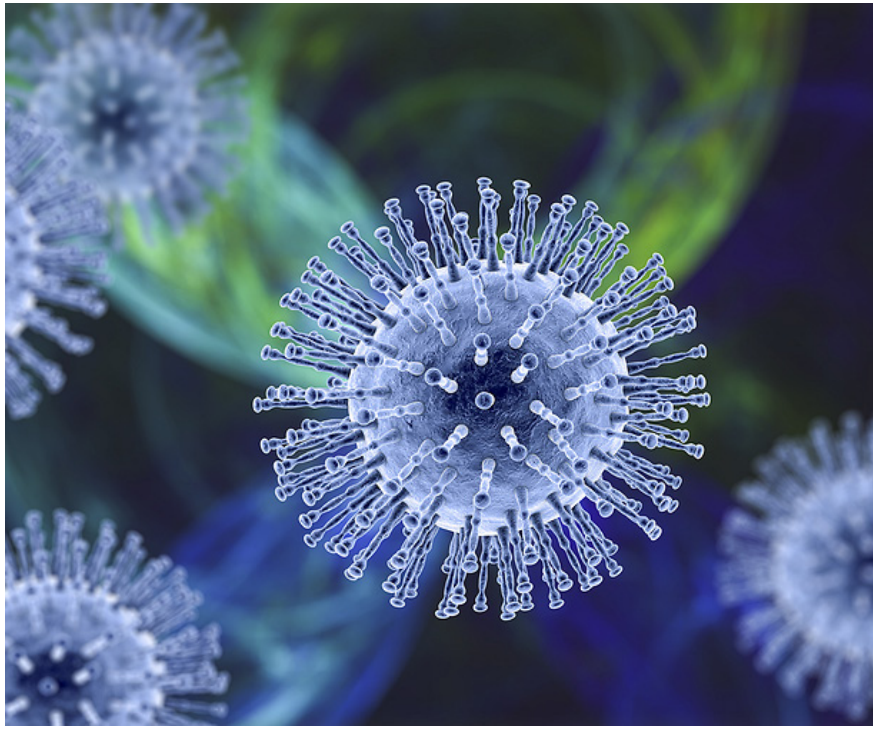
KCE REPORT 335

Federaal Kenniscentrum voor de Gezondheidszorg
Centre Fédéral d'Expertise des Soins de Santé
Belgian Health Care Knowledge Centre

ASSESSING THE MANAGEMENT OF HOSPITAL SURGE CAPACITY IN THE FIRST WAVE OF THE COVID-19 PANDEMIC IN BELGIUM



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Reported interests: All experts and stakeholders consulted within this report were selected because of their involvement in the topic of the management of hospital surge capacity in the first wave of the COVID-19 pandemic in Belgium. Therefore, by definition, each of them might have a certain degree of conflict of interest to the main topic of this report.

Layout: Ine Verhulst

Disclaimer:

- **The external experts were consulted about a (preliminary) version of the scientific report. Their comments were discussed during meetings. They did not co-author the scientific report and did not necessarily agree with its content.**
- **Subsequently, a (final) version was submitted to the validators. The validation of the report results from a consensus or a voting process between the validators. The validators did not co-author the scientific report and did not necessarily all three agree with its content.**
- **Finally, this report has been approved by common assent by the Executive Board.**
- **Only the KCE is responsible for errors or omissions that could persist. The policy recommendations are also under the full responsibility of the KCE.**

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SCIENTIFIC REPORT

1 INTRODUCTION

How to use this document?

This scientific report is not intended to be read as a stand-alone document, but as a complement to the short report of this study. It gives a detailed account of the methods and results of each of the scientific building blocks underpinning the messages rendered in the short report. Each building block is treated in a separate chapter of the scientific report.

The context, problem description, as well as a transversal discussion of the results and the conclusions are to be found in the short report, which is published as a separate document on our website. It can be accessed from the same referral page as the current document.

1.1 Scope and purpose of the report

The outbreak of the COVID-19 pandemic has presented unique challenges for most countries all over the world. While the pandemic's challenges were unprecedented, so were also public health and economic responses launched by governments. At the start of the pandemic crisis in Belgium in early March 2020, various initiatives were taken at different levels without consultation or consistency (for example, in some areas nursing homes imposed visitation restrictions or mayors decided to ban people who returned from regions at risk from going to public places and schools, etc.).[1] Therefore, the Prime Minister announced on 12 March that the "federal phase" came into force, which means that there is a national coordination of all measures by the Minister of Internal Affairs. The Belgian government declared a lockdown for the entire country from 18 March 2020, following the example of other (European) countries.

In response to the COVID-19 crisis several committees or task forces were put in place or were activated in Belgium, both inside and outside existing structures. One of these committees is the Hospital & Transport Surge Capacity (HTSC) committee, which was tasked with developing measures and guidelines relating to hospital surge capacity and hospital transport to cope with the pandemic.

Study aim

The Director-General of the Federal Public Service (FPS) Public Health, who is also the chairman of the HTSC committee[a], asked KCE (in June 2020) for an assessment of the HTSC committee, and of the response of hospitals.

The aim of this report is **to assess the process of regulation of the HTSC committee as well as the hospital responses to the measures that were imposed on them by the committee** in order to:

- document the policy process during the first wave;
- identify lessons concerning hospital capacity and transport for the current and potential future pandemics;
- and formulate recommendations for policymakers and hospitals.

It should be kept in mind that the role of this assessment cannot be compared to the role of an inquiry commission or any other kind of political commission.

Scope

The assessment period runs from the initiative to establish the committee until the end of June 2020. Initiatives that were taken by the committee after that date will be discussed only if they contribute to the aim of the study. The assessment of the committee is mainly focused on the establishment of the committee and the process of decision-making and communication to the hospitals, but not on the impact of measures on patient outcomes, staff well-being or the financial situation of hospitals. Evaluations that already existed, are included in the study. Selected topics of that regulation will also be assessed in an international comparative perspective.

The assessment of the response of hospitals is focused on, but not limited to, the creation of surge capacity, the role of the hospital emergency plan, and collaboration initiatives.

Although the HTSC committee also issued measures for psychiatric hospitals, the scope of this study is limited to **acute hospitals** (including university hospitals). This does, however, not rule out that some lessons identified or recommendations apply also to psychiatric hospitals.

Outline

For a better understanding of the role of the HTSC committee, we first describe the organisational structure of COVID-19 crisis management in Belgium (section 1.2). An important instrument in crisis management for hospitals is the hospital emergency plan (HEP). We describe the main characteristics of the HEP in section 1.3. Since the main mission of the HTSC committee was to help hospitals to cope with a surge in demand for critical care beds, we define “surge capacity” in section 1.4. Section 1.5 gives a brief overview of the methods that were applied in the scientific report.

1.2 Governance of the COVID-19 crisis: a complex institutional structure reflected in the tangle of bodies

Figure 1 shows an overview of the organisational structure of the COVID-19 crisis management. On this organogram, a distinction is made between permanent crisis management structures, structures that were set up specifically for the management of the COVID-19 crisis and existing (non-crisis) federal organisations.

[a] On 6 October 2020 he was appointed “corona commissioner” and since then he is no longer chairman of the HTSC committee.

Permanent crisis management structures

Belgium is a federal state with three communities and three regions. As a result of this complex institutional structure, there are eight ministers responsible for health: one federal and seven regional health ministers. As a consequence, many "inter-ministerial conferences" have been established to coordinate policies between the different levels. The **Inter-ministerial Conference (IMC) Public Health** is one of them. The IMC supervises the actors of the Belgian monitoring and risk management system, as described in the protocol agreement of 11 March 2008:[1]

1. The **National Focal Point (NFP)** is established following the International Health Regulations (IHR) of the World Health Organization (2005).[2] It is defined as *"the national centre that shall be accessible at all times for communications with WHO IHR Contact Points"*. One of the functions of a NFP is the coordination of the analysis of national public health events and risks, including collaborative risk assessment with the WHO on public health events.
2. The **Risk Assessment Group (RAG)** analyses the risk for the population on the basis of epidemiological and scientific data. This group is coordinated by Sciensano, and is composed of epidemiologists of Sciensano and the Superior Health Council, and representatives of the health authorities of the federal state and the federated entities. Experts with specific knowledge of the health risk can be consulted. The RAG gives advice to the Risk Management Group.
3. A **Risk Management Group (RMG)** relies on the advice of the RAG to decide what measures need to be taken to protect public health. The RMG is composed of representatives of the health administrations and all ministers of health, and is chaired by the Belgian NFP. The RMG receives instructions from the IMC Public Health and also submits its recommendations to the IMC. In the event of a serious crisis, the RMG meets regularly to manage all health-related aspects of the crisis.

The **National Crisis Centre (NCCN)**, within the FPS of Internal Affairs, is in charge of emergency planning and crisis management infrastructure. In particular, it ensures coordination, preparation of decisions, their possible execution and follow-up. This federal organisation is linked to the crisis organisation at the local level. The NCCN is also responsible for providing uniform and consistent information to the public.

In addition, to guarantee coordination at the national level, a **Crisis Cell Public Health** was activated on 15 April. It ensures that the federal health organisations and the health sector know their respective missions, carry them out and interact effectively with each other.

Structures specific to the COVID-19 crisis

At the start of the COVID-19 crisis, additional structures were put in place. A Scientific Committee Coronavirus was established (in January 2020) to advise health authorities on the latest scientific developments about this new virus. The committee gives scientific advice to, amongst other, the RAG.

Several task forces were set up, which are supervised by the RMG and the IMC Public Health. The **HTSC committee** is one of these task forces. In Figure 1 a (non-exhaustive) list of other new task forces is given. Some of them are no longer active. Others have recently been set-up.

Existing federal institutions

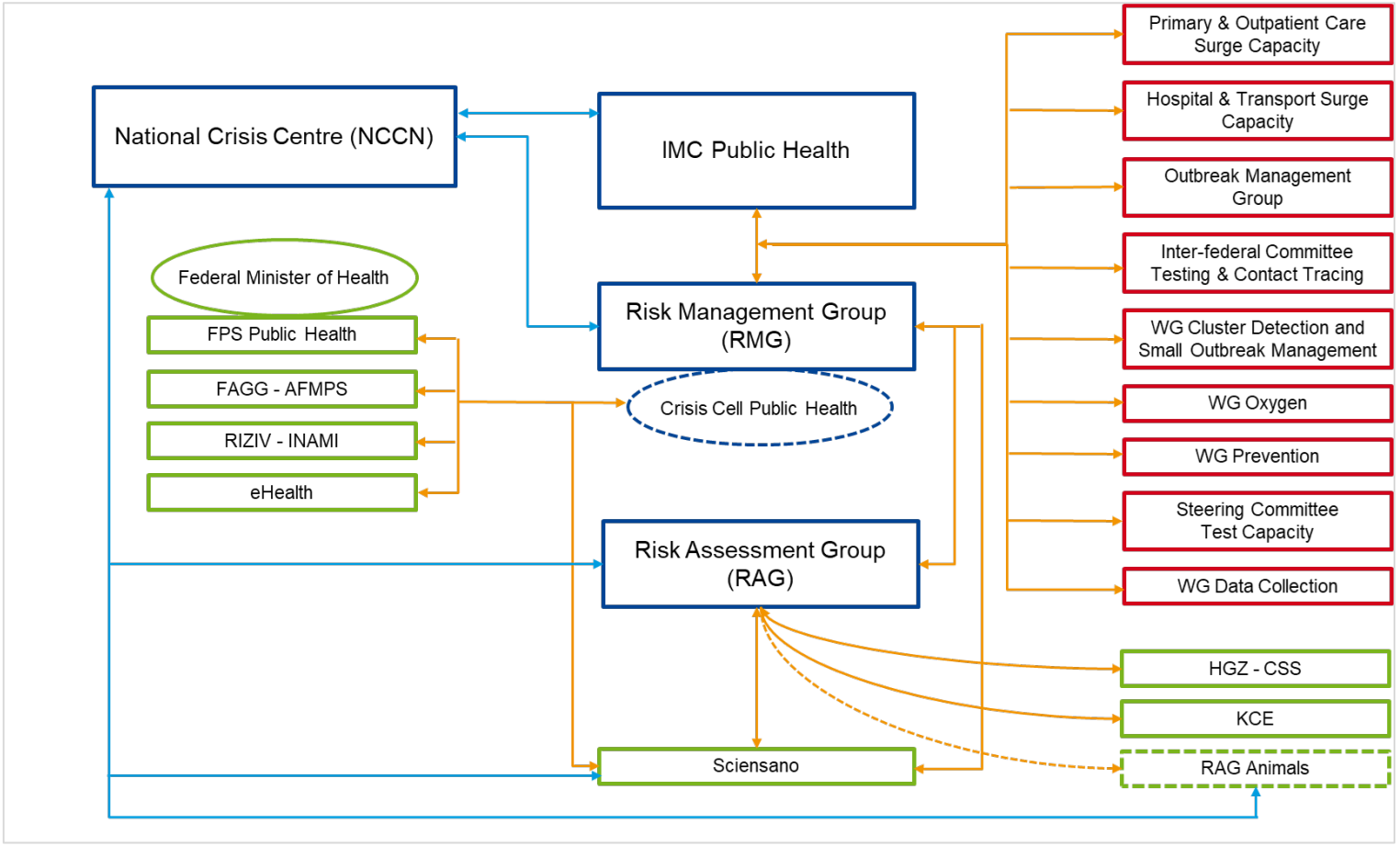
The RAG benefits from the support of various **federal scientific organisations** such as the Superior Health Council (HGR – CSS) and KCE. Sciensano (formerly the Scientific Institute of Public Health) is responsible among others for collecting and analysing data on the evolution of the epidemic and for establishing procedures for GPs, hospitals, laboratories and patients. A new Risk Assessment Group Animals has also been set-up that brings together scientists in the field and representatives of the FPS Public Health, FAVV – AFSCA and Sciensano.

In addition to their regular missions, **federal health institutions** such as the FPS Public Health, RIZIV – INAMI[b], FAGG – AFMPS[c] and the eHealth platform also carried out missions related to the crisis.

[b] National Institute for Health and Disability Insurance

[c] Federal Agency for Medicines and Health Products

Figure 1 – Organisational structure of COVID-19 crisis management



Source: Adapted from FPS Public Health (2020)[3]; IMC = Inter-ministerial Conference

1.3 The hospital emergency plan as a tool for response to a pandemic or other crisis

Greater uniformity in hospital emergency plans since 2016

The Royal Decree of 23 October 1964 (and further modifications) defines the licencing standards for hospitals. Having a HEP is one of these licensing standards.[4] A HEP defines what needs to be done in case of a disaster inside (e.g. blackout, chemical accident, hospital bacteria, etc.) or outside (e.g. chain collision, flood, attack, etc.) the hospital. However, until recently there was a large diversity in how hospitals defined such plans, and a survey carried out by the FPS Public Health in 2013 made clear that about one-third of hospitals did not have a licensed HEP.[5] Therefore, between 2014 and 2016, a task force prepared a "template" (and corresponding legislation) for a generic HEP, which is suitable for all kinds of disaster incidents and for all hospital types. Although the template is a generic document, it can be modulated and adapted to the size, type or special aspects of the hospital or emergency situation. Contrary to the previous plans, which focused on the procedure to set up a hospital crisis management committee, the new plan is more focused on operational readiness.

Since the 6th State reform in 2014, licensing standards are determined by the federated authorities. To avoid different licensing standards in Flanders, Wallonia or Brussels, a Protocol Agreement was concluded between the federal government and federated authorities on 26 October 2016.[6] The Agreement defines the content, procedures and different roles within the HEP with the aim to increase uniformity in these HEPs for the whole country. The Protocol Agreement builds on the Common Statement of 27 June 2016 of the federal and federated authorities in which they declared to align on the HEP.

In 2019, each of the federated authorities issued a Decree (with the same content) that defines the licensing standards for the HEP, including the procedure for approval. It was decided that every hospital had to dispose of an approved HEP on 31 December 2019[d]. However, the deadline for submitting the HEP to the municipal authorities has been extended to 31 December 2020, and the deadline for submitting the HEP to the competent minister to 1 August 2021.

Reflex and treatment capacity define the available capacity in a hospital

The HEP defines two concepts related to capacity. **Reflex capacity** refers to the minimum number of patients a hospital can take up (at the hospital site with a licensed specialised emergency department) in the first two hours of a disaster and is put equal to 3% of the number of licensed beds, per hour. This reflex capacity guarantees a capacity to provide the initial basic care.

Treatment capacity refers to capacity that is needed to treat patients after the initial reception and provision of basic care. It is defined in terms of the number of available beds per type of bed, ventilators and operating theatres that can be staffed within 15 minutes, etc.

Activation process of the HEP

The HEP distinguishes two phases: the "information phase" and the "action phase". The **information phase** starts as soon as a disaster warning is received.

The **action phase** consists of two levels. In **level 1** only a limited number of extra staff is needed, some services are reorganised (emergency department, ICU or operating theatre) and the reflex capacity is sufficient for the number of affected patients. In **level 2** a larger number of extra staff is involved, a large part of the hospital has to be reorganised and the number of patients exceeds the reflex capacity of the hospital.

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[d] The original deadline for Flanders was 1 July 2019.

1.4 How do we define surge capacity?

In literature as well as in policy documents, diverse definitions are used for "surge capacity". In this report, we follow (where possible) the definition provided in one of the technical guidance papers of the WHO: *"Surge capacity is the ability of a health system to manage a sudden and unexpected influx of patients in a disaster or emergency situation. Creating surge capacity involves a comprehensive approach linking the four S's of surge capacity: space (or structure), staff, supplies and systems."*[7]

- **Space** (structure): covers hospitals and beds, and facilities (such as triage areas or cohort units with adequate air ventilation) that are already available or could be equipped for specific emergency needs; structures beyond the hospital setting that are repurposed (for example hotels, community centres).
- **Staff:** concerns the provision of sufficient numbers of appropriately skilled and supervised health and social care workers. Special attention has to be given to specialisations that are needed and to an analysis of potential shortfalls.
- **Supplies**: relates to the availability of specific equipment for emergency deployment, both for patient care and health worker safety. In the context of COVID-19, this covers intubation equipment, mechanical ventilators, specific medications, extracorporeal membrane oxygenation equipment (ECMO), personal protective equipment (PPE), etc.
- **Systems**: refers to modes of working (such as the activation of integrated policies and procedures) that ensure an optimum surge capacity response. This covers decision-making, communication, continuity of operations and supply chain management.

1.5 Methods

Mixed-methods approach

The study applies a mixed-method approach. The methods used are outlined in detail in the beginning of each chapter.

The following data collection techniques were applied:

- Document analysis of the minutes of the meetings of the HTSC committee (Chapter 2) and of the letters the committee sent to the hospitals (Chapter 3)
- In-depth interviews with members of the HTSC committee, representatives of the hospital sector and content experts (Chapter 4)
- Online survey of Belgian acute hospitals (Chapter 5)
- Analysis of other Belgian initiatives that evaluated topics relevant to surge capacity via surveys, data analyses, etc. (Chapter 6)
- International comparison of the development of hospital surge capacity approaches in selected countries (Chapter 7)
- Literature review of international tools and guidelines for hospital surge response strategies (Chapter 8).

2 ANALYSIS OF MEETING MINUTES OF THE HTSC COMMITTEE

Key Findings

- **The Hospital & Transport Surge Capacity (HTSC) committee was established in the beginning of March 2020 as a working group of the Risk Management Group (RMG) with the mission to monitor the number and type of COVID-19 patients admitted to acute (including university) hospitals, to discuss issues concerning capacity, inflow, through-flow and outflow of patients, and to propose decisions to the RMG concerning the organisation of adequate hospital care capacity for COVID-19 patients in Belgium.**
- **The HTSC committee gathered almost daily during the period 1 March 2020 – 30 June 2020 (our observation period).**
- **There was an extensive information exchange to and from the HTSC committee with a large number of other bodies and working groups that were involved in the COVID-19 crisis.**
- **The HTSC committee sent several letters to the acute hospitals with measures to be followed; all letters were preceded by extensive discussion in the HTSC committee and received approval from the RMG.**
- **The HTSC committee discussed the availability and occupancy of hospital / ICU beds in every meeting to its best ability based on the available aggregated data from the Sciensano Hospital Surge Capacity survey and from the Incident Crisis Management System. However, the discussions were compromised due to suboptimal data quality and due to lack of data. As a consequence the surveys needed several adaptations and extensions during the COVID-19 crisis and this had to be communicated to the hospitals. The HTSC committee lacked important information to fulfil its mission properly, especially in the first weeks of the crisis.**
- **The HTSC committee developed surge capacity plans and adjusted them following the phases of the COVID-19 crisis (increase, decrease, permanent reservation). These plans were communicated to the acute hospitals in several letters, after approval by the RMG.**
- **The communication of the HTSC committee regarding surge capacity mainly related to surge / scaling up of (ICU) bed capacity and to a much smaller extent to surge in equipment, surge in personal protective equipment (PPE) or infrastructure or to surge of staff.**
- **The HTSC committee devoted much time to the preparation (timing, conditions) of the restart of regular care.**
- **Several issues were discussed in the HTSC committee that did not fit within its scope. This required much alignment with and transfer to other bodies and working groups.**

2.1 Background of the HTSC committee

In the beginning of the COVID-19 crisis in Belgium the Hospital & Transport Surge Capacity (HTSC) committee was established on request of the Risk Management Group (RMG)[e] with the aim to coordinate activities regarding needed (extra) hospital care for patients infected by COVID-19 and to prepare necessary measures to guarantee sufficient hospital capacity across Belgium. All decisions and actions of the HTSC committee are supposed to be approved by the RMG.

In this chapter the working of the HTSC committee is analysed, with the aim to have an insight in the decision and communication processes in the committee that preceded the instructions / measures it issued.

We have concentrated the analysis on the discussions in the committee that preceded the letters (n=16) that were sent by the committee to (at least) the acute hospitals. This information is complementary to Chapter 3 in which the letters of the HTSC committee to the hospitals are analysed.

The analysis is based on the available minutes of the HTSC committee meetings in the period 01/03/20 – 30/06/20. During that time period, the HTSC committee held at least[f] 71 meetings; for 61 of them, minutes of the meetings were available for analysis. The minutes of meetings were, in general, structured as follows: participants, actual numbers on COVID-19 patients in hospitals (national, provincial) and hospital bed availability, lessons from the data, issues discussed and issues not discussed. It was not always clear from the minutes who was speaking or responding. The minutes did not contain a list with decisions made.

2.2 Mission of the HTSC committee

The letters of the HTSC committee to the hospitals, dd 13/03, 17/03 and 25/03, explained the mission of the committee: i.e. to monitor the number and type of COVID-19 patients admitted to general and university hospitals, to discuss issues concerning capacity, inflow, through-flow and outflow of patients, and to propose decisions to the RMG concerning the implementation of the "Hospital and transport surge capacity plan".

2.3 Members of the HTSC committee

At the start it was stipulated that the HTSC committee should consist of representatives of the

- federal and federated (cabinets of) ministers of health
- federal and federated health administrations
- federal health inspectors
- ministry of defence
- hospital umbrella organisations

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e See minutes of RMG of 06/02: *"Er wordt een werkgroep ziekenhuizen opgestart, coördinatie Erika." / "Un groupe de travail sur les hôpitaux est en cours de création, coordination Erika."* (https://d34j62pglfm3rr.cloudfront.net/rmg/nl/20.02.06_RMG_verslag_NL.pdf/https://d34j62pglfm3rr.cloudfront.net/rmg/fr/20.02.06_RMG_rapport_FR.pdf) and of 13/02: "*Erika Vlieghe zal een werkgroep oprichten voor de ziekenhuizen (surge capacity). Ze moet op de hoogte worden gebracht van de instanties die deel moeten uitmaken van deze groep." / "Erika Vlieghe va mettre en place un groupe de travail concernant les hôpitaux (surge capacity). Il faut l'informer des instances devant faire partie de ce groupe."* (https://d34j62pglfm3rr.cloudfront.net/rmg/nl/20.02.13_RMG_verslag_NL.pdf/https://d34j62pglfm3rr.cloudfront.net/rmg/fr/20.02.13_RMG_rapport_FR.pdf)

f From the initiative of the RMG in February 2020 to establish a hospital surge capacity committee and the real start of it, there were several meetings held under a different name, i.e. "coordination meeting hospitals"; we took these into account as being a meeting of the HTSC committee. Furthermore, the number of 71 meetings is based on the information we gathered through different channels. Some meetings held in the beginning have not been archived.

- Scientific Committee Coronavirus.

The HTSC committee is chaired and administratively supported by the Directorate-General Healthcare of the Federal Public Service (FPS) Public Health[g]. Ad hoc, other organisations and experts could (and were) invited to the HTSC committee meetings when needed (e.g. Sciensano, RIZIV – INAMI, KPMG, Deloitte, were invited for one or more meetings).

A total of at least 95 persons participated in one or more HTSC committee meetings in the period 01/03/20 – 30/06/20. However, part of this number of participants can be explained by the fact that the participating bodies were represented by multiple members (as a member or as a substitute) and by occasional attendance of external consultants.

2.4 Communication from and to the HTSC committee

As can be seen in Figure 1 the HTSC committee operated in a complex landscape of official bodies and task forces, each with its own task and mission but all related to the COVID-19 crisis. Consequently, some issues that arrived at the HTSC committee or were discussed in HTSC committee meetings, were forwarded to other persons, committees and organisations; vice versa the HTSC committee received issues to discuss from several persons/organisations.

Main organisations to which the HTSC committee sent information were the hospitals, the RMG, the Inter-ministerial Conference (IMC – CIM)[8], the Risk Assessment Group (RAG), the task force testing, the task force primary and outpatient care surge capacity and internal departments of the HTSC committee members' organisations. The committee received input from mainly hospitals, IMC – CIM, RMG, RIZIV – INAMI, Sciensano and a plethora of other organisations. It is not clear from the minutes how this information exchange happened (email, telephone, etc.).

2.5 Issues discussed

The HTSC committee discussed many issues related to the organisation of the hospital activities in the COVID-19 crisis, varying from stopping and resuming of regular hospital activities, testing of personnel and patients on COVID-19, availability and use of personal protective equipment (PPE), regulation of hospital visitors, transport of patients to/from/between hospitals, cooperation with and support to nursing homes, intermediate care structures, case definitions, international cooperation, and many others.

One issue, directly related to the HTSC committee's main mission, was discussed in each meeting: the availability/occupancy of hospital (ICU) beds, and the number of (new) patients admitted and discharged.

Hereafter, we discuss in more depth the issues that were discussed in the HTSC committee meetings and were reflected in the letters of the committee to the acute hospitals (see Chapter 3).

2.5.1 Registration of hospital capacity and use

Bed availability and bed occupancy

Since the main focus of the HTSC committee is to monitor hospital capacity to treat COVID-19 patients, figures on available capacity and on the number of admissions of COVID-19 patients were discussed in each meeting; these figures were discussed at the national and provincial level.

Hereto, the HTSC committee used data from two surveys that hospitals had to fill out daily: the "Incident Crisis Management System" (ICMS)[h] and the "hospital surge capacity" (HSC) survey of Sciensano.

[g] An organigram of the HTSC committee can be found at https://www.health.belgium.be/sites/default/files/uploads/fields/fpshealth_theme_file/organigram_htsc_nl.pdf and https://www.health.belgium.be/sites/default/files/uploads/fields/fpshealth_theme_file/organigram_htsc_fr.pdf.

[h] ICMS is a software platform, developed as part of the federal hospital emergency plan, and each Belgian hospital has access to it. The manual of

In the letter of 04/03 hospitals were asked to register daily their **hospital capacity data** into ICMS and send these daily before 11am to the federal authorities. Next to this ICMS registration, hospitals were required in the letter of 10/03 to fill out daily a questionnaire from Sciensano with information about **hospital bed occupation**. This became legally obliged on 30/04 after publication in the Belgian Official Journal ("Belgisch Staatsblad"/"Moniteur belge")[9].

According to the text in the Belgian Official Journal, the following data had to be filled out daily:

- in ICMS, per hospital site:
  - available capacity of beds, on which patients with COVID-19 could be admitted
  - available capacity of ICU-beds, on which patients with COVID-19 could be admitted
  - number of available ventilators
  - number of available extracorporeal membrane oxygenation (ECMO) machines
- in the Sciensano HSC survey, per hospital, and split by confirmed and suspected COVID-19 cases:
  - total number of hospitalised patients with COVID-19
  - number of newly (since previous survey) admitted patients with COVID-19 (split by patients that were directly admitted to the hospital and patients that were referred form another hospital)
  - number of patients with COVID-19 on the ICU
  - number of patients with COVID-19 that are mechanically ventilated
  - number of patients with COVID-19 receiving extracorporeal membrane oxygenation (ECMO).

Both surveys asked for aggregated data. An example on how these data (27/03) were discussed in the HTSC committee is shown in Box 1.

This scheme was discussed in each meeting; the new daily numbers were compared to the numbers of the day before and in each meeting the committee formulated lessons learned from the numbers (e.g. increasing pressure of COVID-19 patients in some hospitals or regions and if transfers to other hospitals or regions are required; total pressure on hospital (ICU) beds and if additional capacity should be created).

Numbers were mostly only compared to the day before and only the minutes of the meeting (MM) of 18/05 contained a chart (Figure 2) in which numbers over a longer period were presented.

the ICMS can be found at https://sites.google.com/view/icms-elearning/home?authuser=0.

Box 1 – Daily data available to the HTSC committee, example of 27/03/2020

Sciensano

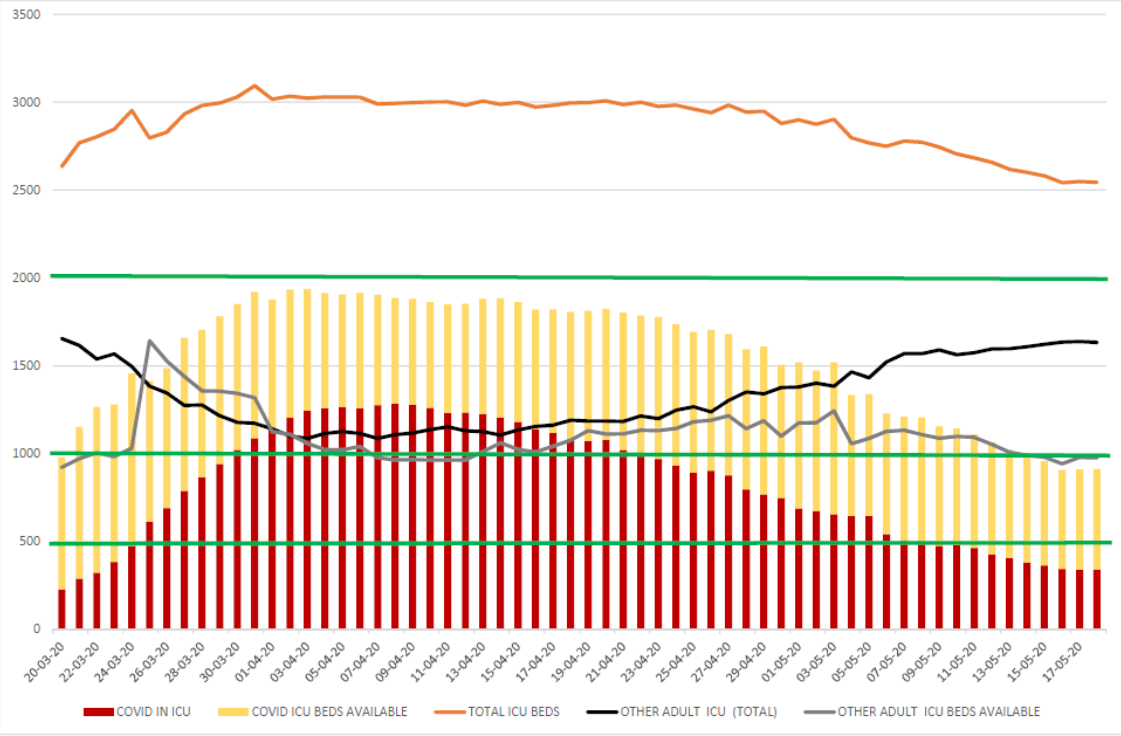
- Response 97% (12:00h)
- Hospitalised
  - Confirmed: 3637 (yesterday: 3042)
  - Suspected: 1358 (yesterday: 1369)
- In ICU
  - Confirmed: 770 (yesterday: 690)
  - Suspected: 87 (yesterday: 103)
- New patients – not referred
  - Confirmed: 548 (yesterday: 490)
  - Suspected: 775 (yesterday: 749)
- New patients – not referred
  - Confirmed: 13 (yesterday: 11)
  - Suspected: 9 (yesterday: 9)
- Discharged – not referred
  - Confirmed: 201 (yesterday: 183)
  - Suspected: 205 (yesterday: 162)
- Discharged – not referred
  - Confirmed: 15 (yesterday: 11)
  - Suspected: 11 (yesterday: 4)
- Ventilated
  - Confirmed: 566 (yesterday: 498)
  - Suspected: 33 (yesterday: 47)
- ECMO
  - Confirmed: 16 (yesterday: 11)
  - Suspected: 1 (yesterday: 0)
- Deceased
  - Confirmed: 57 (yesterday: 74) – total 386
  - Suspected: 17 (yesterday: 15) – total 152
- Number on provincial level (17:00h)
  - Antwerpen: 627
  - Brabant Wallon: 56
  - Brussel-Bruxelles: 579
  - Hainaut: 451
  - Liège: 388
  - Limburg: 353
  - Luxembourg: 84

ICMS

- 119 of the 128 hospital sites shared their data by 11h08:
  - Currently, there are in total, regardless of specialism (ICU or COVID-19) 11 803 beds available.
  - There are 2 973 beds on hospital units foreseen for COVID-19 patients.
  - The hospital sites have foreseen a complementary capacity of 869 beds on ICU.
  - Currently there are 806 beds on ICU available for admission of COVID-19 patients.
  - 547 beds on ICU remain available for admission of non-COVID patients.
  - A total of 610 ventilators are available on 119 hospital sites.

- Namur: 79
- Oost-Vlaanderen: 393
- Vlaams-Brabant: 217
- West-Vlaanderen: 409
- Military hospital

Figure 2 – ICU availability and occupancy between 20 March and 17 May 2020



Source: HTSC committee meeting minutes 18/05/20

During the meeting of 11/05, it was decided to add a new parameter to the data discussion: the **acceleration rate**. This was defined in the MM as the number of new patients with COVID-19 (confirmed and suspected) admitted on a given day in percentage of the number for the day before as well as in percentage of the average number of the seven previous days ("*Het aantal nieuwe patiënten (nieuwe gevallen bevestigd en verdacht) in percentage afgezet tegen het gemiddelde van 1 dag en het gemiddelde van 7 dagen ervoor op ziekenhuisniveau.*"). This was calculated per hospital. In this way the HTSC committee could better detect and estimate an increase/decrease in pressure to the hospitals and locate regional problems and take appropriate actions (e.g. transfer to other hospitals / regions).

Additionally, the MMs of 25/03, 26/03 and 27/03 mention a data-visualisation tool from DNalytics made available for HTSC committee members, but it is not clear to what extent this was used and which data were visualised by the tool.

Also some MMs mention the use of a prediction model(s) by the HTSC committee (MM of 07/04: "*Predictiemodel van Lise R en PWC wordt door ons gebruikt om de trends in opnames te volgen*"), but it did not came clear from the minutes how this tool/model was applied or used to inform decisions and if eventual other models were also used.

By discussion of all above numbers, the HTSC committee could see if available (ICU) bed capacity was in balance with bed occupancy and new admissions of COVID-19 patients. In this way it could decide if additional capacity had to be created or if hospitals in some regions were saturated and if inter-hospital transport was needed (regulation).

However, it appeared from several HTSC committee minutes that there were often and recurrent data problems: hospitals not reporting daily, missing data, mismatches between the HSC survey and ICMS numbers, changes in data definitions, wrong data input, unclear operationalisations of variables, and other. At several times it was mentioned in the MM that the **HTSC committee lacked a good view on available (ICU) beds and available number of ventilators and ECMO equipment** and there was a kind of mismatch between licensed and extra created beds and de facto available operational beds (so including personnel to care for a patient on a ICU bed); the same applied to ventilators and ECMO equipment. The HTSC committee lacked view on available human resources[i].

All this made the interpretation of capacity and occupancy difficult and it required changes to the surveys and communication to the hospitals. Also from reactions of the hospitals to the HTSC committee, it became clear that there were interpretation difficulties on how to fill out both questionnaires. During the crisis, the HTSC committee also decided (MM 18/04, 24/04) to organise additional single surveys to hospitals on top of the Sciensano and ICMS daily surveys, e.g. on the number of ventilators and ECMO equipment.

The discussions in the HTSC committee on availability and occupancy of hospital (ICU) beds led to several letters to the acute hospitals in which instructions were given on registration of data.

> *MM 31/03 "Omwille van blijvende onduidelijkheid zou ik graag binnen ICMS volgende wijzingen in de omschrijvingen laten uitvoeren."*
>
> *MM 04/04 "Minder ICU bedden in ICMS dan dat wij menen te weten."*
>
> *MM 17/04 "Cijfers m.b.t. capaciteit die gegeven worden door Sciensano lijken niet overeen te komen met onze gegevens."*
>
> *MM 04/05 "Discordantie tussen de gegevensverwerking van capaciteit volgens Sciensano en volgens ICMS."*

[i] This was recognised by the HTSC committee and therefore an external consultancy group (KPMG) was invited to the meeting of 28/03 to hear if they could develop a tool on human resource availability. However, it is not clear from the MM what happened with the KPMG proposal.

MM 19/05 "De case definition van Sciensano zorgt voor blijvende onduidelijkheid. De ziekenhuizen hebben elk hun interpretatie, waardoor dit mogelijks van invloed is op de totale cijfers die we krijgen van Sciensano."

MM 28/05 "Er is een verkeerde inschatting voor de beddencapaciteit. De cijfers uit ICMS stemmen niet overeen met de realiteit."

Length of (ICU) stay

Next to the Sciensano HSC and ICMS data described above, it appeared from the meeting minutes that length of stay (LOS) in hospital and ICU was felt as a central factor that influenced largely availability of beds and in consequence the number of needed extra beds. However, neither the Sciensano HSC survey nor the ICMS provided data on that.

The problem of missing information on (ICU) length of stay was first signalled in the MM of 04/04 and it was decided to send a specific survey to the hospitals concerning LOS that should be returned by 06/04. This survey had many limitations according to the MM of 07/04, but it showed that between 67-73% of the ICU-admitted COVID-19 patients required ventilation therapy on ICU and that the minimal length of ICU stay should be estimated at minimally 10 to 15 days and that mean length of ICU stay might be approximately 21 days (*La durée minimum d'une personne (hors décès devrait être au minimum de 10 à 15 jours) et il est probable que la valeur moyenne soit plus proche de 21 jours)* when used as input variables for the prediction models.

In the MM of 08/04 it is signalled that Sciensano is also gathering data about LOS and that the committee would ask Sciensano for further information. Length of stay could be derived from the voluntary individual patient clinical survey that was initiated by Sciensano. Hospitals were asked (but it was not obligatory) to fill out a survey for each (confirmed) COVID-19 patient at admission and at discharge.[10] The survey contained questions on clinical parameters[j], ICU use, ICU LOS and of course an admission and discharge date, from which LOS could be calculated.[11] However, this clinical survey did not cover all patients (for 76% of admitted COVID-19 patients admission and discharge data were filled out) and was not filled out by all hospitals (n=97).

In the MM of 28/04 it was again signalled that the HTSC committee missed important information about LOS and that a new survey to hospitals should be organised and that it was of utmost importance to receive information from Sciensano on what they gathered on LOS data. On 30/04 the HTSC committee discussed the dispersion of COVID-19 patients across regular units and ICUs and differences in this between hospitals, but this raised even more questions and showed lack of essential information. Nevertheless, it was decided to put the intended new survey on LOS on hold until more information was received from Sciensano.

On 04/05 Sciensano joined the HTSC committee and informed the committee about the individual patient clinical survey it was doing and what type of results could be expected (however, without presenting actual results). In this meeting of 04/05 it was also questioned whether these individual patient clinical survey should be mandatory. On 07/05 Sciensano joined again the HTSC committee and its clinical survey was again discussed. On 14/05 and 28/05 Sciensano came to the HTSC committee and presented preliminary data from the clinical survey, but nothing specific about LOS[k]. No further mentions were made in the HTSC committee minutes neither on new LOS data nor on the intended new survey to the hospitals (unclear if it has been sent or not).

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j Detailed information on the variables in the clinical survey can be found in Appendix 2 of Van Goethem et al. 2020.[11]

k On 02/07 Sciensano published a report[12] that stated that the median LOS of the confirmed COVID-19 patients was 8 days (P25=4; P75=14) and for patients that required ICU the median ICU LOS was 8 (P25=4; P75=17); later on (21/07) an article concerning LOS was published on behalf of The Belgian Collaborative Group on COVID-19 Hospital Surveillance, based on the Sciensano individual patient data admission/discharge survey and presenting the same results concerning LOS.[13]

Conclusion on data discussions in the HTSC committee

In conclusion, the HTSC committee discussed the availability and occupancy of hospital / ICU beds in every meeting to its best ability based on the available aggregated data from the Sciensano HSC survey and ICMS.

However, the discussions were compromised due to the suboptimal data quality and due to the lack of data. As a consequence the surveys needed several adaptations and extensions during the COVID-19 crisis and this had to be communicated to the hospitals.

The HTSC committee lacked important information to fulfil its mission. For example, number of infected persons in the general population, number of infected patients in residential care settings, number of deaths, length of stay, number of (available and appropriate) healthcare professionals, number of non-COVID-19 patients requiring hospital care, evolution over time of the parameters, and other. In this way it was difficult for the HTSC committee to have a clear view on the (expected) pressure on the hospitals and to anticipate adequately in organising (extra) hospital capacity.

2.5.2 Hospital / ICU capacity measures

One of the main missions of the HTSC committee was to monitor the balance between bed capacity and COVID-19 patients requiring hospitalisation (and ICU treatment, ventilator therapy, ECMO therapy) and to propose measures to create extra capacity when needed, and eventually to transfer patients from saturated/overcrowded hospitals to others. In consequence, this issue was a constant in the HTSC committee meetings and the minutes of it. Surge capacity plans were developed and adjusted during the whole COVID-19 crisis.

Development of capacity plans for upscaling, downscaling and reserving capacity

The initial “hospital and transport surge capacity plan” (Appendix 1.1) that was mentioned in the first letters of the HTSC committee, was prepared by the COVID-19 Scientific Committee in coordination with the Department of Urgent Medical Care of the Directorate-general Healthcare of the Federal Public Service (FPS) Public Health. The plan was presented and discussed in the HTSC committee meetings of 02/03, 03/03, 06/03 and 07/03, and further discussed in the RMG on 09/03 and 11/03 and finally approved in the RMG meeting of 13/03.

The essence of that plan was to provide an answer to an expected rising number of COVID-19 patients needing hospitalisation. The plan discerned four stages: in the first stage with a limited number of patients, only two reference hospitals are supposed to admit COVID-19 patients; in a second stage with more patients, reference and university hospitals admit COVID-19 patients; in the third stage all large hospitals (>550 beds) admit COVID-19 patients and in the fourth stage all hospitals admit patients as much as they are able to, and the hospital emergency plans should be activated.

Soon after the HTSC committee was established it became clear that this fourth stage was required immediately and even that normal capacity would not be sufficient. New plans were developed and discussed in many of the HTSC committee meetings. The plans were in the beginning on upscaling capacity, while from May on they also were targeted on downscaling and on reserving capacity for an eventual second wave of COVID-19.

The surge capacity plans were communicated to the hospitals in several letters (for more details see Chapter 3); all of these letters were preceded by discussion in several HTSC committee meetings and sent for approval to the RMG before they were sent to the hospitals.

How the several plans were developed, did not came clear from the minutes; only the MM of 07/04 mention the use of the prediction model of Lise R and PWC.

Regulation and dispersion

The HTSC committee also discussed in each meeting the regional numbers of hospital bed availability and occupancy to detect eventual high pressure / saturated areas and to decide if transfer of patients between hospitals and regions would be necessary. In case problems were identified, the HTSC committee did not take measures on its own, but asked the federal health inspectors of each region (who are also member of the HTSC committee) to initiate contact with the involved hospitals and to take appropriate actions for the eventual transfer of patients and about creating extra capacity.

2.5.3 Regular hospital care

One of the first decisions of the HTSC committee in the beginning of the COVID-19 crisis was to stop all elective procedures in the hospitals from 14/03 on. This was communicated in a letter of 13/03. **Many questions were raised by the hospitals** on this topic and discussed in the HTSC committee meetings. For example, it appeared that it was not clear what was exactly meant by elective procedures, urgent, life-saving procedures, necessary care and what could be continued and what had to be stopped. There were also questions about the duration of the measure and when regular activities could be restarted again and what conditions would apply.

In the discussions it was also mentioned that more information was needed on the type and size of side-effects of stopping regular care and to what extent patients avoided necessary care.

In addition, the HTSC committee discussed on how to control that hospitals no longer performed elective procedures and if they did what type of sanctions could be applied.

Also, the financial consequences for hospitals and medical specialists of the regular care stop were discussed and how hospitals and specialists could be compensated for the losses. The HTSC committee transferred this topic to other bodies such as RIZIV – INAMI and the Federal Council for Hospital Facilities ("*Federale Raad voor Ziekenhuisvoorzieningen"/"Conseil fédéral des Etablissements hospitaliers*") and the hospitals were informed about this in the letters of 24/04, 30/04 and 17/06.

Much time was devoted to the timing and conditions to restart regular care. Hereto, the HTSC committee decided to involve the Union of Professional Organisations of Medical Specialists ("*Verbond der Belgische beroepsverenigingen van artsen-specialisten"/"Groupement des unions professionnelles belges de médecins spécialistes*" (VBS – GBS)) and the associations of Chief Medical Officers to prepare a restart plan. Main points in this discussion were the extent of care that had been postponed or avoided and needed quick action, the amount of beds that needed to be reserved for an eventual second wave of COVID-19, the possible impact of resuming elective procedures on ICU capacity, financial consequences for hospitals and medical specialists that should be limited as much as possible, the alignment of restart of regular hospital care with the overall Belgian exit strategy (for which a special Group of Experts was installed to prepare an Exit Strategy, the "GEES").

2.5.4 Transport of patients

The many patients infected with COVID-19 often required transport to the hospital. The question was how to organise a split between transport of non-COVID and COVID-19 patients without hampering regular emergency patient transports: who should do the transport, what precautions were to be taken (use of PPE, decontamination of ambulances), how many ambulances needed to be dedicated to COVID-19 patients, what equipment was needed and how could transport be financed. Also the issue of inter-hospital transport in case of patients who became too ill to stay in the initial hospital and required more specialised care was discussed.

These discussions led to letters of the HTSC committee to the hospitals about patient transport: 10/03, 13/03, 25/03, 31/03 and 04/04 in which the headline was that hospitals were required to use their own ambulances for patient transport to, from and between hospitals and to avoid as much as possible the 112-ambulances. It was also outlined that military ambulances could be used when needed and that the federal government would develop a financing plan.

The discussion on transport appeared to be complicated by lack of data on how many transports for COVID-19 patients were done until 10/04 and on how many transports were needed.

2.5.5 Hospital emergency plans

On several occasions the HTSC committee discussed the moment and conditions for the downscaling and eventual de-activation of the hospital emergency plan (HEP) of the hospitals, that was activated in the beginning of the COVID-crisis. As long as the number of COVID-19 patients was high, the committee preferred to keep the HEP in the action phase, as was communicated to the hospitals in the letters of 13/03, 14/03, 25/03, 30/04 and 20/05. On 09/06 the HTSC committee decided that HEPs could be downscaled to the information phase under the condition that the number of COVID-19 patients on ICU was lower than 15% of the licensed ICU-beds (in a loco-regional network) and that downscaling was looked at from a regional perspective (and that the role of the province governors in this decision was clarified). This decision was communicated to the hospitals in the letter of 17/06.

Furthermore the HTCS committee decided on 16/06 that the approval procedure for HEPs could be postponed but that further alignment and discussion with other bodies involved in this matter is needed.

Finally, the HTSC committee discussed the necessity of an evaluation of the HEPs and who should take the initiative for a survey. It was decided that the Department of Urgent Medical Care of the FPS Public Health would do this; the hospitals were asked for their cooperation with the survey in the letter of 22/06.

2.5.6 (Support to) nursing homes

Although nursing homes were not mentioned in the mission of the HTSC committee, problems existing in the nursing homes were frequently discussed. Also because the high rate of COVID-19 infections in nursing homes, and the consecutive necessary hospital admissions, put a severe pressure on the hospital capacity. The HTSC committee discussed admission and discharge policies related to nursing home patients and how hospitals could help/support nursing homes and cooperate with them in combatting the crisis over there. This appeared to be a complicated issue, due to ethical questions (whether or not to still transfer severely ill patients with limited life expectancy to hospitals), and to competence issue (hospitals are a federal matter, while nursing homes are federated).

Among other, it was discussed if

- the establishment of intermediate care structures could be a solution to fasten hospital discharge without putting pressure on nursing homes to take back still severely ill nursing home patients
- the medical corps of the Belgian Defence could be deployed within nursing homes
- hospital pharmacies could provide the necessary medication to nursing homes
- oxygen provision/therapy could be organised within nursing homes
- specialised hospital infection control specialists and geriatric nurses could be sent to nursing homes to assist in organising the care for COVID-19 patients
- hospital nursing and medical staff could be temporarily transferred to nursing homes
- testing strategies in nursing homes could be improved
- personnel of nursing homes who test positive for COVID-19 and with no or light symptoms could keep working
- the provision of adequate PPE in nursing homes could be improved
- etc.

This complex issue was even further complicated due to a lack of data on how many patients from nursing homes were affected by COVID-19 and how many were admitted to the hospitals.

These discussions in the HTSC committee were up-scaled and transferred on 07/04 to the Inter-ministerial Conference (IMC – CIM). The HTSC committee proposed (after approval of the plan by the RMG on 14/04) the IMC – CIM an overarching plan to tackle the COVID-19 crisis in nursing homes[l]. This plan was approved by the IMC – CIM on 15/04.

2.5.7 Intermediate care structures and emergency field hospitals

Related to surge capacity plans for hospitals, the HTSC committee also discussed the establishment of intermediate care structures and emergency field hospitals to lower the pressure on hospitals.

In the meeting of 20/03 and 02/04 the need for emergency field hospitals was discussed; this appeared too difficult to do, because creating extra capacity outside the regular hospitals not only means organising infrastructure but also organising extra staff to give care and this staff was not available.

The discussion on the creation of intermediate care structures ("*schakelzorgcentra"/"structures intermédiaires*") in which patients could be admitted who no longer needed acute hospital care, but were still too ill to return home or to a residential care setting, appeared to be complicated by competent authorities issues and by the question if this fitted within the scope of the HTSC committee or rather within the scope of the task force primary care.

It was decided on 04/04 that the issue of intermediate care structures did not fit within the scope of the HTSC committee and that all questions regarding this would be transferred to the newly established task force intermediate care.

2.5.8 Psychiatric hospitals

Although psychiatric hospitals were not mentioned in the mission of the HTSC committee, these hospitals were discussed frequently and also letters were sent to them. The issues discussed related to psychiatric hospitals were mostly about putting regular activity on hold, testing policy, the use of PPE and regulation of visitors and "therapeutic" leaves of patients.

2.5.9 International collaboration

Requests from neighbouring countries to admit patients from abroad were discussed. The HTSC committee was hesitant and it was decided not to allow such requests since it would hamper the care capacity for Belgian patients. However, the committee stated that all current international agreements should be respected and that essential care for foreign patients already under treatment in a Belgian hospital should be continued as was the case for Belgian patients.

2.5.10 Testing

A recurrent issue in the HTSC committee meetings concerned the testing of patients and staff (in acute hospitals, in psychiatric hospitals, in nursing homes), also within the perspective of the shortage of testing capacity (lab capacity, swabs and reagents, human resources). This topic was regarded as not fitting within the scope of the HTSC committee and was on several occasions up-scaled to the RMG and IMC – CIM and/or referred to the task force testing. Nevertheless, the topic was resubmitted several times to the HTSC committee and needed further discussions within the committee.

The discussions on testing led to several letters of the HTSC committee to the hospitals in which testing measures were outlined.

[l] https://www.zorg-en-gezondheid.be/sites/default/files/atoms/files/Ori%C3%ABntatienota%20DGGS%20Ziekenhuizen%20en%20Rusthuizen_NL_200415.pdf

The HTSC committee also organised a survey[m] in which it aimed to evaluate the testing strategy in acute hospitals; hospitals were invited in the letter of 20/05 to participate.

2.5.11 Personal protective equipment

The use of personal protective equipment (PPE) (e.g. masks, gloves, gowns, etc.) is essential in the care of patients with an infectious disease to protect the personnel and to prevent further spreading to other patients and carers. Already from the start of the COVID-19 crisis it appeared that there was a shortage of PPE in Belgium, as everywhere else in the world. The shortage of PPE led to many discussions in the HTSC committee, such as: Who should be given PPE? What type of PPE is needed in which conditions? How much PPE is used per day? Can PPE be reused? Who should decide on the distribution of PPE? This topic was also up-scaled and referred to the RMG, RAG, Federal Agency for Medicines and Health Products and the task force(s) PPE, but it remained an issue during the whole period we observed.

2.5.12 Stockpile issues

Next to the unavailability of PPE, it appeared that there were also (eventual) shortages regarding essential medications, ventilators, ECMO devices, disposable materials, and others. This raised the question to what extent national stockpiles were in place and if further stockpile strategies were needed to be developed.

2.5.13 Visitor regulations

Due to the contagious character of the COVID-19 virus, measures had to be taken to regulate visitor's flow to the hospitals and these were discussed by the HTSC committee. These discussions led to several letters in which the measures were communicated (see Chapter 3).

In the discussions special attention was paid to what extent visitors' restrictions should be the same for acute hospitals and psychiatric hospitals, to visiting policies for palliative care patients and to the alignment with visiting policies in nursing homes.

2.5.14 Financial issues

Financial aspects related to stopping regular care, creating extra (ICU) bed capacity and sufficient staff, patient transport, acquiring equipment and PPE, income loss for hospitals and medical specialists, testing, detaching personnel to nursing homes, preparation of second wave and permanent bed reservation for COVID-19 patients, and others were taken into consideration in the HTSC committee discussions before measures were prepared. Contacts were made with the relevant parties at stake to be better informed and to see how things could be financed and who should prepare financing plans. Where needed, the discussion were up-scaled and/or transferred to the RMG, the FPS Public Health, RIZIV – INAMI and the IMC – CIM.

2.5.15 Legal issues

At several points in time the HTSC committee was confronted with legal aspects. For example, privacy and GDPR (General Data Protection Regulation) related to test and trace, suing of hospitals and medical specialists when a patient was not admitted to the ICU, how to control that regular care was indeed stopped and what type of sanctions could be applied when this was not the case.

The HTSC committee realised that in a crisis situation not all rules and legislations could strictly be followed and that clinical guidelines might sometimes lack clarity. The HTSC committee stated that hospitals and care professionals deserve support in these matters and it invoked assistance from specialised lawyers of the FPS.

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m https://surveys.sciensano.be/index.php/893766?lang=nl

Also it was discussed to what extent the measures of the committee could be imposed and made obligatory (only the measure regarding the daily data registration in ICMS and the HSC survey of Sciensano was laid down as Royal Decree).

2.5.16 Evaluation of the HTSC committee functioning

In the MMs it was frequently mentioned that the committee wanted to evaluate the effects of the measures it had issued. This happened in an informal way by discussing reactions it received from the field. Based on those reactions, measures were further clarified or the HTSC committee tried to find extra information. “Lessons learned” was a structural item in each of the MM.

In addition, the HTSC committee took initiatives for evaluation surveys, e.g. regarding the hospital emergency plan measures for which it asked the hospitals to participate in a survey in the letter of 22/06 (see Chapter 6 for the results of this survey).

Finally, the HTSC committee decided that its whole functioning should be evaluated and therefore it asked the Belgian Health Care Knowledge Centre (KCE) as independent external organisation to perform this[n]. This was announced in the letter to the hospitals of 22/06.

2.5.17 Other topics

On top of the issues mentioned above, many other topics entered the discussion in the HTSC committee’s meetings. Without being comprehensive, attention was paid to continuation/stopping activities in private practices, deployment of military services in case too many care professionals fell out, how to map available staffing, handling and transporting of deceased patients, registration of available ventilators and ECMO devices, how to act in case healthcare professionals are tested positive on COVID-19, how to continue with routine controls of organisations like FAGG – AFMPS[o] or FAVV – AFSCA[p], waste removal, how to ensure transport of healthcare professionals to the hospitals, the value and use of prediction models and data visualisation tools in making surge capacity plans, how to organise and support eventual oxygen supply to the nursing homes and in the home care setting, needed measures in prisons, communication strategy (who, when, tone), the value of psycho-social managers, and other. Also questions from individual hospitals regarding capacity, or regarding clinical issues were discussed.

Other issues (e.g. vaccinations, burn unit capacity, contact tracing) that were brought to the attention of the HTSC committee, were not discussed since these were considered as not in its scope and were immediately transferred to the appropriate bodies.

Finally, decisions taken by other bodies (such as IMC – CIM, RAG, RMG, Security Council) and task forces (testing, PPE, primary care) were put on the agenda to check congruence and eventual consequences for HTSC committee measures.

2.6 Discussion and conclusions

Minutes of a meeting do tell a lot, but of course they do not tell the whole story. Inherently, all observations and results reported above have their limitations and cannot describe fully the functioning of the HTSC committee. Nevertheless it is clear that the HTSC committee showed a tremendous energy to make difficult and careful decisions in a very difficult crisis situation and under a lot of time pressure.

It must have been a complex and challenging assignment to find the right scope and tasks to perform. But the HTSC committee succeeded to formulate appropriate measures to ensure sufficient hospital care capacity

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[n] The current report is the result of this request.

[o] Federal Agency for Medicines and Health Products.

[p] Federal Agency for the Safety of the Food Chain.

for the care of COVID-19 patients during the first wave and to prepare a surge capacity plan for a second wave.

Of course, the HTSC committee encountered several problems along the way that complicated its functioning. For example, the committee missed a good view on available care capacity (bed, staff, stuff) and recurrent problems were signalled regarding suboptimal data registrations. Hospitals needed to fill out data in two parallel systems, one on bed availability and one on bed occupancy, and both systems required several adaptations over time.

Also the HTSC committee was confronted with a plethora of issues that were brought in and had to be sifted if they belonged to the mission and competence of the HTSC committee or to one of the many other surrounding bodies and working groups. Intensive information exchange to and from the HTSC committee was needed to align and coordinate with other bodies. It may be questioned if a filter (e.g. by the RMG) to select topics that belonged to the HTSC committee would have been helpful to make the committee more efficient and performant.

The HTSC committee communicated a lot of measures to the acute hospitals, but lacked a good view on how the hospitals perceived these measures regarding clarity and feasibility and if the hospitals succeeded to implement the measures.

It could also be questioned what the legal status of the measures was: does the HTSC committee have enough legal power /status to impose such measures?

A strength, for certain, is that the HTSC committee continuously discussed what appropriate actions could be and tried to evaluate its functioning and the appropriateness of its actions by discussing the feedback it received from the field, by organising evaluation surveys and by initiating an external evaluation of its functioning and for which it demonstrated great openness by sharing the minutes of the meetings.

3 ANALYSIS OF THE LETTERS TO THE HOSPITALS

Key Findings

- **The HTSC committee sent several letters to the acute hospitals in the months March to June (our observation period) with instructions what they needed to do. The instructions related to a plethora of issues, but the main measures related to ensuring sufficient hospital capacity for COVID-19 patients and the creation of extra hospital (ICU) bed capacity. It is not clear to what extent all issues of the letters fitted within the mission of the HTSC committee.**
- **The topics and content of the letters followed the course of the COVID-19 pandemic: increase in bed capacity and stop of elective procedures, cautious decrease of bed capacity reserved for COVID-19 together with stepwise restart of regular activities, prepare for a second wave of COVID-19 and creation of permanent vigilance capacity.**
- **The tone of the HTSC committee letters evolved during the pandemic course from kind invitations to more directive formulations.**
- **The proposed measures regarding extra capacity were initially addressed to individual hospitals, but the possibility to collaboration within a loco-regional network was already mentioned from the beginning. In later phases the HTSC committee put more attention to the network collaboration and in the letters of June, the collaboration of hospitals within a network was formulated as obligatory.**
- **A recurrent issue in the HTSC committee letters concerned registration of data about available hospital capacity and about hospital occupancy/use. Hereto, two parallel systems were**

used, one regarding the available capacity (ICMS) and one regarding number of admitted patients (Sciensano). The instructions were extended and adapted several times and needed clarification and further specification along the road. Those changes might on the one hand have improved the data collection but on the other hand they also might have endangered the accuracy/quality of the data needed to adequately monitor availability/occupancy rates.

- **Most of the instructions given in the initial letters were repeated and further clarified in later letters. The HTSC committee clearly learned from experience and from the feedback they received on the measures they communicated.**
- **The instructions about stopping/resuming elective, urgent, necessary and essential care procedures left room for interpretation and discussion.**

3.1 Introduction

As explained in the introductory Chapter 1, in the beginning of the COVID-19 crisis in Belgium (March 2020) a national special task force was established, the "Hospital & Transport Surge Capacity" committee (HTSC committee) with the task to prepare hospital surge capacity measures in order to take care of a large amount of patients with COVID-19.

In this section of the study we analysed the letters that were sent by the HTSC committee to the acute hospitals (excluding psychiatric and rehabilitation hospitals but including university hospitals) and what measures these letters contained. The main aim of this analysis is to document the measures of the HTSC committee and how they were communicated to hospitals.

3.2 Method

The letters to the hospitals from the HTSC committee were not directly sent by the committee itself, but by the federated entities responsible for hospital licensing. For this study, the letters were gathered by checking the websites below and secondly by asking a member of the HTSC committee all letters it asked to send.

These websites were consulted (last access 25 September 2020):

- Agentschap Zorg & Gezondheid (https://zeg.login.kanooh.be/corona-richtlijnen-voor-zorgprofessionals#eerstelijn)
- Agence pour une Vie de Qualité AVIQ (https://www.aviq.be/coronavirus-professionnels.html#05)
- Gezondheidsinstellingen Brussel / Bruxelles Institutions de Santé GIBBIS (https://gibbis.be/fr/coronavirus-fr / https://gibbis.be/nl/coronavirus-nl)
- Federale overheidsdienst (FOD) Volksgezondheid, Veiligheid van de Voedselketen en Leefmilieu / Service Public Fédéral (SPF) Santé publique, Sécurité de la Chaîne alimentaire et Environnement (https://overlegorganen.gezondheid.belgie.be/nl/hospital-transport-surge-capacity-brieven-vlaanderen; and https://organesdeconcertation.sante.belgique.be/fr/hospital-transport-surge-capacity-lettres-wallonie).

Letters addressed to psychiatric hospitals only were not included. A total of 16 letters (sent in the period 01/03/20 – 01/07/20) were selected for analysis. To be selected for our analysis the letters had to be addressed to at least the acute hospitals and had to be signed by the Risk Management Group (RMG)[q], the HTSC committee, the COVID-19 Scientific Committee and by

[q] More information on the place and role of the RMG in the landscape of emergency/crisis measures can be found at: https://crisiscentrum.be/nl/news/crisisbeheer/covid-19-een-gemeenschappelijk-en-complex-crisisbeheer

the chairman of the Belgian Society of Intensive Care Medicine. The analysis was performed on the Dutch versions of the letters[r].

All letters were read and labelled with different themes, such as data registration, ICU beds, regular activity, etc. Also the addressees were recorded. Analysis was done following the chronological line of the letters. The full-text of the selected letters can be consulted on the KCE website (see footnote to Table 1).

3.3 Results

3.3.1 Mail procedures

According to interviews with members of the HTSC committee (see Chapter 4), the letters to the hospitals were drafted within the HTSC committee and then sent to the RMG for approval. Hereafter, the federated entities responsible for hospital licensing sent the approved letters by email and by post to the hospitals.

All letters were addressed (due to our selection) to at least the acute hospitals (including university hospitals), with one exception for the letter of 04/04 that misses addressees but was clearly directed to these hospitals. Some letters were also addressed to other types of hospitals (e.g. psychiatric hospitals or rehabilitation hospitals), or to other services such as ambulance and emergency services or circles of general practitioners (GP) *("huisartsenkringen"/"cercles des médecins généralistes"*). Some of the letters were also sent "for your information (FYI)" to hospital umbrella organisations and the province governors.

The letters were directed in all cases to at least the hospital Chief Executive Officer (CEO) and most of the times also to the Chief Medical Officer (CMO). Sometimes the coordinators of the hospital emergency plan were also addressed and the last four letters also included the Chief Nursing Officer (CNO).

Table 1 gives an overview of the type of services and type of hospital functions that were addressed.

[r] All letters were drafted in Dutch, and then translated into French. Both versions have the same content, with a few minor exceptions. We are not aware of letters written or translated into German.

Table 1 – Addressees of the letters of the HTSC committee to the hospitals

Letters*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Date	04/03	10/03	13/03	17/03	25/03	25/03	31/03	03/04	04/04	16/04	24/04	30/04	20/05	08/06	17/06	22/06
Type of service																
General acute hospitals	Y	Y	Y	Y	Y	Y	Y	Y	NA[s]	Y	Y	Y	Y	Y	Y	Y
University hospitals	-	-	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	Y	Y
Psychiatric hospitals	-	-	Y	-	-	-	-	-	NA	Y	Y	Y	Y	-	Y	Y
Rehabilitation hospitals	-	-	Y	-	-	-	-	-	NA	Y	Y	Y	Y	Y	Y	Y
Ambulance services	-	-	-	-	Y	-	Y	-	NA	-	-	-	-	-	-	-
Emergency 112 services	-	-	-	-	Y	-	Y	-	NA	-	-	-	-	-	-	-
Hospital umbrella organisations	Y	CC	CC	CC	CC	CC	CC	CC	NA	CC	CC	CC	CC	CC	CC	CC
Province governors	-	-	-	-	CC	CC	CC	CC	NA	CC	CC	CC	-	-	CC	CC
Ambulance associations	-	-	-	-	CC	-	CC	-	NA	-	-	-	-	-	-	-
GP circles	Y	-	-	-	-	-	-	-	NA	-	-	-	-	-	-	-
GP associations	Y	-	-	-	-	-	-	-	NA	-	-	-	-	-	-	-
Type of function									NA							
Chief Executive Officer	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	Y	Y
Chief Medical Officer	-	Y	Y	Y	-	Y	-	Y	NA	Y	Y	Y	Y	Y	Y	Y
Chief Nursing Officer	-	-	-	-	-	-	-	-	NA	-	-	-	Y	Y	Y	Y
Coordinator hospital emergency plan	-	-	-	Y	-	Y	-	Y	NA	Y	Y	Y	Y	Y	Y	Y
Other	Y	-	-	-	Y	-	Y	-	NA	-	-	-	-	-	-	-

** The 16 selected letters (in Dutch and French) can be found on the website of KCE.*

[s] This letter did not contain addressees, but was clearly addressed to the acute hospitals since the letter mentions that info is supplementary to the letters of 25/03 and 31/03 concerning patient transport.

All letters were signed by the chairman of the RMG. After the initial phase, in which the HTSC committee was established, letters were then signed additionally by the chairman of the HTSC committee, a scientific expert of the COVID-19 Scientific Committee and the chairman of the Belgian Society of Intensive Care Medicine.

3.3.2 The mission of the HTSC committee

The mission of the HTSC committee was explained in the letters to the hospitals, dd 13/03, 17/03 and 25/03: to monitor the number and kind of COVID-19 patients admitted to "general and university"[t] hospitals, to discuss issues concerning capacity, inflow, through-flow and outflow of patients, and to propose decisions to the RMG concerning the implementation of the "hospital and transport surge capacity plan". The literal text of the letters in Dutch and French is shown below.

In Dutch

- *Het monitoren van het aantal en de aard van de COVID-19-patiënten in de algemene en universitaire ziekenhuizen.*
- *Het bespreken van issues inzake capaciteit, instroom, doorstroom en uitstroom waarmee de ziekenhuizen worden geconfronteerd.*
- *Beslissingen voorstellen aan de RMG om de uitvoering van het "Hospital and transport surge capacity"-plan te verzekeren.*

In French

- *Surveiller le nombre et la nature des patients COVID-19 dans les hôpitaux généraux et universitaires.*
- *Discuter des problèmes de capacité, d'entrée, de flux et de sortie auxquels sont confrontés les hôpitaux.*
- *Proposer des décisions au RMG pour assurer la mise en œuvre du plan de capacité de pointe de l'hôpital et du transport.*

3.3.3 Topics of the letters

Thirteen letters concerned hospital surge capacity as the main theme and three letters concerned patient transport only. Other topics of the letters were data registration, testing of patients and personnel, hospital emergency plans, reference hospitals, cooperation within hospital networks, elective non-urgent procedures, hospital visitors, PPE, involvement of hospital infection control team, nursing homes, discharge of patients, intermediate care structures, financing, restart normal care, preparation for a second wave of COVID-19, etc. Below the topics that relate most to surge capacity are further discussed.

3.3.3.1 Registration of hospital capacity and use

Daily registrations

The HTSC committee considered as one of their essential tasks to have an overview of hospital (ICU) bed availability and occupancy and to adequately monitor these. Hereto, hospitals were asked to register these parameters and to share these with the public authorities. In the letter of 04/03 hospitals were asked to register daily their **hospital capacity data** into the "Incident Crisis Management System" (ICMS) and send these daily before 11am to the federal authorities. Next to this ICMS registration, hospitals were required in the letter of 10/03 to fill out daily a questionnaire from Sciensano with information about **hospital bed occupation**. Both registrations became legally obliged on 30/04 after publication in the Belgian Official Journal *("Belgisch Staatsblad"/"Moniteur belge")*.[9]

In subsequent letters of the HTSC committee (03/04, 30/04, 20/05, 17/06), the request for registration of data in ICMS and the Sciensano questionnaire was repeated and further specified and clarified. The exact text in the letters from the HTSC committee on data to register evolved across the pandemic and sometimes differed from the text in the Belgian Official Journal and also

[t] We refer to these hospitals as acute hospitals throughout the report.

from texts that are available on the Sciensano website[u]. Besides letters from the HTSC committee, hospitals received also letters[v] from the Department of Urgent Medical Care of the FPS Public Health with further details and specification on the data gathering in ICMS. So, instructions for the hospitals concerning data registration were sent by the HTSC committee, the FPS Public Health and Sciensano.

Ad hoc surveys

Next to the above-mentioned daily surveys, hospitals were asked in the letter of 10/03 to fill out a questionnaire regarding the number of available ventilators that are suited for treatment of COVID-19 patients and the number of available ECMO devices. These parameters on available number of ventilators and ECMO devices were later integrated into the ICMS and required to be filled out daily from 24/03 (ventilators) and 30/04 (ECMO) on.

In the letter of 20/05 the HTSC committee asked hospitals to fill out two questionnaires: one regarding test strategy and the other regarding laboratory capacity.

Individual patient data

Hospitals were invited in the letter of 20/05 to fill out voluntarily individual patient data of each patient infected with COVID-19 through an online survey[w] of Sciensano: for each patient a form had to be filled out at admission and again one at discharge.

In the same letter hospital were also invited to cooperate with an intended survey of the Belgian Society of Intensive Care Medicine in cooperation with Sciensano.

3.3.3.2 Hospital / ICU capacity measures

Concerning hospital capacity, three phases in the measures could be distinguished: creating extra capacity in the rise of the pandemic, phasing out / reducing capacity after the pandemic peak and perpetuating capacity for eventual future pandemic outbreaks.

Creating extra capacity

At the start of the COVID-19 crisis, two hospitals were appointed as reference hospitals to admit COVID-19 patients, but this was rapidly extended to nine (mainly university and two highly specialised) hospitals that were asked to reserve bed capacity for the admission of COVID-19 patients.

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[u] For example, according to this text https://covid-19.sciensano.be/sites/default/files/Covid19/COVID-19_FAQ_NL_final.pdf (page 12) hospitals were also supposed to send data about number of casualties.

[v] Letters of the FPS Public Health concerning ICMS:

- 14/03 (https://gibbis.be/images/documents/2020/coronavirus/0327/Begeleidende_Brief_ICMS_Ziekenhuizen.pdf)
- 14/03 (https://gibbis.be/images/documents/2020/coronavirus/0327/Basisinfo_ICMS_Ziekenhuizen.pdf
- 19/03 (https://gibbis.be/images/documents/2020/coronavirus/0327/19-03-2020_Brief_ICMS_Ziekenhuizen.pdf)
- 24/03 (https://gibbis.be/images/20200324_Brief_ICMS_Ziekenhuizen_NL_SIGN.pdf),
- 31/03 (https://www.zorg-en-gezondheid.be/sites/default/files/atoms/files/20200331_Brief_ICMS_Ziekenhuizen_NL_SIGN.pdf)
- 06/05 (https://gibbis.be/images/20200508_Brief_ICMS_2de_GOLF_NL_SIGN.pdf)

[w] More details of this survey can be found at https://covid-19.sciensano.be/sites/default/files/Covid19/COVID-19_FAQ_NL_final.pdf, p10.

However, it soon became clear that also other hospitals had to prepare for admission of COVID-19 patients.

All acute hospitals were urged to create extra capacity in the letters of 10/03, 13/03, 17/03, 25/03. The instructions in the letters evolved from kind vague requests to clear commands, accompanied with numbers of extra beds to realise.

On 10/03, hospitals were asked to take all necessary measures (without further specifying) to admit COVID-19 patients as much as their capacity allows.

In Dutch

"Elk ziekenhuis draagt daarbij solidair en verantwoordelijk maximaal bij volgens zijn capaciteit en expertise."

In French

"Chaque hôpital contribue autant que possible de manière solidaire et responsable en fonction de ses capacités et de son expertise."

On 13/03, hospitals were required **to stop from 14/03 onwards with all elective procedures** in order to render these beds available for admission of COVID-19 patients.

In Dutch

“Vanaf 14/03 moeten alle algemene en universitaire ziekenhuizen, revalidatieziekenhuizen, alsook de privé-klinieken, alle electieve consultaties, onderzoeken en ingrepen annuleren. Bijzondere aandacht moet er zijn voor ingrepen met impact op de capaciteit van het ziekenhuis inzake intensieve zorgen. Vanzelfsprekend kunnen alle dringende en noodzakelijk consultaties, onderzoeken en ingrepen wel blijven gebeuren. Ook alle lopende levensnoodzakelijke therapieën (bv. chemotherapie, dialyse, etc.) of noodzakelijke dagelijkse revalidatie worden voortgezet.”

In French

"À partir du 14/03, tous les hôpitaux généraux et universitaires, les hôpitaux de réadaptation ainsi que les cliniques privées doivent annuler toutes les consultations, examens et interventions électives. Une attention particulière doit être accordée aux interventions qui ont un impact sur la capacité de l'hôpital en matière de soins intensifs. Toutes les consultations, examens et interventions urgentes et nécessaires peuvent continuer à être mis en œuvre. En outre, toutes les thérapies nécessaires à la vie courante (par exemple, chimiothérapie, dialyse, etc.) ou la rééducation quotidienne nécessaire seront poursuivies."

In the same letter of 13/03 the hospitals were also asked to make plans to increase ventilator capacity, e.g. by freeing up operating theatre and recovery rooms.

On 17/03, measures were scaled up and hospitals were required to create extra ICU beds (for ventilated and non-ventilated patients) and to free up non-ICU beds at a rate of 3 to 4 beds per ICU bed for COVID-19 patients and to discharge patients as soon as possible in order to have possibilities for new patients. Further specifications and measures followed in the letter of 25/03, in which hospitals were urged to reserve 60% of their licensed ICU beds for COVID-19 patients only and to reserve 4 non-ICU beds per licensed ICU bed for COVID-19 patients (and if possible a same ratio per extra created ICU bed).

Moreover, in the same letter of 25/03 hospitals were asked to give training to non-ICU personnel in such a way that they are able to work on an ICU.

Phasing out /exit strategy

Based on the observed decreasing number of COVID-19 patients in hospital/ICU, measures were launched in the letter of 24/04 for downscaling of extra created capacity. Hospitals were allowed to slightly decrease the extra created bed capacity but still required to reserve 25% of their licensed ICU beds for treatment of COVID-19 patients (A) and to keep permanently an additional 25% extra number of ICU beds on top of the number of their licensed ICU beds that needed to be operational within 48 hours (B) and to

permanently reserve non-ICU beds equal to minimally 4 times the sum of the number of the permanent reserved ICU beds (A) and the number of the additional ICU beds (B). Additionally hospitals were asked to ensure in a second phase they could double the aforementioned capacity within 7 days when considered necessary by the HTSC committee.

The letter of 30/04 further specified above measures and added that in a third phase hospitals must be able to triple the capacity.

Perpetuating capacity

As was already mentioned in the letters of 24/04 and 30/04, the HTSC committee required hospitals to be prepared for an eventual second wave of COVID-19 outbreak and to keep permanently a reserve extra bed capacity.

In the letter of 20/05, the HTSC committee sent an overview of planned/realised extra capacity per hospital for the second wave and explained that staffing of the extra ICU beds needs to be the same as the staffing of the regular ICU beds.

In Dutch

“Wat de bestaffing van de bijkomende bedden (25% in de eerste fase tot 50% in de tweede fase van de “tweede golf”) bovenop de erkende ICU-capaciteit betreft, dient deze te voldoen aan de bestaffing die voorzien is voor erkende ICU-bedden.”

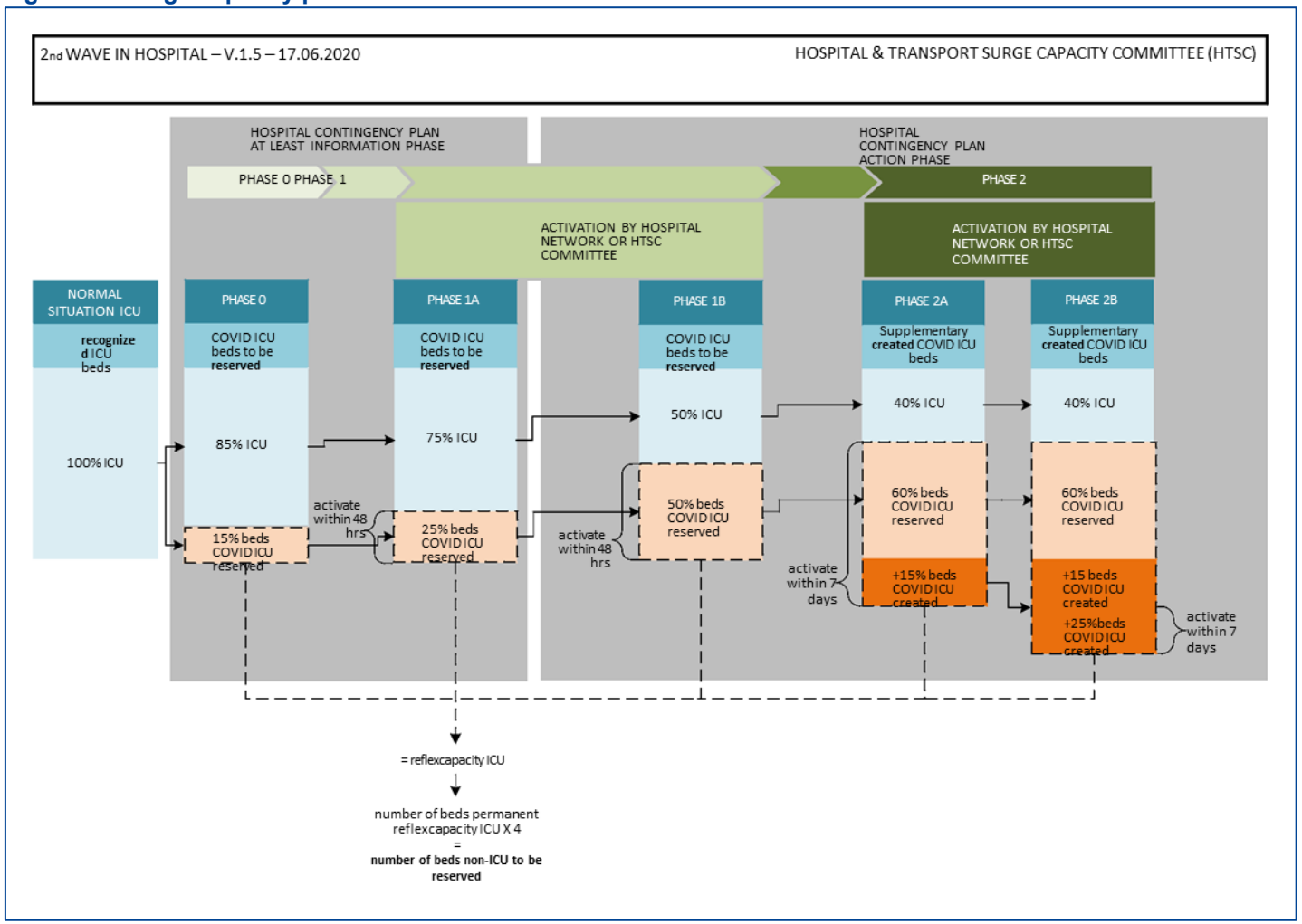
In French

"L'encadrement (staffing) des lits supplémentaires créés en plus de la capacité USI agréée (25 % dans la première phase jusqu'à 50 % dans la deuxième phase de la "deuxième vague") doit être identique à celui des lits USI agréés."

The extra staff could be either new extra staff or reallocated staff from other units. The letter also mentioned that these efforts would be taken into account in the calculation of the financial compensation.

The letter of 17/06 contained an update of the planned extra capacity per hospital for an eventual second COVID-19 wave and stated that hospitals need to permanently reserve minimally four times the sum of the permanently reserved licensed ICU beds and the number of additionally created ICU beds for the non-intensive treatment of COVID-19 patients. An attachment to this letter explained what this exactly meant for each hospital and contained exact numbers of beds to reserve per hospital. Another attachment to the letter presented a figure in which all phases and needed extra capacity are schematised (see Figure 3).

Figure 3 – Surge capacity plan for the second wave



Source: Letter of the HTSC committee to hospitals dd 17/06.

In recapitulation, all above measures along the time are summarised in Table 2.

Table 2 – Overview of surge capacity measures in the letters from the HTSC committee to the hospitals

Phase	Date of letter	Measures
Creating extra capacity	10/03	• Take all necessary measures to admit COVID-19 patients as much as possible
	13/03	• Stop all elective procedures by 14/03 • Enlarge ventilator capacity • Free up rooms
	17/03	• Create extra ICU beds • Free up non-ICU beds at a rate of 3-4 to 1 ICU bed • Discharge patients asap
	25/03	• Reserve 60% of licensed ICU beds for COVID-19 only • Reserve 4 non-ICU beds per 1 ICU bed for COVID-19 only • Start ICU training for non-ICU personnel
Phasing out /exit strategy / preparation for a second wave	24/04	Phase 1 • Reserve 25% of licensed ICU beds for COVID-19 (A) • Keep permanently an additional 25% extra number of ICU beds on top of the number of licensed ICU beds that need to be operational within 48 hours (B) • Reserve permanently minimally 4 times the sum of the number of the permanently reserved ICU beds (A) and the number of the additional ICU beds (B) Phase 2 • Ensure to be able to double the aforementioned capacity within 7 days when considered necessary by the HTSC committee
	30/04	Phase 1 **Permanent reflex capacity**: • Reserve 25% of licensed ICU beds for COVID-19 (A) • Keep permanently an additional 25% extra number of ICU beds on top of the number of licensed ICU beds that need to be operational within 48 hours (B)

		• Reserve permanently minimally 4 times the sum of the number of the permanently reserved ICU beds (A) and the number of the additional ICU beds (B) Phase 2 **Additional reflex capacity**: • Ensure to be able to <u>double</u> the aforementioned capacity of phase 1 within 7 days when considered necessary by the HTSC committee Phase 3 • Ensure to be able to <u>triple</u> the aforementioned capacity of phase 1
Perpetuating capacity	17/06	Reserve minimally four times the sum of the permanently reserved licensed ICU beds and the number of additionally created ICU beds for the non-intensive treatment of COVID-19 patients

All measures regarding bed capacity in the letters of the HTSC committee used the concept of "licensed hospital beds" and depart from the number of "licensed ICU beds" to calculate extra ICU and non-ICU bed capacity. From 25/03 the measures were illustrated by exact numbers of extra capacity per hospital.

The communication of the HTSC committee regarding surge capacity mainly related to surge / scaling up of (ICU) bed capacity and to a much smaller extent to surge in equipment (ventilators, ECMO), surge in PPE (masks, gloves, etc.) or infrastructure (e.g. closing operating rooms) or to surge of personnel (how much extra personnel is needed, how much training does new personnel need, strategies to find extra personnel, etc.).

Surge capacity within networks

The proposed measures regarding extra capacity were initially addressed to individual hospitals, but from 26/04 the letters explained that it was allowed that hospitals within a loco-regional network could create this in a combined way with the other hospitals from that network. Later surge capacity targets for an eventual second wave were formulated at the network level. More details are described in section 3.3.3.6.

Financing of surge capacity

The letters of 24/04, 30/04 and 17/06 explained that the federal authorities would take care of financial compensation of the hospitals regarding the reserved and extra capacity for admission of COVID-19 patients in the first wave and for the permanent reflex capacity for an eventual second wave. The letters also mention that his financial compensation will be discussed with the Federal Council of Hospital Facilities *("Federale Raad voor Ziekenhuisvoorzieningen"/"Conseil fédéral des Etablissements hospitaliers"*).

In Dutch

24/04: "De federale overheid zal voorzien in een systeem van financiële compensatie van de permanent gereserveerde capaciteit (eerste fase), alsook voor wat de eventueel te activeren tweede fase betreft."

30/04: "De federale overheid zal binnen haar bevoegdheden voor de "tweede golf" voorzien in een systeem van financiële compensatie van de permanent gereserveerde capaciteit (eerste fase), alsook voor wat de eventueel te activeren tweede (en later ook derde) fase betreft. Deze compensatie zal zowel betrekking hebben op het ter beschikking houden van de capaciteit zelf, als op het gebruik ervan voor de zorg van COVID-patiënten. Voor wat de "eerste golf" betreft, wordt in het kader

van de daartoe reeds opgerichte werkgroep binnen de Federale Raad voor Ziekenhuisvoorzieningen, een oplijsting worden gemaakt van de meerkosten en minderopbrengsten ten gevolge van de behandeling van COVID-patiënten; een systeem moet worden ontwikkeld dat verhindert dat zwaar belaste ziekenhuizen in hun globale financiering benadeeld zouden worden ten opzichte van minder belaste ziekenhuizen."

17/06: "Binnen de werkgroep van de Federale Raad voor Ziekenhuisvoorzieningen zal met beide scenario's (waakcapaciteit en reflexcapaciteit) rekening worden gehouden bij het voorzien van een compenserende financiering. We houden hierbij rekening dat deze capaciteiten niet noodzakelijkerwijs bezet zullen zijn en de extra aanvullende kosten (extra personeel, structurele werkzaamheden, gespecialiseerde medische apparatuur, verlies van honoraria, …) zullen hierbij in rekening worden gebracht."

In French

24/04: "Le gouvernement fédéral prévoira un système de compensation financière pour la capacité réservée en permanence (première phase), ainsi qu'en ce qui concerne l'activation de la deuxième phase si nécessaire."

30/04: "Le gouvernement fédéral prévoira, dans le cadre de ses compétences pour la "deuxième vague", un système de compensation financière pour la capacité réservée en permanence (première phase), ainsi que pour toute deuxième (et plus tard troisième) phase à activer. Cette compensation couvrira à la fois le maintien de la capacité elle-même et son utilisation pour la prise en charge des patients COVID. En ce qui concerne la "première vague", le groupe de travail déjà constitué à cet effet au sein du Conseil fédéral des Etablissements hospitaliers établira une liste des coûts supplémentaires et des recettes réduites résultant du traitement des patients COVID ; un système doit être mis au point pour éviter que les hôpitaux fortement sollicités ne soient désavantagés par rapport aux hôpitaux moins sollicités en termes de financement global."

17/06: "Au sein du groupe de travail du Conseil Fédéral des Etablissements Hospitaliers, les deux scénarios (capacité de veille et capacité réflexe) seront pris en compte lors de l'octroi du financement compensatoire. Nous tiendrons compte du fait que ces capacités ne seront pas nécessairement occupées et que les coûts supplémentaires (personnel supplémentaire, activités structurelles, équipement médical spécialisé, perte d'honoraires, ...) seront pris en compte."

3.3.3.3 Regular hospital care

As mentioned in paragraph 3.3.3.2 the letter of 13/03 stipulated that the hospitals had to stop all elective consultations, investigations and procedures by 14/03. The letter stipulated further that all urgent and necessary consultations, investigations and treatments could be maintained, and that all current vital treatments (e.g. chemotherapy, dialysis, etc.) or necessary daily rehabilitation could be continued.

The letter of 16/04 further specified what essential care is that could be continued, such as treatment of chronic conditions in cases that postponing would lead to irreversible or unacceptable deterioration, treatment of acute mental health problems and preventative activities such as vaccinations and neonatal screening. And as far regular care activities were continued, these could only take place under the condition that this can happen in a safe way, on which Sciensano developed specific guidelines. This letter also stated that the HTSC committee understood that there might be discussion on what exactly is meant by urgent and necessary care and that the stop of all elective activities might have severe consequences for the hospital functioning. Therefore the HTSC committee announced to carefully monitor this and to counsel health professional organisations on how to start regular activities again.

In the letter of 24/04 the hospitals were informed that an advice of the High Council of Medical Specialists and General Practitioners *("Hoge Raad van Artsen-specialisten en van Huisartsen"/"Conseil supérieur des médecins*

spécialistes et des médecins généralistes"[x]) concerning resuming regular care was received and a discussion meeting was held between the Directorate-General Healthcare of the FPS Public Health, RIZIV – INAMI, the Union of Professional Organisations of Medical Specialists ("*Verbond der Belgische beroepsverenigingen van artsen-specialisten"/"Groupement des unions professionnelles belges de médecins spécialistes" (VBS – GBS))*[y] and the associations of CMOs. In that meeting it was agreed to develop practical guidelines[z] on how types of regular hospital care could be restarted taking into consideration the eventual impact on ICU capacity, medication stock, PPE stock, etc. and the specificities of each hospital. In the same letter the HTSC committee announced that further information on this issue would be released in a coming letter.

This preparatory work led to guidelines presented in the HTSC committee letter of 30/04 and consisted of several elements:

1. To continue with all urgent and necessary care. Hospitals should pay attention in a first step to all care and procedures that were cancelled in previous months. Hospitals were asked to analyse all postponed care and to contact patients in such a way that patients with the highest priority would receive care (all types: consultations, hospital at home, mobile teams, day care, regular hospitalisation, etc.) before patients with lower priority care needs. To determine priority, the VBS – GBS published a (dynamic) list of grades of emergencies per medical specialism (https://www.vbs-gbs.org/index.php?id=covid-19&L=360); these are to be used by each individual clinician taking into account the patient specific situation and taking into account the hospital situation and hospital guidelines.
2. As regular primary care will also be resumed, it might be expected that this will lead to more hospital referrals and admissions and that should be taken into account.
3. The restart of elective non-COVID activities will be conditioned and limited by
   a. further continuing care of COVID-19 patients who are still in the hospital
   b. compliance of hospitals with the requirements of the preparation for a second wave of COVID-19
   c. availability of sufficient personnel and taking into account the severe burden of workload of the personnel in previous weeks during the first COVID-19 wave (sickness leaves, postponed holidays, etc.)
   d. having realised organisational and infrastructural procedures and guidelines concerning patient admissions, patients and visitors streams, waiting rooms, scheduling of consultations and of diagnostic and treatment procedures that guarantees sufficient social distancing, prevent crowding and separation of COVID-19 and non-COVID-19 patients
   e. adequate stock (and continuous monitoring of it) of PPE for patients, visitors and healthcare professionals
   f. adequate stock (and continuous monitoring of it) of medications and medical supplies needed for patient care
4. If the conditions as specified in 1 and 2 and requirements as specified in 3 are fulfilled, then hospitals are allowed to resume regular hospital care in a stepwise fashion, namely:
   a. From 04/05/20:
      - consultations, hospital at home activities and mobile teams
      - non-surgical day-care activities (geriatrics, psychiatry)

x https://overlegorganen.gezondheid.belgie.be/nl/advies-en-overlegorgaan/raden/hoge-raad-van-artsen-specialisten-en-van-huisartsen

y https://www.vbs-gbs.org/index.php?id=1

z VBS – GBS published list of grades of emergencies per medical specialism https://www.vbs-gbs.org/index.php?id=covid-19&L=360

- surgical day-care activities that do not require intensive care

b. From 11/05/20:

- inpatient admissions/activities that do not require intensive care
- activities that may require intensive care.

This letter of 30/04 continued that it is the responsibility of the CEO, CMO and the emergency plan coordinator (and any others) to develop a plan for a step-wise restart of regular hospital activities that ensures continuity of care, safety of personnel, patients and visitors and hospital preparedness and that takes all above requirements into consideration. This plan had to be made available for the public authorities. The letter also stated that competent federal governmental organisations (FOD – SPF, RIZIV – INAMI, FAGG – AFMPS) dispose each separately and together of instruments to monitor the restart of activities and the compliance with all above mentioned requirements.

So, regular hospital activities could be restarted from mid-May on, but in a restricted and very conditional way.

3.3.3.4 Transport of patients

Three letters (dd 25/03, 31/03, 04/04) of the HTSC committee were dedicated to patient transport only, but other letters (dd 10/03, 13/03, 17/03, 03/04, 30/04, 20/05) also contained instructions on how to organise patient transport to, from and between hospitals.

The main measures concerning transport were:

- Transport of COVID-19 patients to highly specialised centres should be avoided as much as possible, so that those centres can concentrate their activities and capacities to the most severely ill patients and to avoid overload of ambulance services.
- Appointment per province of **ambulances dedicated for transport of COVID-19** patients.
- All transport of COVID-19 patients should be carried out with sufficient protective material for ambulance personnel & patients and all ambulances should be disinfected after use.
- Ambulances should be staffed by qualified personnel as much as possible.
- Patients that are referred from a triage centre to hospital and are not able to go on their own, can be transported by a dedicated COVID-19 ambulance (through the 112 dispatch centres in case of emergency).
- Inter-hospital transport of COVID-19 patients should be done as much as possible by the hospitals' own ambulances.
- Transport of patients after hospital discharge should be performed by the patients' family by preference and otherwise should be done by the hospitals' own ambulances.
- Inter-hospital transport and transport after discharge by the hospitals' own ambulances should be paid out the hospital budget (budget of financial means), but the **federal authorities will reimburse it.**
- In case mass transportation of patients is needed (e.g. from own hospital site to another site), then this should be done without 112-ambulances.
- In case there are insufficient ambulances for all transport requests, **military ambulances** can be called upon for assistance (through 112 dispatch centre).
- Patient transport over the road has always the preference; only in special and highly conditioned cases, helicopter transport can be used.

So, hospitals were required to use as much as possible their own ambulances for patient transport to, from and between hospitals and not to use the 112 ambulances. Appropriate hygiene measures were required to be applied.

3.3.3.5 Hospital emergency plans

Activation of the hospital emergency plan

Every Belgian hospital was required to have ultimately on 01/07/19 a hospital emergency plan (HEP; see Chapter 1) to deal with major accidents inside (e.g. blackout, chemical accident, hospital bacteria, etc.) and outside the hospital (e.g. chain collision, flood, attack, etc.). Each hospital is also required to have an emergency plan coordinator (as can be seen in

Table 1, these coordinators were also addressed in the letters from the HTSC committee).

The RMG decided on 28/02 that federated authorities should warn hospitals to **activate the first phase** of the hospital emergency plan. The letter of 04/03 of the HTSC committee referred to that required activation of the HEP by the competent licensing authorities and asked the hospitals to start filling out daily the available bed capacity in the ICMS platform. Several following letters reminded the hospitals to fill out the ICMS regarding available capacity (see above 3.3.3.1).

In the letter of 13/03, hospitals were asked to **implement the action phase** of the HEP from 14/03 on, and were reminded in the letter of 17/03.

In the letter of 25/03, the HTSC committee urged the hospitals to pay attention to the personnel that is necessary to carry out all measures that were taken within the hospital emergency plan; hospitals were asked to anticipate as much as possible on eventual drop-out of personnel due to illness and to take care of sufficient training for the needed personnel.

In the letters of 30/04 and 20/05[aa], the HTSC committee stated that hospitals need to **keep the HEP action phase active until further notice**.

On 17/06 the HTSC committee informed hospitals that the HEP phase could be **down-scaled from action phase to information phase** if some conditions were fulfilled (see also section about hospital networks 3.3.3.6).

Evaluation of the HEP

In the letter of 20/05 the HTSC committee announced that they wanted to learn from the current COVID-19 crisis on how to adapt HEP procedures and guidelines; this was more extended in the letter of 22/06 in which hospitals were asked to fill out a questionnaire about the functioning of the HEP (see for further information Chapter 6).

3.3.3.6 Collaboration of hospitals within a network

Several letters (dd 04/03, 10/03, 13/03, 17/03, 25/03, 03/04, 24/04, 30/04, 20/05, 17/06) from the HTSC committee urged the hospitals to work together within their loco-regional network, about surging their capacity, transfer of patients, organisation of the COVID-19 test strategy and PPE.

As mentioned before, in the initial phase of the crisis, nine hospitals were assigned as reference hospitals to admit all patients with COVID-19 and all other hospitals were asked to send their patients to these reference hospitals. However, it soon became clear that all hospitals were needed to take care of the rapid growing number of COVID-19 patients and so all hospitals were asked to surge capacity (letter 10/03) in a **sphere of solidarity** and in a way that each hospital takes a maximum number of patients that fit within its capacity and expertise.

The letter of 13/03 added the concept of collaboration between hospitals within the loco-regional network.

[aa] In the letter of 20/05, the HTSC committee allowed hospitals of which the HEP was not yet approved, to keep on functioning with the pending HEP.

***Dutch**:*

"Ziekenhuizen kunnen vanzelfsprekend alle initiatieven nemen om af te stemmen binnen het locoregionaal ziekenhuisnetwerk waarbinnen zij opereren."

***French**:*

"Les hôpitaux peuvent, bien entendu, prendre toutes les initiatives pour se coordonner au sein du réseau hospitalier locorégional dont ils sont membres."

This rather non-committal request changed along the course to more directive requests and clear instructions on what hospitals needed to do:

- Letter 17/03:
  - Hospitals that are confronted with patients whose severity level exceeds the hospital expertise, were asked to refer these patients to the reference hospitals.
  - Hospitals *are invited to make agreements* at least at their loco-regional level about referrals of patients when their maximal capacity is reached.
- Letter 25/03:
  - Hospitals *are supposed to have made already clear agreements* with other hospitals, at least at the loco-regional level, concerning referrals in case maximum capacity is reached.
  - Hospitals that are confronted with patients whose severity level exceeds the hospital expertise, were asked to refer these patients to the reference / university hospitals.
  - As soon as 50% of occupancy rate for COVID-19 patients is reached (both ICU and non-ICU, and both regular licensed capacity as extra created surge capacity), *hospitals need to warn all other hospitals within their loco-regional network* in order to prepare eventual referrals.
  - And as soon as 75% of occupancy rate for COVID-19 patients is reached (both ICU and non-ICU, and both regular licensed capacity as extra created surge capacity), or as soon as only 3 ICU beds are left, *the hospital starts referring patients to other hospitals in their loco-regional network* and warns the federal health inspectorate for further regulation by the competent 112 centres.
  - In case all hospitals within a loco-regional network reach above saturation levels, they need to contact the federal health inspectorate who will ask for further regulation and decisions within the HTSC committee and further concertation with the 112 centres.
- Letter 24/04:
  - Hospitals are allowed to realise the appointed surge capacity levels together, e.g. within a loco-regional network or a province. In such a case hospitals are asked to mention this to the competent authorities.
- Letter 30/04 contained surge capacity targets per hospital **and** per loco-regional hospital network:
  - As soon a hospital reaches an occupancy rate of 75% of its reflex capacity and/or has only 2 ICU beds left, the hospital starts referrals.
  - As soon a loco-regional hospital network as a whole reaches an occupancy rate of 75% of its reflex capacity, then the federal health inspector will take appropriate measures.
- Letter 20/05 mentions that referral of patients should be done primarily within their loco-regional network, and *only when the loco-regional network reached its maximum capacity*, the health inspector will look for solutions outside of that network.
- Letter of 17/06 contains instructions regarding downscaling the level of the hospital emergency plan and regarding preparedness for an eventual second wave of COVID-19; the instructions are formulated as targets/levels for the whole loco-regional network:

- Downscaling from action phase to information phase *should happen simultaneous for all hospitals within a loco-regional network.*
- The CEOs of the hospitals within a loco-regional network *should jointly inform* the authority responsible for hospital licensing.
- The *hospitals within the network should* reserve permanently 15% of the licensed ICU beds (=A) within that network and four times A of non-ICU beds within that network as 'vigilance capacity' for treatment of COVID-19 patients.
- *Hospitals within a network should be able* to upscale their hospital emergency plans to the action phase within 48 hours.
- *Hospitals within a network should be able* to upscale within seven days their hospital emergency plans to phase 2A in which 60% of licensed ICU beds (for the whole network) are reserved and an additional 15% ICU beds are created within the network. Additionally, hospitals within a network should be able to upscale their reflex capacity with 25% within an additional period of 7 days (phase 2B).

So, already from the very beginning of the crisis, the HTSC committee gave a central role to collaboration of hospitals within their loco-regional hospital network. At first, the HTSC committee advised hospitals to work together, but later on, they obliged hospitals to collaborate.

3.3.3.7 Nursing homes

Since COVID-19 affected many older persons residing in nursing homes, they represented a large part of hospital admissions.

The letters of 17/03 and 25/03 stressed the importance to discharge patients as soon as they no longer require hospital care and that competent federated authorities had given instructions to the nursing homes they need to reintegrate their residents after a hospital admission.

The collaboration between hospitals and nursing homes was further elaborated by the HTSC committee together with many other organisations in a special document[bb] that was spread in April 2020.

3.3.3.8 Hospital visitors

In the letter of 13/03, the HTSC committee commanded all types of hospitals to no longer allow visitors from 14/03 on; some exceptions were made (parents of children, immediate relatives of patients at the end of life, maximum one accompanying person for patients needing a consultation).

The letter of 30/04 confirmed continuation of this measure (and exceptions) until further notice.

On 20/05 a new letter stipulated that the visitor measures need to stay in place until 02/06 and hospitals were asked to develop from then on their own visitors' policy that guarantees patients', professionals' and visitors' safety (this was repeated in a letter of 08/06).

bb https://www.zorg-en-gezondheid.be/sites/default/files/atoms/files/Ori%C3%ABntatienota%20DGGS%20Ziekenhuizen%20en%20Rusthuizen_NL_200415.pdf

3.3.3.9 Other topics

The letters of the HTSC committee to the acute hospitals mentioned a lot of other topics next to those that were already discussed above. For example concerning testing strategies, use and reuse of PPE, involvement of hospital hygienist /infection control teams, patient own contributions for transport.

3.4 Discussion and conclusions

Broad scope of topics that evolved with the course of the COVID-19 crisis

The HTSC committee, which was specifically created in the context of the COVID-19 crisis, sent several letters to the acute hospitals in the months March to June (our observation period) with instructions what they needed to do. The instructions related to a **plethora of issues**, varying from organisation of COVID-19 testing, visitor regulation, personal protective equipment, data registration, cooperation within a network, hospital emergency plan, regular activities, patient transport and upscaling (ICU) bed capacity. These topics are all related to the functioning of hospitals, but one could question if all these fit within the main mission / scope of the HTSC committee to ensure sufficient hospital capacity to care of large numbers of patients with COVID-19.

The topics and content of the letters followed the course of the COVID-19 pandemic. The first measures focused on creating capacity in reference hospitals but when the incidence of hospital admissions rose exponentially, soon more drastic measures were taken. In the beginning (March-April) all instructions were directed to make as much hospital capacity as possible available for the rapid increasing number of patients requiring hospital care (e.g. by stopping all elective procedures or by upscaling ICU bed capacity). When the pandemic numbers lowered (May), instructions were given concerning restart of regular activities and downscaling capacity. And when the pandemic numbers became really low (June), the instructions in the letters were focused on the preparedness for an eventual second COVID-19 wave.

From invitations to obligations

The **tone** of the HTSC committee letters changed as well during the pandemic course. The mostly kind invitations in the beginning to do something changed over time to imperative measures that hospitals were obliged to follow. The same pattern could be seen in the clarity of the numbers and figures for surge capacity targets that needed to be reached and in the clarity of instructions regarding data registration. Also the suggestion to hospitals for collaboration within a loco-regional network in the first letters evolved to a more “mandatory” request in the later ones.

It might be discussed what the exact **legal status is of the measures** that were communicated to the hospitals and what the legal status is of the HTSC committee itself. To what extent are hospitals obliged to follow all measures? And what in cases they were not willing or not able to do so?

Beds and staff

All measures regarding bed capacity in the letters of the HTSC committee used the concept of licensed hospital beds and departed from the number of licensed ICU beds to calculate extra ICU- and non-ICU bed capacity. From 25/03 on the measures were illustrated by exact numbers of extra capacity per hospital. From this it could be deduced that the staffing standards applicable to licensed ICU beds would also apply for additional ICU beds. Yet, this was not made explicit. It lasted until the letter of 20/05 that the HTSC communicated that the same levels of staff should be allocated to licensed ICU and additional ICU beds.

The communication of the HTSC committee regarding surge capacity mainly related to surge / scaling up of (ICU) bed capacity and to a much smaller extent to surge in stuff (ventilators, ECMO, PPE) or surge in space (e.g. closing operating rooms) or surge of staff (number of extra personnel needed, training of new personnel, strategies to find extra personnel, etc.).

The proposed measures regarding extra capacity were initially addressed to individual hospitals, but from 26/04 the letters explained that it was allowed that hospitals within a **loco-regional network** could create this in a combined way with the other hospitals from that network. At first, the HTSC

committee advised hospitals to work together, but later on they obliged hospitals to collaborate.

Data registration instructions needed several adaptations along the course of the first wave

A recurrent issue in the HTSC committee letters concerned **registration of data** about available hospital capacity and about hospital occupancy/use. Hereto, two parallel systems were used, one regarding the available capacity (ICMS) and one regarding number of admitted patients (Sciensano). The gathered data in ICMS requires data per hospital site while the Sciensano survey requires data per hospital. The instructions were extended and adapted several times and needed clarification and further specification along the road. These further instructions were issued by the HTSC committee but in addition also by the Department of Urgent Medical Care of the FPS Public Health and by Sciensano.

The required data registration on bed capacity and use concerned both aggregated data per hospital or per hospital site.

The letters did not mention any requirement of registration concerning (ICU) hospital length of stay[cc]. This is remarkable since this is an essential parameter in predicting (ICU) bed occupancy.

The several additions and clarifications of the data to register along the course, might on the one hand have improved the data collection but on the other they also might have endangered the accuracy/quality of the data needed to adequately monitor availability/occupancy rates.

Efforts to clarify measures

Most of the **instructions** given in the initial letters were **repeated and further clarified** in later letters; this applies to targets of extra beds to create, definition of necessary care, cooperation within a network, type of data to register and others. The HTSC committee clearly learned from experience and from the feedback they received on the measures they communicated.

The instruction to stop all elective procedures was clearly formulated as a MUST, but that letter left **room for interpretation and discussion** on what could be considered as urgent, necessary and essential care. The letters concerning resuming regular activities were full of conditions that could be interpreted in different ways. One could question if the instructions in the letters were interpreted in the same way by all hospitals and if every hospital kept a same amount of regular care activities during the COVID-19 crisis (see Chapter 6 for some results).

Cohorting non-COVID and COVID-19 patients

Although the letters of 13/03 and 25/03 mention that transport should be split into transport for COVID-19 patients and for non-COVID-19 patients, initial letters from the HTSC committee did not mention anything about creating separate COVID and non-COVID units in the hospital. Only the letter of 30/04 has a clear sentence that states separation between COVID and non-COVID patients. This is remarkable since such a separation has much consequences for organising hospital care and extra capacity and is essential in the context of the management of a pandemic of respiratory virus. Probably letters from other instances to the hospitals gave those instructions[dd].

[cc] ICU and hospital length of stay were calculated by Sciensano based on the non-mandatory survey for individual patients at admission and at discharge; see further these publications.[11, 12]

[dd] For example Sciensano "*Volgens de bestaande richtlijnen in de ziekenhuizen moeten COVID-19+ patiënten maximaal in specifiek voor COVID weerhouden bedden worden opgevangen." / "En accord avec les directives existantes dans les hôpitaux, les patients COVID-19 doivent être (autant que possible) pris en charge dans des unités dédiés."* and *"Scheid patiënten met een verdenking op COVID-19 van bij aankomst in het ziekenhuis van andere patiënten." / "Séparez les patients suspects de COVID-19 des autres patients dès leur arrivée à l'hôpital."* (https://covid-19.sciensano.be/sites/default/files/Covid19/COVID-19_procedure_hospitals_NL.pdf / https://covid-19.sciensano.be/sites/default/files/Covid19/COVID-19_procedure_hospitals_FR.pdf)

Evaluation of the HTSC committee

Interesting is the fact that the letters of 17/06 and 22/06 contained an invitation to evaluate the followed strategy regarding the deployment and downscaling of the hospital emergency plan and the resuming of regular hospital activities. This **evaluation** after the initial efforts and before the next phase of preparedness and vigilance is part of a good action plan according to the international literature.[14-16]

In conclusion, the HTSC committee sent letters to the hospitals containing many advices and instructions on a whole list of issues concerning the functioning of hospitals in the COVID-19 crisis. Most attention was paid to measures for the increase of (ICU) bed capacity and this way ensuring needed hospital care for the large amount of infected patients.

4 ANALYSIS OF INTERVIEWS WITH KEY INFORMANTS

Key Findings

- **The HTSC committee took fast and firm decisions that created a framework for all Belgian hospitals to take actions in order to ensure sufficient hospital capacity (and ICU capacity in particular) for COVID-19 patients.**
- **Although the creation of the HTSC committee, its functioning and its measures are generally perceived as a success, it relied too much on personal initiatives and coincidence. Its activation, composition, scope, role and mission should become part of a national pandemic and crisis plan.**
- **A more formal evaluation of the impact of the measures on patient outcomes (e.g. hospital-standardised mortality rates) seems to be indicated.**
- **Identified keys to the success were the expertise, the solidarity and professional attitude of healthcare professionals and hospital management.**
- **Hospitals focused during the first wave mainly on surge capacity within their own hospital. In general, the loco-regional networks were assessed as not sufficiently mature. Moreover, necessary preconditions to collaborate on the organisation of surge capacity were not met. Respondents attributed several advantages to the organisation of surge capacity at a larger scale such as a more flexible roll out of COVID-19 units. In that sense it seems logical that the HTSC committee gradually introduced the level of the loco-regional network into its measures. In some loco-regional hospital networks agreements were made such that part of the initial (ICU) surge capacity in smaller hospitals was organised by larger hospitals in the**

network. In that way regular medical activities were less affected.

- The HTSC committee functioned quite autonomously with a clear scope. Yet many topics outside the scope were discussed. In the future, a general coordination of all committees should be reinforced.
- The HTSC committee struggled during the first weeks of the epidemic with information about COVID-19 related hospital admissions and available beds. The combination of ICMS (available capacity), administrative available data (licenced beds) and an ad hoc survey organised by Sciensano (daily reported aggregated data about incidence and prevalence) was used to get a view on hospital admissions and available hospital capacity. A transversal evaluation of the interviews indicate a need for a more sustainable data system with a better view on patients and operational hospital capacity.
- Shutting down non-necessary, non-urgent care created a pool of staff and free capacity that could be used for COVID-19 patients. Although there was general support when this measure was taken at the start of the first wave, there is a common belief among respondents that it should be avoided at all cost in the future since it has side-effects on patient outcomes, financial stability of hospitals and physician income. A recurring suggestion in the interviews is that a more tailored approach adapted to the local severity of the epidemic is required.
- The HTSC committee members indicated that the committee created a platform where many relevant actors (such as federal and federated public authorities, hospital umbrella organisations or the Belgian Defence) could discuss topics in-depth. Several respondents indicated a need to create such a platform in a more structural way but this view was not shared by everyone. There is general agreement that the HTSC committee in itself should only be reactivated when a hospital capacity problem or threat is identified.
- The measures were perceived as somewhat theoretical and "administrative" as they focus on licensed hospital beds and ICU beds in particular. Decisions were based on expert opinion and information about available hospital capacity and use. Based on the interviews it seems that evidence and international guidance about surge capacity were not intensively used in the decision-making process.
- Moreover, the interviewed committee members indicated that the focus of discussions was mainly concentrated on bed capacity. Discussions about staff and infrastructure were less dominantly reported and seemed to a great extent left to the initiatives of the hospitals. Respondents stressed that medical and nursing staff are essential to operate these beds and machines.
- Several hospitals supported nursing homes in their local area with expertise, staff, equipment, etc. According to the respondents the collaboration between hospitals and nursing homes, which is not facilitated by the division of competencies in this country, needs to be reinforced. In the long run, hospital networks and primary care zones (in Flanders) need to be matched.
- Potential models for the organisation and provision of hospital capacity in future public health crises emerged from the interviews. Respondents reported challenges such as to educate and train staff in specific domains (e.g. ICU skills), to be able to mobilise this capacity very fast when needed and to have infrastructure and equipment in place that is used for other purposes outside times of crisis.

4.1 Methods

4.1.1 Aim of the interviews

The main aim of the interviews is to get a general view on the Hospital & Transport Surge Capacity (HTSC) committee (composition, functioning, etc.) and its measures as perceived by committee members and the hospital sector. It was not possible within the timeframe of the current study to interview a large sample of hospital representatives. Therefore, this information needs to be read in parallel with results resorting from the survey (see Chapter 5). The interviews also served as input for the development of the survey.

4.1.2 Field map

We used a purposive sampling design to recruit people who are likely to provide the most relevant information in function of the research questions.[17] Field mapping was used to identify the key players who have a certain interest in the problem under study and represent all possible perspectives. Since we are interested in covering all variability around the issue of the HTSC committee, we created a field map that consisted of:

- Committee members:
  - Content experts
  - Federal public authorities
  - Public authorities of the federated entities
  - Hospital umbrella organisations
- Hospital sector:
  - Hospital management (Chief Executive Officers (CEO); Chief Medical Officers (CMO); Chief Nursing Officers (CNO))
  - Physician organisations and unions
- Content experts of specific topics not entirely covered by the above mentioned groups:
  - Hospital emergency transport
  - Belgian Defence (medical services)
  - Risk Management Group.

Based on desk research and punctual information collected from our existing network we compiled a long-list of relevant key informants. These are individuals who have considerable policy influence or are experts/professionals who are known to have an outspoken view on the functioning of the HTSC committee. Out of this list, people were invited for an in-depth interview.

4.1.3 Recruitment and data collection process

Out of the long-list, 25 people were invited to the in-depth interviews: 4 from federal public authorities and 1 from the federal cabinet; 3 from public authorities of federated entities; 4 from hospital umbrella organisations; 2 content experts; 1 from Defence; 3 CMOs; 2 CEOs, 1 CNO; 3 physician union or organisation members; 1 member of the Risk Management Group. All face-to-face interviews were conducted between 8 June 2020 and 23 September 2020, and all 25 invited stakeholders agreed to participate (Dutch language: 17; French language: 8). The in-depth interviews lasted between 1 and 2 hours and were conducted via video-conference. All interviews were audio-recorded and transcribed verbatim. Before starting the interviews the objective was explained, confidentiality of the discussion was assured and permission to audio-record the discussion was requested. Each interview was conducted by two members (1 taking the lead; 1 posing additional questions) from the research team (a total of three researchers conducted the interviews).

4.1.4 Data collection tools

An interview guide was developed for the in-depth interviews (available upon request). A separate interview guide for committee members and for other interviewees was developed, with a large overlap of questions. The research team based the questions on previous experience with research about organisation and financing of the hospital sector, discussions during informal contacts with stakeholders and content experts. The general themes addressed were: the functioning of the committee, the data requested and used by the committee, the measures regarding hospital surge capacity (including material – infrastructure – staff), visitor restrictions, routine medical activities restrictions, role of hospital networks, medical transport and role of hospitals to support nursing homes.

The interview guides were tested during two pilot interviews (with one Dutch-speaking and one French-speaking interviewee). Based on the pilot interviews the interview guides were only slightly adapted. Given the fact that adaptations to the interview guide were only very minor, the data collected during the pilot interviews were included in the analysis.

4.1.5 Analysis

A thematic inductive qualitative analysis was performed. The transcripts of the in-depth interviews were coded in QSR NVivo 12. A basic node structure was created by one researcher, by doing the open coding of three transcripts. Interviews from respondents with different profiles were chosen to capture as many ideas as possible in this preliminary node structure. Next, the three researchers who conducted the interviews continued the open coding of the other transcripts. The node structure was further developed as the coding process evolved.

In a next step one researcher did the axial coding, hence generated overarching themes and relationships between nodes. The final step of selective coding, which means linking concepts together, was part of the reflection necessary to write first drafts of the chapter. Results emerging from the interviews were supported by a selection of the original text fragments (in Dutch/French). Not all statements were supported by quotes in the final chapter to increase the readability of the text. They are, however, available upon request.

For all text fragments the viewpoint (hospital sector or HTSC committee) is mentioned. The interviews with the umbrella organisations represent both the view of the HTSC committee as the hospital sector. Depending on which perspective they took on a given topic we labelled the text fragment either with “hospital sector” or “HTSC committee member”.

4.2 Results

Disclaimer. The reader should be aware that this chapter is based on the opinions of the consulted stakeholders and experts. Hence, statements without a reference to research reports or data sources are solely based on stakeholder opinions stated during the interviews and not on verified facts.

It should be noted that the results are based on interviews conducted between 8 June 2020 and 23 September 2020. The HTSC committee is still active and the COVID-19 crisis still requires substantial hospital capacity at the time of writing this report. As such some of the statements are outdated (e.g. shortcomings that are already remediated, changes in strategy, actions that were recommended during the interviews that are already put in practice).

4.2.1 Mandate and decision-making process of the committee

4.2.1.1 Start-up committee and decision-making process

Ad hoc decision rather than pro-active policy response to a growing epidemic crisis

From the interviews it is clear that in the past a national pandemic plan including the role of hospitals (i.e. reference hospital for admission of first patients and role for all hospitals in case of an outbreak on the Belgian territory) was already drafted.[18-20] Yet, the activation of the national hospital surge capacity strategy, including the installation of the "Hospital & Transport Surge Capacity (HTSC) committee", was, according to the respondents, not foreseen as such and therefore it was perceived as an ad hoc decision. Its instalment was reported to be based on coincidence and depending on personal initiatives. Some respondents pointed out that a (more) timely and pro-active response of public authorities, based on epidemiologic information that became already available during the months of January and February 2020, had been a better approach.

Although the Risk Assessment Group (RAG), Risk Management Group (RMG) and National Crisis Coordination Centre (NCCN) were already activated in January 2020, respondents stated that the focus of the initial measures was on case-definition and isolation of people coming from abroad. Respondents indicated that during January and February 2020, potentially due to an underestimation of the epidemiologic situation and its consequences, the RAG, the RMG and the NCCN did not focus on preparedness of an outbreak of the virus on the Belgian territory, let alone on the impact on hospital capacity.

Moreover, there seemed to be a disconnection between the NCCN, the RMG and the department of the FPS Public Health responsible for hospitals (Directorate-General Healthcare) which certainly did not smoothen the decision-making process, especially because that department had, according to the respondents, the expertise about hospital emergency plans, hospital capacity, etc. They perceived this knowledge as insufficiently present in the RAG, RMG and NCCN at that time.

"Ik denk dat de FOD al veel vroeger… dat er binnen de FOD ook al veel vroeger gewoon een structuur moest zijn, of iemand zijn, die met recht en reden zegt: 'Wij gaan hier ons noodplan herbekijken en we gaan dat afstoffen.' dus ja… het hele epidemische beleid in januari en februari… dus alles wat besproken werd in de RAG en de RMG, was eigenlijk… ja… Het ging over inkomende eventueel besmette reizigers, het ging over al dan niet uitbreiden van de testcapaciteit, van de gevalsdefinitie. Maar daar was heel weinig aandacht op dat moment voor preparedness in België zelf. Hoe klaar zijn we in België zelf om een schok op te vangen. Dat leek geen prioriteit. Misschien ook omdat in de RAG en RMG zeer weinig hospitaalmensen vertegenwoordigd zijn of mensen… ik denk… daar is zeker absoluut een issue geweest, want ik denk dat er zeer grote bezorgdheid was in het departement [van DG Gezondheidszorg] zelf, maar dat om een of andere reden zij 'gedisconnecteerd' waren van de Risk Management Group, en van al die besprekingen over de epidemie, tot hun grote frustratie. En dat daar dan een zekere disconnect was, wat niet goed was, en wat er ook toe heeft geleid dat zij niet officieel een soort van mandaat kregen om zich voor te bereiden om heel die machinerie in gang te zetten. Terwijl ik achteraf de indruk had dat zij eigenlijk wel min of meer in de startblokken stonden om dat te doen. Dus ja, dat is toch wel een issue geweest, waarvan ik denk: dat moet wel ergens formeel uitgeklaard worden. Hoe is dat kunnen… Ik heb dat ook met herhaling gezegd; van: 'Ja, er is hier geen beleid en geen planning vooruit.' En ik denk dat dat een symptoom daarvan is." **(HTSC committee member)**

Committee installed in a context of returning travellers and the spectre of hospital capacity shortage comparable to the North of Italy

A reconstruction of the start of the committee and the context in which decisions were taken can be made based on the interviews of the key actors involved in this early process. While there were some preliminary meetings (a working group initiated by the RMG) at the end of February, it lasted until early March, when the travellers returned from their holiday in Italy (and many of them appeared to be COVID-19 positive), before the HTSC committee was formally launched. It is important to note that the launch of this committee was situated in a context of global shortage of protective personal equipment (PPE) and when it became clear (via international contacts of content experts and shocking images in the media) what the impact of the COVID-19 virus was on hospital capacity in Italy. The committee originated, according to the interviewed key actors, from personal initiatives of field experts and civil servants who assessed that it was urgently needed to develop and implement a national strategy to free up hospital capacity (not in the least intensive care beds) for COVID-19 patients. This national strategy was not part of a formal plan.

The initial measures (i.e. admitting patients to reference hospitals and next to academic hospitals) were abandoned very soon, which was perceived as a good decision by the interviewed committee members. The HTSC committee soon decided that all hospitals had to free up (and create additional) capacity. This decision, communicated to hospitals on 13 March, is now evaluated as a positive decision which was much and urgently needed. Yet, in retrospect, if Belgium had been hit by COVID-19 as first European country, several respondents assessed that a scenario with an acute shortage of intensive care beds was not unlikely.

> *"Een succesfactor, was natuurlijk dat, men moet dat toch niet onderschatten, dat we zouden niet klaar geweest zijn op dezelfde manier als Noord-Italië niet eerst was gekomen. Want eigenlijk… Ja, ik denk dat wij tien of veertien dagen achterliepen ofzo; of zelfs een paar dagen meer, ik weet het niet exact. Maar eigenlijk was net dat de tijd die we nodig hebben gehad om ons echt goed voor te bereiden. Want veel ziekenhuizen waren al individueel gestart."* **(HTSC committee member)**

4.2.1.2 Scope of the HTSC committee

Scope focussed primarily on hospital surge capacity and ICU in particular

The interviewed committee members stated that it was clear from the start that the prime objective of the committee was to take measures to ensure that hospital surge capacity was created for COVID-19 patients. In first instance, it focussed on the capacity of intensive care beds as this seemed to be the most critical point in the hospital capacity (i.e. many hospitalised COVID-patients required ICU while capacity was limited to about ± 2 000 beds) at that moment in time. It was reported that the predominant focus on ICU surge capacity was influenced by the sharp lack of ICU capacity in the North of Italy. While the focus was on ICU capacity, in parallel measures were taken to create surge capacity on general hospital units. The general perception among the interviewed respondents is that the committee accomplished its mission in that respect.

Transport was, from the start, part of the scope but was reported to be less prominently discussed during HTSC committee meetings. A general observation made by the interviewed respondents is that the lack of PPE crossed many discussions and decisions, often causing frustration. Therefore, although not part of the main or official scope of the HTSC committee, this reality played an important role within this group.

Despite the clear overall scope, a respondent concluded that there was no outspoken strategy to check if important issues were missed. At a certain moment (via feedback from the field) it appeared, for instance, that psychiatric hospitals were somewhat left aside in the discussions and reasoning (e.g. visitor arrangements). At least, no special attention was given to the particular problems in psychiatric hospitals during the first couple of weeks. A respondent suggested to use in the future a checklist with important domains and topics that has to be evaluated regularly to help to avoid that a particular topic is overlooked (by the HTSC committee or other committees).

"Je moet je afvragen: wat was het hoofddoel van dat comité? Het hoofddoel was de surge capacity, dus de beddencapaciteit regelen, en zorgen dat we alle patiënten konden hospitaliseren die hospitalisatie nodig hadden. Dat was eigenlijk het hoofddoel van dat comité. En ik denk voor wat dat betreft dat we daarin geslaagd zijn. Mission accomplished op dat moment." **(HTSC committee member)**

Separate committee for outpatient capacity

While initially part of the scope of the HTSC committee, it was reported that quite soon (see Chapter 2) it was decided to install a separate committee to deal with outpatient capacity issues (e.g. triage of patients, collaboration between general practitioners and emergency departments). While there are "conceptually" good reasons to treat these issues in one committee that also has hospital surge capacity within its scope, the size of the COVID-19 crisis was reported to cause such a high workload that it could no longer be managed by the HTSC committee alone. Moreover, it would have required that the HTSC committee, with already a large number of members, was expanded with primary care representatives. Therefore, it was perceived by the interviewed HTSC committee members as a good decision to treat the outpatient capacity issues in a separate committee.

"En ik denk rond 18 maart heeft Pedro Facon [President of the HTSC committee] gezegd: 'Dat gaat hier niet meer, want wij zijn eigenlijk niet meer bezig met ziekenhuis maar met eerste lijn, dus ik maak een aparte werkgroep eerste lijn. Ik splits dat af, en gedeelte woon- en zorgcentra, noem maar op. Ik splits dat af en ik steek dat in een aparte werkgroep, zodanig dat je daar met de andere partners kunt gaan babbelen, ook al was een deel van de partners dezelfde." **(HTSC committee member)**

Many topics outside its prime objective were discussed

Despite a clear main scope of the committee, several topics were discussed in the committee that were, according to the respondents, not part of its scope (and for which other committees were installed). It concerned discussions about topics related to hospital capacity such as the PPE (e.g. shortage, distribution, priorities, etc.), ethical guidelines regarding ICU admission, payment of surge capacity and test strategy. But also topics on the side or clearly out of scope (e.g. suspending mandatory registrations such as the Minimal Psychiatric Data, distribution of medications) were reported as being discussed during HTSC committee meetings. These discussions were perceived as numerous and time-consuming.

The interviewed respondents gave several explanations such as lack of decisions being taken in other committees, the unique composition of the committee (see below), a deliberate strategy of some members in an attempt to put topics on the agenda of other committees in which they were not represented knowing that the president of the HTSC committee takes part or is in contact with many of these committees (RMG, IMC, etc.). Several actors appreciated that they could put these topics, although out of scope of the committee, on the agenda of the HTSC committee and had the feeling that they were followed up by the committee or elsewhere.

Another recurrent comment was that the HTSC committee treated both strategic (e.g. defining occupancy rates on ICU from which a hospital should transfer patients to another hospital) and operational issues (e.g. organisation of particular transports). This was perceived as quite cumbersome and also a factor (once the peak of the first epidemic wave was over) in the decision of some committee members to no longer participate to meetings. It was also reported that, in a sense, it slowed down the committee in the pace of decision making.

"Ah ja. Maar de opdracht van de surge is niet bij de opdracht zelf gebleven. En dat was wel een heel moeilijke en tegelijkertijd een vermoeiende, die soms toch wel wat hoogspanningen heeft geleid. Ik heb ook wel met Pedro [President HTSC committee] af en toe wat woorden gehad, maar soit, in zo'n crisistijden kan dat ook niet anders. En ik had de indruk – maar dat kwam misschien ook door de rol van Pedro, omdat die ook in een IMC zit, een RMG, een RAG, waar die

allemaal inzit -, dus er kwam soms wel heel veel samen in die werkgroep dat eigenlijk niet onze bevoegdheid was. Bijvoorbeeld mondmaskers, discussies rond testing, de schakelzorgcentra zijn even aangeraakt, de samenwerking met de woonzorgcentra. Er kwam heel veel bij elkaar, waar soms Pedro wel wat geïrriteerd was, van: 'Dat is hier niet de opdracht van deze werkgroep.' Maar tegelijkertijd deden we het toch maar, omdat de juiste mensen rond de tafel zaten, als ik dat met alle bescheidenheid mag zeggen." **(HTSC committee member)**

Inter-federal committee

While it was perceived by many in the hospital sector as a federal committee, it was in fact an inter-federal committee including representatives of federated entities. The sense of urgency of the crisis also implied, according to the respondents, that who was competent (i.e. federal state or federated entities) for the measures taken by the HTSC committee was not questioned. As such the committee was, in general, evaluated as taking decisive measures despite the complex institutional context. This statement only holds for the hospital surge capacity measures. After all, decisions in other domains such as the role of hospitals to support nursing homes, etc. (see below) were hampered by the discussions about who was responsible for what.

"Ik heb ook heel veel geleerd over bevoegdheden, over wat federaal en Vlaams is in dit complexe land, en ik weet dat wij een aantal keer die bevoegdheden ook hebben overschreden door maatregelen af te kondigen die dan eigenlijk door deelstaten zouden moeten gebeuren. Maar aangezien die dan ook wel vertegenwoordigd waren bleek dat dan eigenlijk ook niet zo'n probleem te zijn. Dus ik denk door de snelheid waarmee we moesten werken, hebben we een aantal dingen kunnen doorkruisen. Dus qua bevoegdheden was het me niet helemaal duidelijk, en misschien nog altijd niet, maar de scope van het comité was wel heel duidelijk." **(HTSC committee member)**

4.2.1.3 Composition

Lack of transparency

On the basis of a transversal analysis of the interviews we can conclude that the origin of the composition of the committee was not transparent, neither for the committee members nor for the hospital sector. While the Belgian healthcare sector has a long tradition with concertation committees, where representation is often based on well-defined criteria and processes (e.g. installation of the Federal Council of Hospital Facilities), the composition of the HTSC committee is reported to be largely based on the judgment of its initiators. It evolved, according to the respondents, somewhat at the start (see also Chapter 1) but soon consolidated in a fixed panel. The content experts were mainly recruited, as reported by themselves and other committee members, because they raised the alarm. Despite this lack of perceived transparency, the authority of the committee was reported (by committee members and hospital sector representatives) as largely accepted.

"De samenstelling is me niet altijd even duidelijk geweest voor alle duidelijkheid, maar goed. Ik heb daar geen slechte indruk van gehad, in ieder geval niet." **(Hospital sector)**

Large committee but a unique platform to discuss topics with (almost all) relevant actors

Despite the large number of members (public authorities: federal and federated entities; hospital umbrella organisations; federal cabinet Public Health; content experts in ICU and infectious diseases; liaison officer of the Belgian Defence) the participants perceived it as a unique platform in the complex Belgian institutional context. They had the feeling that for the first time a platform was created to discuss in-depth topics with almost (see below) all relevant actors around the table.

An atmosphere of mutual trust, building on good previous inter-personal relationships, was mentioned several times as one of the key components contributing to its success. This was considered as a strength by the

respondents but can also been seen as a threat (depending on persons rather than functions).

Other success factors that were reported by the HTSC committee members to have contributed to the successful functioning of the committee, are: respect of confidentiality rules, strong leadership, respect for diverging opinions, agreement about what was communicated (and respecting these agreements), etc. (see also decision-making process, section 4.2.1.5). In any case, it was perceived as rather exceptional that such a large committee with many different actors could make such firm and fast decisions.

> *"Omdat je daar toch met een aantal uiteenlopende belangengroepen zit; de FOD zelf, de gezondheidsinspecteurs die misschien toch op een net iets andere manier kijken, de ziekenhuiskoepels, defensie die daar ook zat, de regio's die daar zaten - wat soms toch ook wel pittige discussies opleverde omdat de meningen daar ook niet altijd gelijkliepen -, en dat we toch erin gelukt zijn om op een of andere manier er toch weer telkens in te lukken om naar een consensus toe te gaan die door iedereen gedragen werd en die ook door iedereen ook met enthousiasme naar buiten toe werd uitgedragen. En dat is toch wel een fijne ervaring die je in het gewone leven laat ons zeggen niet altijd op die manier hebt, van gelijk welke aard van commissies. Dus in die zin: sterk werk. …. In het begin was het echt 'sauve qui peut' hè; het was alle hens aan dek en we moesten daar niet teveel over zeveren. Er moesten mensenlevens gered worden. … Naarmate dat de tijd vordert gaat het toch over nuances; gaat het over dingen waar je toch makkelijker al eens van mening kunt verschillen. … Het feit dat de mensen elkaar kenden, dat er ook een heel duidelijk beslissingsproces was, waar iedereen zijn inbreng kon in hebben en er toch een vorm van democratische inbreng was, liep dat wel." (***HTSC committee member)***

Policy makers sufficiently represented while field experts were underrepresented

The composition of the committee mainly included policymakers and hospital management representatives: civil servants of public authorities or representatives of umbrella organisations. While the latter liaised with their members (mainly with CEOs) to get feedback from hospitals, there is a general perception among the interviewed HTSC members that the voice of experts on the field was insufficiently covered by the committee members. This perception was confirmed during the interviews with the hospital sector representatives where some frustrations about the lack of representation of some groups were formulated. This concerned physicians who were only represented via two content experts but not via a delegation of CMOs who were identified as the central actors on the field in many interviews. This argument holds a fortiori for the nursing profession who had no representative at all. Indeed, nursing staff decisions were reported as an important element to consider when hospital surge capacity has to be created (e.g. mixing nursing teams, models of care, staff wellbeing). As such respondents suggested that bringing specific expertise from the field into this committee could have been helpful (e.g. via CNOs delegated by the Belgian Nursing Association and CMOs via their professional organisations). Moreover, it would have been a better reflection of the crisis management teams that managed the crisis on the field (i.e. hospital crisis coordination teams). From the interviews we identified two possibilities for their representation: a permanent representation or a targeted consultation at moments when their expertise could be of added value. This also applies to other domains of expertise that were mentioned as lacking within the committee (e.g. geriatric care, psychological support, rehabilitation, disaster response).

> *"Peut être pas dans les hôpitaux, mais par exemple, on s'est bien rendu compte qu'à la fin, on a trouvé utile, certes tard, mais il n'est jamais trop tard, d'entendre les représentants des médecins chef, des départements directions de départements infirmiers. Donc c'est quelque chose qui, il faut bien le reconnaitre, (…) au départ, les courriers n'étaient pas adressés aux directions de départements infirmiers et pourtant, ils font partie, évidemment, intégrante et en première ligne de l'organisation des soins, ils font partie (…) de la*

*cellule de coordination de crise. Ce n'est que sur la fin, sur le tard que les courriers leur étaient adressés en direct, par exemple. Et où on a jugé bon de les inviter. Je ne dis pas tous les hôpitaux, mais peut-être ce comité, imaginé d'avoir un représentant des médecins chefs, des urgentistes, des directions de département infirmier, voir selon les thématiques, certains experts, ça peut être d'autres experts, ça peut être utile." (***HTSC committee member)**

4.2.1.4 *Authority of the committee*

The measures issued by the committee were reported as being far-reaching, as was the impact of the crisis on hospital demand: general hospital capacity and ICU beds in particular. As such, the authority of the committee during the peak of the first wave of the epidemic was, according to the respondents, not questioned. Hospitals reacted in a very professional way and adapted their hospital (infrastructure, processes, staff, equipment, etc.) at short notice to expand their capacity and be able to admit COVID-19 patients. They made the necessary investments without having surety that budgets would follow. The respondents reported that there was a lot of solidarity and professionalism among hospital management and staff to accurately respond to the crisis.

*"Ja, we zaten echt heel duidelijk in een 'befehl ist befehl' modus op dat moment. Zeker in die beginperiode… En wat ik gezien heb is dat er heel snel een enorm bewustzijn was van noodzaak om een aantal dingen op te volgen. De eerste week na het stilleggen van de activiteiten hadden we links en rechts weleens iemand die zei: 'Ja, nu zitten we hier te wachten en met onze vingers te draaien', maar tegen het einde van de week hebben we dat niet meer gehoord. Het was zo'n tsunami die op ons af kwam, en er was daar relatief weinig gemor over." (***HTSC committee member)**

4.2.1.5 *Decision-making process*

Strong leadership with a focus on the job

The interviewed respondents praised the pragmatic and strong leadership of the chairman of the HTSC committee. The different viewpoints were treated with respect but decisions were taken when needed. What's more, the far-reaching nature of the decisions at the start (e.g. stop non-urgent medical activities) were taken at a time that the sense of urgency was not yet present in other committees or decision-making bodies. According to the interviewed participants it took leadership and courage to take this type of decisions at that moment. The leadership style contributed to "unity of command" regarding hospital capacity issues. This was reported to be in sharp contrast with the lack of unity of command that was perceived in general. When there were (small) incidents with deviations in the communication or timing from what was decided, this was discussed and corrected in a next meeting. Moreover and despite the discussions of a large number of related topics (see section 4.2.1.2) respondents mentioned that the chairman kept, at the end, always the focus on the job: "hospital and transport surge capacity". This facilitated the decision-making process.

"Wat ik gezien heb, is dat Pedro [President HTSC committee], die dat leidt, eigenlijk een heel snel denkend, pragmatisch persoon is, en dat we op die manier enorme snelle stappen hebben kunnen zetten. Het eerste, eigenlijk de eerste vergadering, zijn we onmiddellijk afgestapt van het idee van de twee expertziekenhuizen, …wat natuurlijk onhaalbaar was. Dan zijn we onmiddellijk overgegaan naar: 'kijk, dit gaat iets zijn dat heel België gaat treffen', en dat was eigenlijk ook heel snel beslist. Ik dacht eerst: ik ga dat heel lang moeten beargumenteren, want dat was op dat moment nog altijd de toon overal. Maar het was eigenlijk heel snel van: 'Oké, nee, dat is waar, we gaan dat anders doen." **(HTSC committee member)**

"En daar denk ik dat we wel eenheid in commando gehad hebben, wat superbelangrijk is in crisistijd. Ik moet dat een beetje nuanceren naar bevoegdheidsverdeling toe, die toch wel heel complex is en die bepaalde dingen onnodig complex ook heeft gemaakt. Maar als ik het beperk tot de missies van de HTSC was die eenheid in commando daar

en is men erin geslaagd om ook echt tijdig en nuttige, achteraf gezien ook nuttige, maar ook met nuttige bedoelingen besluiten te nemen." **(HTSC committee member)**

Data-informed meetings with decisions based on expert opinion

The meetings started every day with an overview of the key figures (number of admitted patients with COVID-19; ICU admissions, etc.). Respondents stated that this helped to focus the discussions and the decision-making process. Yet, the content of the measures were (also because of the absence of evidence due to the new and unprecedented impact of the virus) reported to be mainly based on expert opinion. From the interviews it can be deduced that the HTSC committee heavily relied on the two content experts to feed the initial discussions. In a next step, the introduction of a topic was mainly followed by a thorough discussion, and also feedback (via the provincial federal health inspectors or the umbrella organisations) from hospitals or problems with which hospitals were confronted were taken into account. Finally, a decision was taken.

"Internationaal hadden we heel weinig. Wat we hadden van expertise was de expertise van 2 experten. Dat waren de externe experten en andere experten zijn daar nauwelijks bij geweest. En verder… de vraagstelling, probleemstelling en beslissen… daar is zeer weinig aan… Als je gaat kijken naar de wijze van beslissen dan heeft men wel grosso modo beslist in functie van hoe je in crisissituaties beslist, namelijk: je hebt een probleem, je legt het probleem voor, er is een korte discussie, en dan wordt er beslist, punt." **(HTSC committee member)**

The RMG adopted most of the HTSC committee advices: political interference seemed to be limited

The HTSC committee was, in fact, an advisory body of the RMG (see place in organogram in Chapter 1). The RMG stood, according to the respondents, on its authority (e.g. the RMG did not tolerate preliminary communication to the hospital sector on measures that were not yet formally approved by the RMG). Yet, respondents reported that in practice most of the advices formulated by the HTSC committee regarding hospital and transport surge capacity were translated into decisions by the RMG and communicated as such to the hospital sector. According to the interviewed HTSC committee members, the political interference seemed to be limited but not absent (e.g. on some topics such as the admission policy of foreign patients the HTSC committee members reported to have felt political pressure).

There was a general perception among the HTSC committee members that the committee remained under the radar. This was perceived by them as a good thing because it kept them out of the political discussions and made it possible for them to work quite autonomously.

The HTSC committee members also described that they acted quickly with a high sense of urgency. They perceived this as being in sharp contrast with the echoes that they received from the RMG where the sense of urgency at the start of the crisis appeared to be lacking. Nevertheless, the RMG seemed to trust the HTSC committee and adopted their advices regarding hospital and transport capacity. For other topics (e.g. testing strategy) the role of the HTSC committee was less clear. The HTSC committee was, according to the respondents, rather used as a sounding board or as a means to bring topics (via the chairman who participated in several committees) on the agenda in other committees.

"Was dat een 'obvious' traject' dat voor ons altijd helemaal duidelijk was? Nee, maar we kenden het op den duur wel. Dat we de ruimte hadden om te discussiëren en een aantal dingen op poten te zetten, maar dat de formele goedkeuring om dat de wereld in te sturen toch nog ergens op een ander niveau lag." **(HTSC committee member)**

"Je ne suis pas sûr que le comité a chaque fois pris des décisions finales. C'était très varié. Alors parfois, on nous informait de discussions au niveau, par exemple, du RAG. Parfois, on nous informait de certains dossiers qui étaient déjà passés à la CIM ou avant de passer à la CIM. Parfois, on nous demandait de nous prononcer sur certaines thématiques avant d'être présentées en CIM et puis ça nécessitait encore la validation du RMG derrière avant d'être communiqué. Pour d'autres courriers, je pense que quelque part le comité a réellement décidé sans devoir passer par d'autres organes d'avis et a pu écrire dans un certain sens." **(HTSC committee member)**

Very demanding process in terms of time and energy

The management of hospital surge capacity during the first wave of the epidemic caused a stressful period of a long duration for both HTSC committee members, hospital managers (and hospital staff: see further). The meetings were frequent, of long duration and the outcome of their decisions was far-reaching. In addition, several people combined their committee activities with other commitments of their regular job. Many of the interviewed persons indicated that they were tired and needed time to reboot.

4.2.1.6 Communication to hospitals

Official letters with directive communication style

The main communication channel of the HTSC committee to hospitals was through formal letters signed by the president of the HTSC committee, the president of the RMG, the president of the Belgian Society of Intensive Care Medicine and a member of the Scientific Committee COVID-19 (see Chapter 3). From the start, the letters were addressed to the CEO and CMO of the hospitals. Only after a few weeks the CNOs were addressed. This was, according to the respondents, an oblivion since they acknowledge that CNOs were represented as key actors in all hospital-specific crisis management committees.

The HTSC committee members indicated that there was a clear policy to communicate with one single voice. The strategy to discuss the measures, make a decision that needed to be approved by the RMG and then send one letter via the federated entities (with the logos of all involved public authorities) was highly valued. Yet, according to the interviewed respondents from the hospital sector it was not always clear to the individual hospitals from which committee they received directives about what and what the connection between all the different committees was. In addition, they stated that they were overrun with instructions and often at unpleasant times (e.g. late at night, during weekends).

> *"Voilà, la communication officielle et les courriers qui reprenaient l'ensemble des logos des administrations de santé et de chaque entité fédérée. C'était la colonne vertébrale de la communication entre le comité et le secteur des hôpitaux. (…) Les courriers étaient discutés au sein du comité. Etaient, en tout cas, identifiés, et donc je suppose (…) validés par une série d'autorités et d'entités fédérées. Les envois étaient chaque fois confiés aux entités fédérées car il fallait aussi assurer la traduction et il fallait une adresse mail de contact. (…) Et donc l'idée que ça soit un courrier du comité avec tous les logos, etc. On a dit, ça c'est un message qu'on a fait passer, ce sont ces courriers-là qui partent de ce comité qui s'occupe de la surge et du transport au niveau du secteur hospitalier et l'information fiable c'est celle-là."* **(HTSC committee member)**

The communication style was perceived as directive by the hospital sector. While in some hospitals this was, according to interviewed hospital representatives, perceived as helpful to implement the measures within their hospitals, other interviewees indicated that the somewhat theoretical, detailed and complicated directives were not a sign of much confidence in the professionalism of hospitals.

In addition, the measures were communicated without a clear rationale. It was not always entirely clear to the hospital sector what the underlying objective of the communicated measures was. Some stated that general directives with an accompanying objective would have been a good alternative to enable hospitals to implement the surge hospital capacity in a more tailored way. After all, respondents from hospitals stated that they are professional organisations (healthcare professionals and management) capable to react to a changing context in a rapid and flexible way. They were also perceived as such by the interviewed committee members.

> *"Ik denk dat dat niet ongelooflijk in vraag gesteld werd op dat moment, maar dat er wel ergernis was over de toon van de brief, die zeer directief was, en over de steeds wisselende vragen van: 'Kan je die en die cijfers aanleveren?' "* **(Hospital sector)**

"Oui, je disais un peu scolaire dans l'instruction. (…) Sauf à ce que les hôpitaux aient été de mauvaise composition ce qui n'était pas le cas. Par essence un hôpital s'adapte à ce qui lui arrive. Et donc je ne pense pas que ça a été un grand apport pour les hôpitaux de dire il faut faire comme ça, il faut en ajouter autant, il faut… Les hôpitaux sont tout à fait capables de faire ça spontanément." **(Hospital sector)**

Nevertheless, while the composition of the HTSC committee or the link with other committees was not always clear to the hospitals, the content of the letters was, in general, accepted without many questions. Some of the interviewed respondents complained about the timing (i.e. letters were often sent in weekends) and rapidly changing nature of the measures with large operational implications (e.g. creating an additional ICU unit).

Additional communication channels

The communication via letters was complemented with daily zoom meetings per province held by the federal health inspectors. During these zoom meetings additional background about the measures was given and questions were answered. It was also a way to collect feedback from the field (mainly via CMOs but also CNOs and CEOs participated) and bring it to the table of the HTSC committee. While this was highly valued, especially by hospitals in places where the epidemic impact was the highest, it seems from the interviews that this strategy was, due to personnel shortages in these services, not deployed in a same manner and to the same extent for the entire Belgian territory. Therefore, potentially not all hospitals had the same experience of involvement/possibility to give feedback to the committee. In addition, there were some small incidents reported by the interviewed committee members about measures that were communicated to the hospitals before consensus was reached in the HTSC committee or measures that were not yet approved by the RMG. Also the umbrella organisations reported that they connected with their members and gave feedback at the HTSC committee. The same was done by the federated entities when they received feedback from hospitals in their region.

"De samenstelling is me niet altijd even duidelijk geweest voor alle duidelijkheid, maar goed. Ik heb daar geen slechte indruk van gehad, in ieder geval niet. Het is zo dat wij van in het begin van de crisis ook altijd wel heel goed op de hoogte zijn gehouden van die besprekingen binnen dat comité, beslissingen die genomen zijn, ook zelfs informatie die we gekregen hebben voor officiële brieven de wereld ingestuurd werden, of naar de ziekenhuizen werden gestuurd, met een goeie toelichting via de gezondheidsinspecteur die ook altijd aanwezig was op die vergaderingen. Dus er was een mooie link met het comité, naar ons toe, naar de hoofdartsen toe. Ik moet zeggen dat sinds het comité via de gezondheidsinspecteur prominent op de voorgrond kwam in de crisis, dat het voor ons ook wel wat makkelijker werd om de zaken te regelen intern." **(Hospital sector)**

4.2.1.7 Organigram of the HTSC committee

Place in the web of other committees and decision-making bodies

While the establishment of the HTSC committee was, according to the interviewed respondents, the result of the personal initiative of content experts and civil servants, the composition of the committee and its mission were approved by the RMG. In fact, the HTSC committee had the status of an advisory body or "working group" of the RMG. Even for the committee members it was unclear what the role and responsibilities of all COVID-19 related committees was (e.g. RAG, task force shortage PPE, the role of the governors of provinces, etc.). Some respondents indicated that there was a lack of coordination of all the different committees which required energy and time (e.g. redundant discussions and concertation, discussion on topics that were out of scope, frustration) that could have been saved at a time that a public health crisis with a substantial duration needed to be managed. Some stated that the RMG failed to take up this role of coordinator.

"Wat het moeilijk maakte was vooral heel de structuur errond. Alle RMG's, RAG's, GEES, werkgroepen, noem maar op. Het was voor mij niet altijd even duidelijk: van waar komt nu welke informatie en wie heeft nu wat beslist." **(HTSC committee member)**

While the complex context of competencies after the 6th State Reform is a well-known reality within the domain of healthcare, the HTSC committee managed, according to the interviewed committee members, to transcend this context and take the necessary decisions regarding hospital and transport surge capacity.

4.2.1.8 Future role of the committee

HTSC committee as a crisis committee to manage surge capacity versus a permanent consultative body

The functioning of the HTSC committee was highly valued by its members, and resulted in a strong professional network of people that did not always know each other beforehand. All interviewed committee members think the committee should be reactivated in case of a second wave or in case of another crisis that requires surge hospital capacity. The opinions about a future more permanent role are more divergent.

While some see managing surge capacity at the time of a crisis as the only role for the committee, others want to build on the positive experiences of the current HTSC committee. They want to turn this format, where both public authorities from federal and federated entities, umbrella organisations, complemented with other actors (e.g. the Belgian Defence) discuss hospital-related and/or health policy topics in-depth, into a more permanent "reflection committee".

> *"A titre personnel, je trouvais vraiment que d'avoir tous ces acteurs autour de la table avec nos avis parfois contradictoires, avec nos expertises, avec nos désaccords, parfois, peu importe, c'était quelque chose de vraiment intéressant et on a même certains d'entre nous émis l'idée de le poursuivre en se disant, peut-être pas dans un rythme aussi (…), mais on pourrait très bien réactiver ce genre de choses en cas de besoin, sur cette thématique, sur une autre, avec un rythme différent."*
> **(HTSC committee member)**

Auto-evaluation after the first wave

During the interviews several initiatives to evaluate the measures that were taken during the first wave of the epidemic were mentioned. It is beyond the scope of this chapter to describe the results of these evaluations. We refer the reader to Chapter 6 for more information. The following type of evaluations were mentioned during the interviews:

- The committee started several self-evaluations to prepare a second wave. These evaluations concern a survey about the functioning of the hospital emergency plans and a brainstorm in a conceptual subgroup to prepare actions to be ready for a second wave (e.g. education and training of staff in ICU). Also reflections about more permanent structures are taking place such as a care programme for respiratory infections, a permanent hospital buffer capacity, and support to nursing homes provided by hospitals (e.g. expertise in infection control & prevention).
- Some umbrella organisations started evaluations about the hospital response in the first wave of the epidemic (survey, debriefings, etc.). Also more general evaluations (e.g. parliamentary evaluations, consultancy organisations commissioned by the NCCN) are conducted in which the evaluation of the hospital surge capacity is one component.
- Although the evaluation of the results (impact on patient outcomes) across hospitals is requested by several HTSC committee members and hospital sector representatives, they also indicated that this seems to be delicate in the current context.

4.2.2 The data used to inform the HTSC committee and manage the surge capacity

4.2.2.1 Basic data to manage hospital surge capacity were not available at the start of the crisis

To manage hospital surge capacity in times of a COVID-19 epidemic the respondents indicated that it is essential that at least data are available to policymakers about the number of operational hospital beds (COVID and non-COVID), the number of ICU beds (with and without ventilator; for COVID and non-COVID patients), the number of patients admitted to these beds (COVID, non-COVID, COVID-suspected) and some clinical characteristics (e.g. length of stay, duration of mechanical ventilation). Yet, problems were reported with this basic data at the start of the crisis. Respondents stated that it was difficult to get a grasp on the available hospital (and ICU) capacity. Gradually this information became available, improved and was used at every meeting of the HTSC committee. The data gave the HTSC committee members a daily overview of the situation on the field and supported them to take measures (surge or de-surge) when indicated.

In addition to conceptual and data-definition problems and instructions, respondents from the hospital sector also complained that the IT-infrastructure and data-platforms to submit data were not performant, not integrated and not-professionally developed (especially during the first couple of weeks). In any case, the lack of a performant system and a clear view on key figures resulted in a loss of energy. Time and energy were wasted not only to get the data definitions right, but also (according to interviewed HTSC committee members) in data processing and tools not always focussing on the key figures. In addition, respondents from the hospital sector indicated that the registration burden increased over time due to additional data demands (e.g. additional ad hoc surveys) for which they questioned the usefulness for the committee to make decisions.

Administrative data about hospital capacity do not reflect the real capacity that is deployed on the field

The FPS Public Health holds data on “licensed beds” and “justified beds” (or beds covered by the hospital payment system) but not on operational beds. The former is outdated as hospitals decreased the number of (operational) beds by shifting activity to day care and outpatient care, by shortening the length of stay, etc. while the administrative number of licensed beds were more or less kept at the same level. As such there are more licensed beds (administrative reality) than operational beds (reality on the field). Moreover, respondents indicated that the administrative label given to a bed (e.g. C=surgical, D=internal medicine, I= intensive care) does not always reflect the expertise, infrastructure and material that is available to run a bed. What is needed, according to some interviewed HTSC committee members, to manage the crisis is the number of available operational hospital beds and ICU beds in particular. After all, a licensed (not operational) bed can only be activated when the required staff (medical, nursing, etc.), infrastructure and equipment is available.

> *“ICMS, c’est la difficulté qui était liée au nombre de lits renseignés, je vais parler des lits USI, ce sont les plus important, donc de soins intensifs. Il y avait une difficulté dans quel est le véritable nombre de lits disponibles COVID-19 à l’USI. (…) Parce qu’il y avait une définition qui était théorique du nombre de lits et une définition qui était opérationnelle.La définition théorique c’était par exemple, c’était ce qui était mis dans les directives, c’était, vous devez avoir 25% de vos lits reconnus + un nombre x de lits en plus que vous mettez dans les hôpitaux. Je peux bien comprendre car l’important de ce que les gens qui dirigent doivent avoir, est ce qu’on aura assez de lits pour accueillir les malades. Mais la différence pour les hôpitaux, (…) c'est qu’il y a une différence entre dire, c'est bien de dire, j’ai autant de lits, je mets autant de lits COVID et j’en crée autant à l’extérieur, dans les salles de réveil, dans les salles d’op, dans les medium care, etc. mais est ce que j’ai le personnel pour les tenir correctement ? Est ce que ça va fonctionner ? Est ce qu’en ayant ces lits qui sont par exemple dans les salles de réveil des quartiers opératoires, je vais continuer à pouvoir travailler au quartier opératoire pour les urgences ? Donc je ne parle même pas de*

la relance des activités ici mais tout ça est difficile." **(HTSC committee member)**

Other committee members disagreed and stated that the combination of data sources resulted in a good view on capacity needs on the field. The licensed beds gave a view on the starting point (total capacity without additional measures) and the application of the measures on surge capacity gave a view on the additionally created capacity. When this information was crossed with ICMS (Incident & Crisis Management System) data on available beds, a good view on the reality on the field was obtained according to them.

"… dus de erkende capaciteit intensieve, de evenredige bij gecreëerde capaciteit, … 2000, en dan de factor maal vier om je capaciteit aan verpleegbedden te hebben. Dus we zaten in een total, in een contingent van 10.000 bedden, die nooit volledig opgebruikt geweest is. Dus… Maar we wisten wel degelijk, als we elke dag bekeken, waar onze grenzen lagen voor intensieve en voor de totale capaciteit van bedden. … via ICMS dat heel nabij van dag tot dag werden opgevolgd, hoeveel er nog ter beschikking was." **(HTSC committee member)**

Some registrations were suspended which potentially prohibits a good understanding of what happened on the field

In addition, while some supported the principle to suspend the mandatory registration of some administrative databases (e.g. Minimal Psychiatric Data, Mobile Urgent teams, nursing data part of the Belgian Hospital Discharge Data Set) it was perceived as a decision that was insufficiently concerted. After all, nursing respondents indicated that it created a black box about which nursing activities are performed for COVID-19 patients at a time that such information is essential to learn about practice variation, workload, etc. Also the suspension of the Minimal Psychiatric Data evoked mixed reactions.

"Ik begrijp niet dat in zo'n volle crisissituatie, dat men de minimale verpleegkundige gegevens niet als relevant meeneemt hè. Dat heb ik ook duidelijk aangegeven, dat dat de grootste misser is die je maar kunt maken. En dat wil niet zeggen dat ik het niet steun, dat ze misschien op dat moment hun registratie niet zouden doen. Maar dat er zelfs geen plan is om dat retroactief te doen, dat kan ik echt niet volgen. Dat kan ik écht niet volgen. Dat is tegen-intuïtief. Als ik zie wat er in het buitenland allemaal gebeurt om daar bevragingen op te doen en te begrijpen wat dat proces meemaakt, dan begrijp ik dat totaal niet, waarom dat de overheid samen met de koepels zo'n belangrijke beslissing neemt zonder afstemming met de experten. Ja, dat is voor mij een heel belangrijk punt. Niet. Te. Begrijpen." **(Hospital sector)**

Hospitals are legally obliged to submit data

Submitting data about available beds and aggregated data about the COVID-patients was made compulsory. The compulsory daily submission of capacity data created according to the interviewees the perception within the hospital sector that the surge capacity directives were not without obligations either.[9] Despite the problems mentioned above and the heavy workload caused by these data registrations that came on top of the existing data obligations, the interviewed respondents from the hospital sector supported the data collection. They recognised the need of these data in the context of managing hospital surge capacity at the time of a crisis. Making this registration compulsory by law and to foresee financial sanctions when hospitals do not comply was, however, a bridge too far for some and an indication of lack of trust of the public authorities in the hospital sector.

"Alors le secteur, tout à fait convaincu que les enregistrements étaient nécessaires. Ça on n'a jamais eu de remise en question là-dessus. Néanmoins ça a été très lourd. Donc des enregistrements quotidiens de Sciensano qui se sont étoffés avec le temps, des questionnaires, les anamnèses, les enregistrements quotidiens, les rapports post hospitalisation, les analyses qualitatives, ça a été quand même très très lourd." ***(Hospital sector)***

"*Ok, donc d'un côté, je pense que le « harcèlement » des hôpitaux a été utile pour qu'on obtienne les données. D'un autre côté, je ne suis pas sûr que d'aller jusqu'à un décret, enfin un Arrêté Royal, qui les obligeait à le faire sous peine de sanction, qu'on n'a jamais appliqué, ce n'est pas ça, était vraiment utile. Car on était dans un système de crise et je pense que la parution d'Arrêtés qui obligent, si vous voulez, ça a tendance plutôt à braquer les hôpitaux plutôt qu'à les rendre*

collaborants. Autant le « harcèlement », même s'ils n'ont pas toujours apprécié, ça a eu des résultats ; mais moi, je n'aurais pas aimé qu'on applique un Arrêté Royal qui leur donnait des sanctions financières s'ils ne répondaient pas aux enregistrements, d'autant plus que c'était du travail supplémentaire qui était nécessaire mais eux, ils avaient plein d'autres choses à faire." **(HTSC committee member)**

Existing data systems were adapted or new systems were developed: this took time and caused frustration

Given the absence of a performant data system the committee had to invest time in defining which data were minimally needed to manage the surge capacity. To have a view on the number of hospitalised COVID-19 patients an ad hoc web-survey was developed. Hospitals had to submit each day data to Sciensano (see Chapter 3). It took some time and versions to get the definitions right which caused frustration both within the committee and the hospital sector.

"Donc voilà, les données épidémiologiques c'était nécessaire. Pour moi, ça a été bien mis en place, mais peut être qu'on aurait pu réfléchir davantage à toutes les données dont on avait besoin pour éviter de redemander à chaque fois, de rajouter une couche, si vous voulez, aux hôpitaux et les hôpitaux ont eu beaucoup à faire à prendre en compte les demandes qui s'agglomeraient au fil du temps." **(HTSC committee member)**

To get a view on the (available) beds a combination of data sources was used: the existing administrative data and a daily submission of the available hospital beds (general, ICU, ventilators) via ICMS (Incident & Crisis Management System). Yet, ICMS is according to several respondents designed to be used for disaster management (e.g. terrorist attack, massive road accidents) but not to manage an epidemic of the size and duration of COVID-19. Even today it still is considered as a proxy of the reality on the field depending on which data are submitted by hospitals. To validate the number of ICU beds the HTSC committee submitted a list with the number of ICU beds (licensed beds, newly created ICU beds, ICU beds for COVID-patients and ICU beds for non-COVID patients) to the hospitals.

"Wel, ik moet eerlijk zeggen … als ik daar vast toekwam en zag welke data we hadden of niet hadden en hoe dat verzameld werd dan zakte mijn broek af. Ik dacht echt van: wat is dit nu? … de heel simpele vraag …: 'hoeveel intensieve bedden zijn er in België?' en daar kon niemand op antwoorden. En eigenlijk tot op vandaag kan niemand daarop antwoorden. Het zit ergens tussen de 1900 en de 2100, dus er zit 10% verschil op die cijfers. Afhankelijk van hoe je telt, of je erkende bedden, aangegeven bedden… Dat is eigenlijk onwaarschijnlijk. Dus dat is eigenlijk onaanvaardbaar, zoiets. Dat is ook wat geen enkel land… En eigenlijk hebben we daar heel snel '2000' opgeplakt, en dan eigenlijk ons gebaseerd op ICMS, wat de ziekenhuizen aangaven, en dat bleek dan ook min of meer te kloppen." **(HTSC committee member)**

"Est venu s'ajouter l'ICMS (…). Ce n'est pas une plateforme dédiée à une crise fédérale pendant 4 mois, elle n'est pas faite pour ça au départ donc ça a été très très lourd avec des multiples fichiers qui finalement étaient perçus par le secteur, compliqués à comprendre, à remplir." **(Hospital sector)**

Validity questions

Several of the interviewed hospital representatives mentioned that the data guidelines given by the public authorities were insufficient to capture the complex reality on the field. Therefore, many of the respondents stated that they agreed on data definitions within their single hospital or hospital group (e.g. suspected versus confirmed cases, duration that a patient with confirmed COVID-19 stays a COVID-19 patient; is an available ICU bed immediately operational or within a certain time frame). As such, it is possible that interpretations differed and validity problems occurred. The committee was aware of these problems and additional instructions (e.g. by giving examples) or explanations (e.g. zoom sessions) by the responsible public authorities were given in an attempt to remediate this.

"Ik denk dat we ons echt moeten zorgen maken over de validiteit van die gegevens. … En de belangrijkste zijn denk ik Sciensano natuurlijk, en daarnaast ICMS ook, wat capaciteit betreft. … Wij hebben daar ook echt mee geworsteld, om dat performant te kunnen aanleveren. Er zijn inderdaad overlappingen tussen verschillende vragen. … Wij hebben op verschillende momenten echt moeten knopen doorhakken, van: We gaan dat nu zo doen, en zo rapporteren. Wat denk ik goed is om consistent te zijn intern. Maar wat natuurlijk enorm zorgen baart… over de validiteit op populatieniveau." **(Hospital sector)**

The data output presented to the HTSC committee at the start was, according to the interviewees, rather basic but improved after a while. They reported that after a couple of weeks data were presented in a clear way to the HTSC committee members during each meeting.

4.2.2.2 *Large steps were taken to improve the data at the start of the crisis but more work needs to be done*

Imperfect but also the most performant hospital data to manage the COVID-19 crisis at a national level

As mentioned above, respondents stated that there were many shortcomings in the data available to the HTSC committee. But in the end, several respondents stated that the hospitalised patients and available hospital beds (and ICU in particular), as used by the HTSC committee, were the only more or less reliable data to manage the epidemic crisis in the large sense (i.e. general public health measures were based on these data) during the first wave. Other data (e.g. positive cases) were not reliable because they included substantial underreporting due to a lack of testing on a large scale.

"Maar uiteindelijk waren dat ook de enige data waarover we beschikten tijdens de epidemie hè. Dus ik denk… dat is wel een enorme sprong voorwaarts geweest. Uiteindelijk waren de data van ons comité de enige solide data die beschikbaar waren, en dat zijn de enige stabiele data waar we op konden vertrouwen en konden zeggen: 'Oké, we hebben de data binnengekregen van 103 hospitalen. Zoveel nieuwe opnames en dit en dat.' Dat heeft op korte termijn… Het heeft bloed, zweet en tranen gekost om dat op punt te krijgen maar ja… uiteindelijk hadden we eindelijk wel iets waar we op konden bouwen, mee konden plannen, en waar we een beetje mee konden modelleren. Dus ik denk… dat is wel absoluut de moeite waard geweest voor dat bloed, zweet en tranen." **(HTSC committee member)**

More detailed information about patient profiles was lacking

To get a good grasp on the (future) available hospital capacity respondents indicated that it is important to know how long patients stay in the hospital and on the ICU, what their comorbidities are, how long they are ventilated, where they come from, etc. This information is essential to predict the capacity use of newly admitted patients and to control demand. This type of information was lacking for a long time (e.g. length of stay on ICU; admitted from a nursing home). The HTSC committee had to make estimations based on internationally published figures until the analysis on (voluntary) data collections became available (see Chapter 1). Respondents are aware that these data will eventually (within six months to one year from now) become available via the Minimal Hospital Data (MZG – RHM), but they also indicated that this only allows retrospective evaluations and is not useful for on the spot crisis management. An option to submit these data immediately (analogue to data requirements for hospital stays with low variability, for which data need to be submitted at the end of the stay) was not considered by the HTSC committee but was nevertheless suggested by one of the interviewed committee members. At a given moment also ad hoc surveys were launched to obtain additional information. Respondents did not assess this as being the best approach as it risks to be of insufficient quality: registration burden but no valid/reliable data. What's more, it was considered as redundant since Sciensano did set up a (voluntary) patient level database of COVID-19 patients. Yet, it took a long time before resources were dedicated to exploit these data. Finally, some respondents indicated that some of these questions require a clinical study in itself which was out of scope of the HTSC committee.

"Het zou potverdikke toch wel handig geweest zijn moesten we nu in die eerste maand, die we ondertussen achter de rug hebben, geweten hebben wat voor soort volk we in die bedden hebben liggen gehad, zowel op intensieve als in de gewone verblijfsafdeling. En het is een paar keer door mijn hoofd gegaan: 'MKG, MKG-comorbiditeiten, wat speelt er precies mee?' En daar hebben we toch een klein beetje blind gevaren. We kenden aanvallen; we wisten de locatie waar dat die mensen zaten, maar zoals gezegd voornamelijk in bulk. Maar het individuele traject van de patiënt, daar hadden we niet het minste idee van, en we vielen soms van de ene verbazing in de andere over ligduren die minder waren." **(HTSC committee member)**

"Mais le corollaire c'est que certaines données nous manquent. Par exemple, au niveau de l'admission des personnes en provenance des maisons de repos, ce n'est arrivé que vraiment par la suite et plutôt sur la fin de la crise, et donc au plus fort de la crise, on n'avait pas de données par exemple, sur les résidents des maisons de repos qui étaient admis. Et comme il y a eu, et il y a toujours, une polémique sur la prise en charge des résidents en maisons de repos, peut-être que ça aurait permis de vérifier certaines hypothèses, ou pas." **(HTSC committee member)**

Data about available staff to complement the current capacity information

Capacity was mainly measured in terms of beds and equipment (ventilators) while respondents stressed that medical and nursing staff are essential to operate these beds and machines. A respondent stated that this was the result of an "administrative approach" of managing hospital surge capacity. Therefore some respondents suggested to collect information about the available staff and their expertise and how staff was made available for the surge capacity (e.g. proportion of staff for ICU beds with ICU skills). In addition, since absenteeism can be a substantial problem during an epidemic (e.g. infected staff, mental health problems) some suggested to monitor well-being and absenteeism.

"Ça aurait pu être intéressant car à l'heure d'aujourd'hui, on aurait aussi une vue d'ensemble au niveau national sur la conséquence de la gestion de cette crise au niveau RH, au niveau absentéisme, au niveau charges psychosociales car cet enregistrement il est fait au sein de chaque hôpital, au sein de chaque institution. On a mis des tas de choses en place, on finance, on met des programmes, plein de choses qui se mettent mais sans véritablement avoir une vue d'ensemble sur l'impact que ça a eu réellement sur le besoin aujourd'hui et demain." **(HTSC committee member)**

Evaluation of hospital standardised mortality rates was lacking

While several members stressed the importance of evaluating hospital standardised mortality rates (HSMR), such evaluation was not conducted at the time of the interviews (see Box 2). Respondents stated that it could be very informative since all hospitals admitted critically ill patients with the same pathology. Respondents stated that they expected differences in HSMR because some centres have more experience and expertise than others to treat critically ill patients. If this hypothesis is confirmed, it could result in important structural reforms (e.g. different levels of ICU comparable to models used in other countries) and lessons on how to manage future crises (see Box 2). Many of the data necessary to perform this evaluation are already available, yet additional data will have to be collected via a data extraction from electronic or paper patient records to make such evaluations possible at recurrent time intervals. Some pointed out that a national rollout of past efforts to collect such information has not been implemented yet (see Box 3) which they regretted.

"Want eigenlijk is er op een bepaald moment een proefproject geweest, en dat project heet MICA. Dat was een project waarbij we een continue ICU-databank gingen hebben van alle ICU's die daar verplicht op aangesloten moesten zijn met verplichte data-entry, net zoals ze in Nederland, de UK en Brazilië hebben. En ja… dat is dan weer stopgezet hè. Ze hebben dat laten draaien in zes ziekenhuizen, dan bleek dat dat geld ging kosten, en dan hebben ze gezegd: 'Ja, we gaan dat toch maar niet doen.' Maar hadden wij dat gehad… ja, dan hadden we gewoon een dashboard gehad waar niemand iets moest ingeven. Dan zag je gewoon live waar wat lag in België, en konden we ook nu al 'standardized mortality ratio's' berekenen en konden we nu al zien: wie heeft wat gedaan? Want bijvoorbeeld de sterfte in de UK heb ik

gezien… Maal vier hè! Dus dat wilt zeggen dat wij hier in België centra ICU's hebben met een mortaliteit boven de 50%, en we hebben er met een mortaliteit van onder de 15%. Ja… Als we nu een volgende golf willen organiseren dan is dat essentieel om te weten. Want wie weet hebben we dingen gemist qua overspoeld zijn van centra. Was dat eigenlijk… die mensen konden er niet aan doen maar die waren overspoeld en we hebben dat slecht gereguleerd bijvoorbeeld. Of is het echt zo dat er een competentieprobleem is in sommige centra? Of was het een case mix? Hebben ze de verkeerde patiënten op intensieve opgenomen. Dat zijn allemaal dingen die we eigenlijk moeten weten. maar ik denk wel, in de analyse… allez… als we zeggen: we willen eens graag een benchmark doen van de ziekenhuizen in België… Je hebt natuurlijk dezelfde ziekte gedropt in alle ziekenhuizen in heel België. Het is exact dezelfde ziekte, waar variatie op zit of niet. Dus je hebt eigenlijk een ideaal model nu om eens een benchmark te doen van wat ziekenhuizen kunnen voor dit soort dingen." **(HTSC committee member)**

"Ce que je dis, c'est qu'on n'avait pas des analyses un peu plus fouillées. Je vous donne un exemple, on ressentait ce besoin-là, on avait par exemple l'envie d'avoir : quelle est la mortalité dans les hôpitaux au bout d'un mois de pandémie ? Ou : quelle est la mortalité dans les unités de soins intensifs ? Et on a même demandé et ça a été fait, de faire au niveau du comité, une enquête, car il y a des enquêtes qui ont été proposées ou en tout cas réalisées à partir de la Task Force, et on a proposé des enquêtes par exemple sur la mortalité (…) en soins intensifs, le pourcentage qui étaient aux respirateurs, etc. Parce qu'on sentait bien que c'était quelque chose qui était un peu flou et ça pouvait, quand on questionnait l'un, ça changeait un peu, il fallait avoir des chiffres plus globalisés, on a fait ça, on a eu des données qui étaient intéressantes sur une série d'hôpitaux, mais ces données-là, Sciensanio les avait." **(HTSC committee member)**

Box 2 – Hospital standardized mortality rates were calculated and analysed after the first wave

At the time of writing this report no scientific article or report on HSMR in Belgium was publicly available. However, slides on this topic that were presented to the HTSC committee were made available to the research team of this report. In addition, we received the following statement via personal communication with Sciensano (28/10/2020): *"The individual patient data collected through the clinical survey of Sciensano were used to investigate specific research questions. One of them was to understand the risk factors for in-hospital mortality of COVID-19 patients admitted to intensive care units (ICUs). The aim of this study was to analyze clinical characteristics and predictors of mortality of critically ill patients admitted to Belgian ICUs with COVID-19, with a particular focus on ICU organizational characteristics. It was shown that ICU organizational characteristics, such as ICU overflow and a high proportion of additionally created ICU beds were independently associated with in-hospital mortality, together with older age and comorbid diseases. As a consequence, mortality of critically ill COVID-19 patients could be influenced by organizational factors that different health care systems had to face during the epidemic: the rapid creation of additional ICU beds and the challenges of local overflow. These findings supported the creation of the new surge plan (coordinated by the HTSC committee) for the preparation of the second wave. The focus of the new strategy will be to have a maximal spread of COVID-19 patients at a national level occupying first the existing ICU beds. Therefore, readdressing critically ill patients to other specialized ICUs instead of creating new ICU beds will be strongly encouraged."*

Box 3 – MICA: Monitoring Intensive Care Activities

The MICA project (Monitoring Intensive Care Activities) is a project that was initiated by the FPS Public Health (2014) in collaboration with the college of intensive care physicians. Via a pilot study with 6 participating hospitals it was aimed to set up a registration system for ICU (adults) for the continuous monitoring of quality of care via quality indicators and benchmarking. The final report of the pilot study was published in December 2017.[21]

Fifteen hospitals now participate in the project. MICA makes use of the "Epimed Solutions" clinical management software. The software provides real-time reports about several indicators (e.g. standardised mortality rates, length of stay on ICU), real-time benchmarking among participating hospitals (15 Belgian hospitals; more than 500 hospitals in 7 countries).[22]

Since 2019, MICA is one of the registries that is rewarded via the pay-for-performance (P4P) programme. Via this programme, the FPS Public Health allocates about 6 million euro to hospitals via a point system based on quality criteria. In 2020 a maximum of 100 points can be earned. One of the hospital-wide indicators is the participation in a selection of 9 non-mandatory registries, quality labels or quality improvement initiatives. A maximum of 5 points can be earned via this indicator: one per initiative of which MICA can be one.[23]

Lack of transparency

The HTSC committee members stated it was a deliberate choice of the committee to make the available beds and occupancy rates only available at a national level. Hospitals did not know (unless they shared data themselves, for instance, in the context of loco-regional networks) what the situation was in other hospitals. There was a fear that hospitals would shift responsibilities to create surge capacity to other hospitals. The interviewed respondents from the hospital sector indicated this lack of transparency as a shortcoming and a sign of insufficient trust in the sector. They stated that they would have appreciated more transparency since it would have enabled them to pro-actively contact their colleagues. Furthermore, a feedback and benchmark of the submitted data could have helped hospitals to learn from each other and seemed to be a minimum after all the work that hospitals had done to submit these data.

> *"Donc demande du secteur d'avoir un retour. Comme toujours quand il y a enregistrement, les personnes qui font l'effort d'encoder, d'enregistrer, de collecter, attendent un feedback, peut-être pas sur tout, mais c'est un feedback qu'ils n'ont pas eu."* **(Hospital sector)**

In the long term data should be extracted automatically

Respondents indicated the need to invest in the interoperability of electronic health systems in the long term, to avoid that data have to be submitted manually but can be extracted automatically.

> *"Vous allez me dire, est ce qu'il y a une solution ? Bien sûr que oui, la solution n'existe pas aujourd'hui, j'entends bien, mais la solution c'est l'interopérabilité des systèmes informatiques des hôpitaux avec un système fédéral, en tout cas pour le type de données qui sont demandées. C'est vrai pour l'INAMI. A l'INAMI on donne parfois, quand on prescrit tel médicament, il faut aller chercher un formulaire spécial, etc. Mais s'il y avait une interopérabilité entre les réseaux informatiques, pas les réseaux, mais les systèmes informatiques, c'est quelque chose qui pourrait être extrait automatiquement. Et l'extraction automatisées des données qui sont importantes ou intéressantes dans le cadre d'une pandémie, par exemple, c'est quelque chose qui pour l'avenir, devrait, en tout cas, être réfléchi."* **(Hospital sector)**

4.2.2.3 Prediction models

Hospitals used their own prediction models

From the interviews it can be deduced that predicting the use of hospital capacity by statistical modelling was done by individual hospitals (or hospital groups) but certainly not by all. Due to the lack of Belgian data at the start of the epidemic, data from abroad (e.g. Wuhan, North of Italy, South-Korea) were used to feed different scenarios. Hospitals used them to see if they were capable to free up capacity for the worst case scenario. If not, additional measures were taken to enable that additional capacity could be

created on short notice. Respondents stated that using these worst case scenarios was maybe good at the start (e.g. to create a sense of urgency) but appeared to be over-shooting after a while when it became clear that the Belgian situation differed from these examples abroad. The disadvantage they mentioned about local models is that they use different parameters. In addition, they were based on a relatively low number of observations and the predicted results differed substantially according to the scenario that was chosen. Running such a model on a national level would have resulted in more stable predictions.

> *"En dat is een tool… Wat doet die? Op basis van je eigen parameters… Wat is je instroom van COVID-19, via testing en dergelijke meer. Hoeveel patiënten liggen er momenteel in je ziekenhuis? En dan – heel belangrijk – de evolutie in landen waar we al meer data van hebben dan in België op dit moment. En dan moest je dus kiezen. Je kon het scenario Wuhan kiezen, je kon een scenario Noord-Italië kiezen, Korea en dergelijke meer. En dan heb je een variatie natuurlijk want die simulatie is niet hetzelfde, naargelang het land dat je kiest. En een range waar je de nodige capaciteit in kaart kan brengen. En dat hebben we de eerste twee maanden eigenlijk gevolgd, om dus proactief te kunnen inschatten: Moeten we hier nu nog nieuwe afdelingen gaan inrichten als COVID-afdelingen of niet? Of kunnen we daar nog een week mee wachten? En dergelijke meer. …, en vanuit die ervaring weet ik dat dat wel een brede range is waartussen je moet kiezen. Dus ik hoor het wel graag zeggen: 'Vind je dat ze op voldoende evidentie zich gebaseerd hebben? 'Die is er niet hè. Die is er niet."* **(Hospital sector)**

The use of prediction models did not have a prominent place in the HTSC committee at the start of the crisis

While at the start of each HTSC committee meeting the data about the daily situation in the Belgian hospitals were reported, the interviewed committee members do not give a prominent role to prediction models in their decision-making process during the first few weeks. Interviewed respondents do not exclude the possibility that some members used the input from prediction models available elsewhere in their interventions within the HTSC committee meetings but according to them these prediction models were not actively used as a basis for decision making within the HTSC committee. Some members also started to make their own prediction models. As such, based on a transversal analysis of the interviews, it can be concluded that prediction models at that time were at best only used in an indirect manner. In any case, there was not enough information (due to the unprecedented nature of the epidemic) to make accurate predictions.

> *"Mogelijks heeft men gekeken naar predictiemodellen. Ik heb op de werkgroep geen enkel, maar dan ook geen enkel predictiemodel gezien; nul. Dus op de beslissingen van de werkgroep is er geen rekening gehouden met predictiemodellen."* **(HTSC committee member)**

After a couple of weeks the output from prediction models was now and then presented to the HTSC committee. The results of the different scenarios differed substantially. Some respondents indicated that the worst case scenario, which fortunately did not became reality during the first wave, helped to stretch the mind of the HTSC committee members. The worst case predictions required an assessment of which measures were needed regarding hospital surge capacity (including ethical guidelines for ICU admission, etc.) in a maximal scenario.

> *"Ja, als ik het me goed herinner is dat ongeveer vanaf de tweede… vanaf half maart geweest. Er zijn een aantal modellers die met die data aan de slag zijn gegaan. .. En die gaven ons op tijd en stond, ook wel op basis van die data, modellen. En naarmate dat de maand maart vorderde werden wij natuurlijk meer en meer zenuwachtig, van: waar gaat dat hier eindigen? Want wij verdubbelden altijd maar, en die versnellingsratio… ja, dat was heel intens. En dus ja… vanaf dan zijn we eigenlijk naar die modellen beginnen kijken. En ja… daar zaten natuurlijk heel grote foutenmarges op, omdat dat maar beperkte cijfers waren. Maar ja… Wij wilden wel weten: met welke scenario's moeten wij rekening houden? En dan zijn we systematisch beginnen proberen te plannen voor het worst case scenario, dat gelukkig niet gebeurd is hè. Als ik het me goed herinner… [één model] was nogal expliciet en had een best case, een realistisch, en een worst case scenario. En uiteindelijk is het denk ik het realistische scenario geworden. Maar we hebben echt ons gestretcht om na te denken van: 'Wat gaan wij doen als we echt in een worst case scenario zitten?' Dan gaan wij echt extra*

ingrepen, maatregelen moeten doen. Mensen extra opleiden, en misschien nog veel meer restrictief zijn in de patiënten die we opnemen op intensieve zorgen." **(HTSC committee member)**

4.2.3 Measures related to hospital surge capacity

Before the surge capacity plans came into play, there were already some agreements between hospitals regarding the admissions of COVID-19 patients. The military hospital was asked by the Minister of Public Health to admit Belgian citizens who returned from Wuhan for the period of their quarantine. Since the military hospital was not equipped to admit patients with respiratory infections they decided to split their burn care unit in two: a burn care unit and a quarantine unit for travellers from Wuhan. When the HTSC committee started and it became clear that ICU capacity would be the bottleneck, the military hospital took over as much burn patients as possible from the burn units of other hospitals to free up ICU space. After all, other hospitals with burn units were better equipped to deal with critically ill respiratory patients than the military hospital.

4.2.3.1 Hospital emergency plans were activated but they did not foresee a public health crisis of this magnitude

The existence of and experience with hospital emergency plans helped hospitals to react fast and accurate

The existence of hospital emergency plans and procedures (e.g. instalment of hospital crisis coordination cells) contributed, according to the respondents, to the accurateness of the hospital response to the epidemic crisis. The hospital emergency plans (or pandemic plans which were part of the hospital emergency plan in some hospitals) did not foresee a crisis of such a scale and duration and will have to be reviewed. Yet, respondents stated that the activation of the hospital emergency plans contributed to a fast and accurate management of the hospital capacity. Committees were installed including the CEO, CMO, CNO and hospital emergency plan coordinator. In several hospitals also the responsible person for infection prevention and control, the head of ICU (medical but sometimes also the unit managers) and other relevant medical disciplines (e.g. pneumology, geriatric care) participated in these committees or sub-committees. They acted very fast by cancelling non-urgent medical interventions, by redesigning hospital flows to create a COVID and non-COVID department within their hospital, by providing staff (medical and nursing) for the additionally created ICU beds, etc.

"Het feit dat er sinds de jaren '90 natuurlijk systemen zijn van noodplanning in de ziekenhuizen, en die ondertussen al een aantal cycli hebben doorlopen … maakt wel dat het denken in termen van risico's, risico-analyse, beheersmaatregelen, dat dat sterk aanwezig was bij de meeste ziekenhuizen. … dus dat bestond wel. En ook … Ja … Er was ervaring met dit soort van systemen, methodieken en denken. Er was ook governance, met rollen en verantwoordelijkheden, met noodplanningscomités die bestaan en met noodplanningscoördinatoren die bestaan en gefinancierd worden. Met ook duidelijke rollen algemeen directeurs, hoofdartsen, verpleegkundig directeurs. Allez, dat is natuurlijk de preparedness van de ziekenhuissector op catastrofes en incidenten. Dus dat is natuurlijk een belangrijke succesfactor." **(HTSC committee member)**

Hospital emergency plans at different stages of licensing

Since the eighties all hospitals are obliged to have a formally approved hospital emergency plan, as part of hospital licensing standards. The licensing standards focused on the procedure to set up a hospital crisis management committee. The FPS Public Health took just before the 6th State Reform, the initiative to update the hospital emergency plan with more operational requirements. This process was not yet finished before the 6th State Reform. After the 6th State Reform the federated entities became competent but continued (with support from the Interministerial Conference[6]) with the update of the requirements. In February 2017 a joint event (federal and federated entities) for the hospital sector was organised where a.o. a template to revise the hospital emergency plans was proposed. According to a respondent this was the start to review hospital emergency plans in Belgian hospitals. While at the start of the COVID-19 crisis hospitals were at different stages of formal licensing (e.g. in draft; waiting for advice of municipality; submitted for approval; approved by the federated entity) all hospitals already went through the thought process. This respondent stated

that this thought process helped hospitals to be ready for crisis management.

> *"We zaten eigenlijk nu in de fase dat halverwege dit jaar, tegen 1 juli 2020, elk ziekenhuis zijn nieuw ziekenhuisnoodplan had moeten neerleggen bij de bevoegde minister van de deelstaat. Een aantal hebben dat gedaan. Nee, een aantal hebben hun nieuw plan neergelegd, maar dan moest er een advies komen van de burgemeester die dan advies moet kunnen inroepen van de federale gezondheidsinspecteur, dus dat is zo heel die cascade. En dus een aantal mensen zijn wel klaar met het neerleggen van hun plan op gemeentelijk niveau, maar zijn nog niet tot aan het deelstaatniveau geraakt. Een aantal zijn wel op deelstaatniveau geraakt. En een aantal hebben eigenlijk nog niets neergelegd, begin crisis. Wat maakt dat eigenlijk in de meeste ziekenhuizen ofwel de denkoefening al wel gebeurd is, maar misschien nog niet op papier is gekomen. Maar dat in elk ziekenhuis het bewustzijn rond het ziekenhuisnoodplan en het operationeel luik van: wat gaan we nu doen als we zo'n ziekenhuisnoodplan gaan afkondigen, dat was wel overal aanwezig. Dus dat is op zich een pluspunt geweest dat we ons daarop konden baseren."* **(HTSC committee member)**

Divergent viewpoints on extending the hospital emergency plan with a pandemic plan

Hospital sector representatives stated that they started evaluations after the first wave to see on what points they have to change their hospital emergency plan. While some advocated to add a specific pandemic plan, others stated that it is more important to assess on which points the current hospital emergency plan did not foresee an appropriate answer and to change the plan in a generic way to provide appropriate actions in the future (e.g. the role of hospital pharmacists in the provision of PPE and stock management). A respondent stated that a hospital emergency plan should focus on the actions (regardless of the type of crisis: pandemic or other) such as creating ICU surge capacity, reinforce emergency department, etc.. According to this respondent a pandemic part can be part of a hospital emergency plan but only as an annex as the hospital emergency plan should focus on the generic actions.

> *"Eigenlijk is je ziekenhuisnoodplan je basisregels voor in de keuken. En dus als ze je vragen van morgen witloofrolletjes te maken of dat ze je vragen van morgen een vispannetje te maken. Je witte saus die je er gaat insteken is telkens je zelfde basisbereiding. En dat is eigenlijk je ziekenhuisnoodplan. De operationele kant daarvan zijn een aantal basisprincipes die je bundelt en die u gaan zeggen van: als ik mijn spoedgevallendienst wil gaan versterken dan ga ik die en die stappen ondernemen. Als ik op intensieve zorgen meer capaciteit moet gaan creëren dan ga ik die en die stappen ondernemen. En dat is eigenlijk het zeer operationele van: wat doe ik wanneer. En eigenlijk de regel die aanleiding geeft tot het activeren van die stappen, die kan divers zijn. En dat kan een pandemie zijn. Nu, omdat we hier in iets zeer specifieks zitten en dat het effectief niet slecht is van ook een aantal specifieke richtlijnen te hebben, zou het niet slecht zijn dat er binnen het algemeen boek dan… van wat kan er aanleiding geven tot die en die acties, dat ze daar de pandemie nog eens apart gaan bekijken. Dus dan gaan we zeggen van: kijk, voor een pandemie hebben we die, die en die potentiële operationele stappen die we kunnen activeren. En misschien moeten we een aantal andere stappen, waar we vandaag nog niets over beschreven hebben in ons plan, bij gaan beschrijven, van: hoe zorg ik ervoor dat ik veel persoonlijke beschermingsmiddelen heb? Dat is een taak voor de apotheek. Het kan zijn dat er in je ziekenhuisnoodplan nog nergens een flowchart of actie stond voor een apotheek om zich te gaan bevoorraden. Dat is dan een aanpassing in het kader van de pandemie. Dus nieuw in de lessons learned hebben we dat ook gezegd, van: bekijk je noodplan en pas daar aan waar het nodig is. Dus het kan zijn dat een ziekenhuis zegt van: 'Ja, eigenlijk hadden wij in ons ziekenhuisnoodplan vergeten om een fiche te voorzien voor onze apotheker."* **(HTSC committee member)**

4.2.3.2 *Uniform measures for all hospitals*

Framework for all hospitals to contribute to hospital surge capacity

The HTSC committee created uniform measures that applied to all hospitals. According to several respondents hospitals did not wait for these directives to act when there was a local need. Yet, respondents also stated that the HTSC committee measures certainly created a framework for all hospitals to contribute to creating hospital capacity for COVID-19 patients. The willingness to contribute to the effort was reported to be present in all hospitals but the extent of the efforts varied. The HTSC committee directives helped to decrease this variation. In addition, it helped hospital management to convince their medical staff to take these drastic measures. This was not always obvious because the measures had a substantial impact on the income of some medical staff members.

> *"Pour les circulaires qu'on envoyait régulièrement, je pense que ça avait du sens de fixer des règles pour tout le monde. Les hôpitaux se sont arrangés, évidemment. Ils ne nous ont pas attendus pour prendre en charge les patients et voire éventuellement pour s'arranger entre eux. Mais je pense que c'était important d'avoir des règles générales car on a quand même constaté que certains hôpitaux étaient plus volontaires et proactifs que d'autres. Et quand on a fixé des règles de maintenir un certain nombre de lits spécifique pour la prise en charge des patients COVID, on a constaté que certains hôpitaux se limitaient au minimum et que d'autres hôpitaux allaient bien au-delà de ce qu'on leur demandait."* **(HTSC committee member)**

Drastic and uniform measures were perceived as necessary during the peak of the first wave

There is large support among the respondents (both hospital sector and committee members) about the amplitude and uniformity of the measures during the months of March and April 2020. After all, the number of cases was high, dispersed across the Belgian territory, with many unknowns (e.g. true positive rates, treatment and hospital duration of affected cases), lack of PPE, and a fear of a scenario of hospital capacity shortage based on the images of Northern Italy.

While there were hospitals with less cases (due to lower incidence rates in their attraction area) they saw the need for these drastic measures and were ready to show solidarity and admit patients from other provinces. Nevertheless, some interviewed respondents commented that the distribution of COVID-patients across the territory (transfers from hospitals in areas with higher incidence rates to hospitals that were less affected) did not sufficiently take place.

In any case, the options to work with reference centres or COVID- and non-COVID hospitals were assessed as unrealistic during the first wave given the large scale and wide-spread nature of the epidemic. When the epidemic curve decreased and the pressure on hospital capacity was lower, some hospital representatives had the feeling that a more locally tailored approach had to be installed more quickly. From a certain point in time it was possible to build in this flexibility at the network level (see below) but some hospitals perceived (especially those with underutilised surge capacity) the measures as somewhat overshooting at a given point and hampering them to restart routine medical care activities.

> *"En toen het toemetsen van de ziekenhuizen, of het stoppen van het electieve programma is een logische beslissing geweest die op 13 maart genomen is, op een moment dat we aan 10% van Wuhan zaten, en op een moment dat we niet wisten wat er op ons afkwam. We moesten ook nog opleiding geven, ziekenhuizen moesten verbouwen en noem maar op."* **(HTSC committee member)**

ICU surge capacity was the focal point of the directives

The starting point of the measures taken by the HTSC committee was, according to the interviewed committee members, to create additional ICU capacity. This was perceived as a logical measure since a lack of ICU beds seemed to be the critical point in other healthcare systems and it is far more complicated in terms of infrastructure, equipment and staff to create additional ICU beds compared non-ICU beds. Yet, respondents stated that this forced smaller hospitals to create additional ICU at the very early start of the measure. Also regarding the capacity for COVID-19 patients on general hospital units, smaller hospitals were disadvantaged according to the interviewees because the number of beds were linked to the ICU capacity (4 times the ICU capacity). They had to turn a large part of their units into COVID units at a very early stage while larger hospitals could preserve relatively more non-COVID units.

> *"Maar wij hebben ons gekoppeld aan het aantal intensieve bedden, en we hebben gezegd: 'Kijk, de capaciteit van een ziekenhuis wordt gemeten in functie van de intensieve bedden.' En we hebben gezegd: '60% van je intensieve erkende bedden zijn bedden voor COVID, en 40% hou je vrij voor niet-COVID intensieves, omdat dringende hulpverlening blijft doorgaan. En daarbuiten zet je maar bij wat je wil; zoveel mogelijk. Je leidt mensen op, je maakt twee intensieves want de ziekenhuizen… Een klein ziekenhuis met zes bedden intensieve heeft één intensieve. Die kunnen niet zeggen: 'we maken er twee.' Dat betekent dat je een tweede moet maken: verbouwen, isoleren, noem maar op. Dat is niet vanzelfsprekend. De meeste ziekenhuizen daar hebben gekozen van: we pakken de eerste reguliere intensieve voor COVID, en we zetten in een operatiezaal een paar bedden intensieve bij voor niet-COVID. Door die regeling kwam je in een conflict tussen wat het terrein zegt en wat de werkgroep zegt. Onze werkgroep is vertrokken van bedden intensieve – op zich een logische beslissing – maar het was alleen een logische beslissing voor grote ziekenhuizen. …. Ons tweede probleem was onze bedden niet-intensieve. Hoeveel bedden niet-intensieve zet je? En daar heeft de werkgroep gezegd: weet je wat? Vier keer het aantal bedden voor de intensieve zet je maar bij."* **(HTSC committee member)**

The measures were perceived as directive and obligatory but regulation was soft

The hospital sector perceived the measures as very directive and some of the respondents considered the content and tone of the directives even as a sign of distrust in the professionalism of hospitals. A contrasting view was observed among committee members who stipulated that their directives were soft and not enforced by Law. They counted on the goodwill and professionalism of the sector. It has been repeatedly stressed by committee members that hospitals acted as professional and well-managed organisations who created additional hospital capacity incredibly fast. They stated that no firm directives were given about how to create additional capacity. Some described this as a somewhat risky policy approach since creating beds is easy but staffing them appropriately is not. The concrete implementation of the surge capacity was reported as being left entirely to the initiative of the hospitals (e.g. no guidance about staffing norms for ICU beds). The HTSC committee members indicated that this was a sign of trust in the professionalism of the hospital sector. The directive style of the HTSC committee communication was also perceived as a lack of trust in their professionalism and flexibility to respond to the needs of the population. It is clear that the viewpoints on the role of the committee and the autonomy level of the hospitals are quite different depending on the actor interviewed.

> *"Maar onze regulatie was wel echt soft hè. Dus we hebben niets gereglementeerd, behalve dat ze moesten hun registraties doen. Dat is de enige KB die we hebben genomen … en voor de rest hebben wij geen enkele juridische maatregelen genomen in het kader van die Surge Capacity; geen énkele. En wat ik daarmee wil zeggen is dat ook … wij zeggen van: ja, wij willen dat je stijgt en doet wat je kunt. En dan bleek dat ze eigenlijk ondergaan … Wij zeiden: 'Doe wat je kunt en schaal op' enzoverder. Maar al de rest; al die randvoorwaarden, dat hebben de ziekenhuizen gedaan. Zij hebben dat zelf bepaald." "***(HTSC committee member)**

> *"Dus we wisten ook niet waar we nu naartoe streefden. En twee wisten we ook niet echt wat er nu realistisch of aanvaardbaar was. Dus het was eigenlijk van: doe wat je kunt."* **(HTSC committee member)**

It was reported that some hospitals created (and claimed to have this capacity in ICMS) more beds than for which they had capacity in terms of medical and nursing staff. As a consequence, and driven by the crisis and their dutiful attitude, the available staff over-stretched themselves in an effort to staff these additionally created beds to their best ability. This did, according to the respondents, not only have a potential negative impact on staff wellbeing (e.g. burnout, absenteeism) and the long-term provision of staff, it also entailed the risk that quality of care was jeopardized.

> *"Je sais qu'il y a des hôpitaux qui ont rentrés des lits mais qui n'en avaient clairement pas la capacité. Moi je dis qu'on n'aurait pas pu mais c'est mon sentiment sur le terrain. C'est mon feedback des infirmiers, mon feedback des médecins mais le Directeur général a dit, non, on fera ce qu'il faut, on ira. Le problème c'est que dans ce métier, quand on est dans une pandémie, tout le monde était prêt à bosser jusqu'à l'épuisement, tout le monde était prêt à bosser jusqu'à tomber par terre à côté du lit, de fatigue, de malaise et autres. Donc on les aurait peut-être fait les [X] lits mais avec un coût humain faramineux, un coût en personnel et à mon avis un coût en patients car il y aurait eu des gens largement moins bien formés. Ça aurait été dommage car si quelque part, nous on faisait [X] lits avec un niveau de qualité qui à mon avis à partir [de la moitié] aurait descendu fort."* **(Hospital sector)**

The surge capacity measures were to a certain extent theoretical and not reflecting the reality on the field: administrative rather than operational measures

As depicted above the public authorities did not dispose of data on the number of operational non-ICUl and ICU beds. Therefore, administrative measures based on the number of licensed beds were used as a starting point. In addition, the unit of analysis of the committee was the hospital. The license number of the hospital was used in the communication of the measures while several hospitals have different sites with different issues at the operational level.

Moreover, according to some hospital representatives, the HTSC committee recommended a surge capacity at the start of the first wave that was insufficient for hospitals that were hit the hardest. Taking these elements together, it can be deduced from the interviews that there was a perception in the hospital sector that the directives were to a certain extent theoretical.

Large hospitals had more flexibility in creating surge capacity than small hospitals

There was a large difference in the level of flexibility to create additional capacity depending on hospital size. Small hospitals, in general, only have few ICU beds. Therefore, upscaling ICU capacity in a small hospital was reported to quickly result in transforming recovery rooms (and closing operation theatres) into ICUs. In larger hospitals, there is more flexibility as they can gradually call in disease-specific (e.g. neurosurgery and cardiac surgery ICUs) as COVID-19 cohort ICUs. Respondents stated that the same holds for general hospital units. From 26/04/2020 the HTSC committee guidelines also made it possible to create surge capacity at the level of loco-regional networks. In some networks, respondents mentioned that this resulted indeed in agreements on ICU capacity for COVID-patients in which larger hospitals (partly) cover the required ICU capacity for COVID-19 patients to enable smaller hospitals to continue other medical activities (requiring ICU).

> *"En er zijn uiteindelijk ook veel variaties geweest, om een aantal redenen. Sommige ziekenhuizen hebben ons onmiddellijk gezegd: we gaan er zoveel extra doen. Andere ziekenhuizen, zeker de grotere, hadden golven in hun hoofd, en communiceerden ons de eerste extra golf. Dus: 'we openen nog een afdeling', of 'we openen zoveel bedden.' Maar die hadden dan in hun hoofd: 'we kunnen ook nog een tweede, derde, of zelfs vierde..'. "* **(HTSC committee member)**

In addition, several respondents also formulated the hypothesis that hospitals with a larger scale have more expertise to treat critically ill patients which might be reflected in variation of standardised mortality rates across hospitals (see need for data analysis in section 4.2.2.2).

4.2.3.3 Staff with ICU skills: the critical point to create additional capacity

Staff from other medical disciplines were deployed to staff ICU beds

Hospitals have created a substantial additional ICU capacity. While shutting down routine medical activities was reported to create a pool of staff available for non-ICU COVID-19 units this was less evident for ICU. After all, this requires specific expertise from nurses and physicians. According to the respondents, in most hospitals the additional nursing personnel for ICU came mainly from the post-anaesthetic recovery units where activity was lower since only urgent surgical procedures took place. This was perceived as a logic choice since this staff is used to work with ventilators. To enable them to work on ICUs, hospitals provided educational sessions and mixed teams (ICU with non-ICU staff) to ensure that less experienced staff was supervised by more experienced staff. Anaesthesiologists were reported to be deployed to reinforce the medical staff of ICUs but also other medical disciplines were trained to take up this role. Other reported strategies include the re-allocation of staff from other units with an ICU background back to ICU, working together with nursing schools (i.e. lecturers who were included in nursing teams), enhanced role for last year nursing students and medical specialists in training, etc. If the maximum capacity was reached, the main cause was a lack of nursing staff with the right skills to work on an ICU.

Respondents reported that they feared a shortage of ventilators at a given point in time but that this never became reality because hospitals re-activated some ventilators that were no longer in use, invested in new equipment (when available on the market), received ventilators from the army or used ventilators from the operation theatres. HTSC committee members stated that no single hospital reported an acute shortage of ventilators.

> *"Ja… intensieve bedden kwam neer op personeel hè, en we zagen dat heel goed, dat de bijgecreëerde capaciteit natuurlijk ergens anders werd gesloten. Hé, het was niet dat er ergens uit de lucht een blik verpleegkundigen kwam vallen. Die werden van de andere afdeling gehaald, en die andere afdelingen moesten dan ook toe. Of operatiezalen hé, want het is eigenlijk vooral uit de operatiezalen gekomen. Operatiezalen en ontwaakkamers zijn dichtgedaan, en dat personeel is dan ingezet op spoedgevallendiensten en intensieve diensten, met een supersnelle opleiding, … En misschien niet altijd optimaal. …"* **(HTSC committee member)**

Medical and nursing staff working on COVID units were reported being very committed and ready to work additional hours (from part-time to full-time, cancelling holidays, overtime, etc.). Yet, respondents stated that the medical and nursing staff underestimated the duration of the epidemic exposing them to a risk of fatigue and exhaustion. In general, the psychosocial impact of the COVID-19 crisis on the hospital staff received too little attention according to them. In some hospitals psychologists were deployed to support hospital staff but this seems not be a general policy.

> *"On a plutôt eu des difficultés à le faire se relayer. Donc dans les unités de soins COVID, le personnel a voulu rester en place et je pense que c'est une erreur car les gens se sont fatigués dans la durée."* **(Hospital sector)**

Other important hospital capacity measures were taken

Besides measures targeting medical, nursing and other staff hospitals were reported to have taken other important measures to ensure sufficient capacity for COVID-patients. Yet, respondents assessed that staffing was the most critical factor. HTSC committee members reported that in all hospitals cohort units were created. This was done by hospitalising COVID-patients in units that were empty (i.e. units otherwise treating elective patients), using empty buildings, shifting activity between hospital sites in hospitals with multiple sites, separating units by means of urgent reconstruction works, etc. Besides the infrastructure works this also required a redesign of patient flows, etc.

There are also indications that besides stopping elective care other measures were taken to control patient demand. Some respondents stated that there was a perception that hospitals were very restrictive in admitting patients especially from nursing homes. Yet, it is unclear from the interviews whether this was a widespread phenomenon. The HTSC committee members stated that these issues came across during discussions but there were no indications this was a formal policy.

In addition, the ethical guidelines regarding hospital and ICU admissions were out of scope of the committee and were left to the initiative of the scientific and professional organisations of geriatricians and ICU physicians. It is, however, difficult to rule out (based on the interviews) that these practices did not take place in some hospitals.

> *"Maar ik had niet gewild… En het wordt ons nu toch verweten hé. De ziekenhuizen hebben zich dichtgetimmerd, ze hebben alles buitengehouden, en voilà, daarom is het zo goed gegaan. Ik vind dat geen mooie evaluatie maar…."* **(HTSC committee member)**

Respondents stated that the idea to set up intermediate care structures was to allow a faster discharge from the hospital. These intermediate care structures targeted patients in need of care (e.g. rehabilitation, support activities of daily life) but not of hospital care. The army helped to explore the potential locations. Setting up intermediate care structures ("schakelzorgcentra") was reported to be mainly done in Flanders but without great success (structures were created but hardly any patients were admitted). In Wallonia and Brussels, the reported guiding policy was to keep patients within the hospital until they were ready to be discharged.

> *"Nous n'étions pas vraiment favorables à créer des structures intermédiaires mais plutôt favorables au moment de l'acmé et de la pandémie, de garder les patients un peu plus longtemps dans les hôpitaux ou de créer des structures hospitalières, à l'intérieur de l'hôpital, qui pouvaient servir de structures intermédiaires plutôt que de créer des structures intermédiaires de novo à l'extérieur, aujourd'hui non financées, sans personnel."* **(Hospital sector)**

4.2.3.4 Preparedness for a next wave and futures crises

Hospitals reacted fast during the first wave but are now better prepared for consecutive waves

Although the general perception is that hospitals reacted fast during the first wave of the COVID-19 pandemic, the interviewed respondents are convinced that hospitals learned a lot and made a lot of progress (e.g. redesigning patient flows).

Measures should be more tailored and less drastic: more routine medical activities and less visitor restrictions

Unless next outbreaks affect the entire Belgian territory with a demand for hospital capacity that cannot be reached without drastic measures, the general perception among the interviewed respondents is that a more tailored approach should be possible. Respondents indicated that the context has changed drastically. There is less shortage of PPE and testing compared to the first wave. Hospitals now have stocks of PPE. The respondents stated that they are convinced that this allows them to better protect visitors, staff and patients during regular medical activities. Moreover, the hospitals are now designed such that the patient flows can be separated safely.

Shutting down all non-urgent medical activities was reported to have caused an important impact on patients (e.g. reports of postponed but necessary medical care such as oncological problems; fear of going to the hospital also for urgent care) but also on the financial income of physicians (e.g. fee-for-service system has the consequence that income decreases when activity drops) and hospitals (e.g. reduced income via deductions on physician fees and patient supplements).

While a general shutdown of non-urgent care is assessed as overshooting by several respondents, they stated that this will also be less easily accepted given the large impact on patients, physicians and hospitals. Nevertheless they described that a well-balanced approach is necessary: also the psychological well-being of healthcare staff and nursing staff in particular should be taken into account when deciding on measures.

While during the first wave there was probably no alternative (lack of PPE, many unknowns, etc.) many respondents stated that for next waves the measures should be in proportion to the hospital capacity demands in a particular geographical area.

> *"Ja, dat denk ik wel. We hebben nu eigenlijk een soort… enfin.. het kon niet anders denk ik nu, want het was ook echt een grote bom die op ons geland is, en wij hebben dus geantwoord met een even grote bom. Dat is succesvol gebleken en dat kon ook niet anders, maar ik denk inderdaad dat het gedifferentieerder zal… Je weet het natuurlijk niet hè. Voor hetzelfde geld staat in de herfst terug alles op zijn kop, maar ik denk dat in alle geval de mogelijkheid moet onderzocht worden om het lokaal gedifferentieerder te doen, zodat we niet de ganse gezondheidszorg in heel België moeten lamleggen."* **(HTSC committee member)**

Rather than keeping beds empty hospitals should be allowed to free up capacity on short notice

While the surge capacity measures were scaled down by the HTSC committee, all hospitals were asked (from 17/06/2020) to keep a buffer capacity (15% of ICU beds, times 4 for non-ICU beds) and be able to create a reflex capacity (+10% within 48 hours). Respondents stated that keeping 15% of ICU beds empty is too much at a time when the epidemic causes few hospitalisations. If such measures are maintained the hospitals should, according to them, be financially compensated accordingly. Moreover, hospitals stated that they are able to free up capacity at short notice when required and hence that measures should focus on this reflex capacity rather than on a permanent buffer capacity.

Concepts of alternative models emerge

Care programme respiratory diseases: from prevention to rehabilitation

Several suggestions for new care models were put forward during the interviews. A recurrent suggestion was to provide capacity for respiratory epidemics or other crisis situations in a more structural way. One of the suggested models was the development of a care programme covering prevention, treatment and rehabilitation of respiratory infections. This could, according to the respondents, include a (variable) role for all hospitals. A basic capacity could be attributed to all hospitals and more advanced capacity (with a higher reflex capacity) in a limited number of hospitals. Respondents stated that this concept of care programmes should take into account the hospital network model (cf. section 4.2.8.2).

L-beds

Another idea that was suggested is to expand the existing capacity of L-beds (beds for infectious diseases). This would, according to the respondents, require an alternative use at times while there is no demand. Respondents gave some ideas such as using them as permanent research capacity (to admit patients in the context of trials) since this would enable hospitals with such units to free up capacity very quickly. A remark that was given is that it is easier for larger and academic hospitals to find an alternative activity for these type of units, suggesting that these types of hospitals are more eligible to foresee such a buffer capacity. A payment system analogue for that of burn units (i.e. hospitals can use this capacity for other purposes but receive a fixed budget per bed) to finance these L-beds was being proposed.

> *"Ja, ik denk dat we meer naar een model moeten waar we een reserve-bedcapaciteit hebben voor epidemieën of calamiteiten zoals deze, maar die op andere momenten op andere manieren kunnen ingezet worden. "* **(Hospital sector)**

Sufficient staff on ICU to create flexibility in time of crisis

Respondents remarked that the staffing on ICU (and other units) is not generous in an international context: in Belgium the number of patients per nurse is higher than in other similar countries. One option that was suggested was to improve patient-to-nurse ratios to have more margin in case of a crisis.

Crisis capacity that can be mobilised at different levels

One model that was suggested to build a national crisis hospital capacity is one including different layers: individual hospitals; loco-regional networks; national capacity. The respondents referring to such a model suggested that:

- All hospitals should be able to take up a role in case of disasters and public health crises. This can be foreseen, as it currently is, after activation of the hospital emergency plans.
- At the level of loco-regional hospital networks a buffer capacity in terms of equipment and space can be dedicated in case of disasters and public health crises. This can be a wing of a hospital or a specific unit (used for other purposes when not required).
- National capacity with special equipped rooms (e.g. biosafety 3 level rooms in a 40-bed unit) and expertise to admit the most complex cases should be foreseen. Such capacity can be used as an initial buffer capacity to enable hospitals to activate their hospital emergency plans: at the start of a crisis (e.g. epidemic outbreak such as a respiratory virus or Ebola, terrorist attack) there needs to be a buffer capacity that can be used within a very short timeframe enabling general hospitals to activate their emergency plans. This role can be allocated to "national crisis hospitals". The military hospital in Neder-Over-Heembeek[ee] can take up this role but also other hospitals (at other locations) will have to take up this role to cover the Belgian territory sufficiently. A potential suggested route to explore is to have (e.g. in the military hospital) a unit that is used for training purposes when there is no crisis. In any case, the possibility is foreseen in the Act on hospital networks (2019) that the military hospital acts as a "reference point".

It was mentioned that the calculation for different applications/scenarios (CBRNe - Chemical, Biological, Radiological, Nuclear, and Explosives; pandemic; train disaster; terrorist attack) will have to be made to estimate the required size (and budget) of such crisis capacity.

Training programmes

To be ready for next epidemic waves it seems indicated to several respondents to train medical and nursing staff from other (but related) disciplines to take care for patients on an intensive care unit. The same holds for other trainings (e.g. infection prevention & control, practical guidance on how to use PPE). Hospitals developed already some e-learning modules, training sessions, etc. The public authorities are working on financial support for hospitals via the hospital payment system.

> *"We zijn daar inderdaad wel mee bezig geweest. Zeker op het moment dat we nog in de opgaande fase waren en niet wisten: gaan we daar, daar of daar terechtkomen.. hebben we daar wel intensief, .. over zitten discussiëren, van: 'wat zijn de verschillende mogelijkheden? Wat is praktisch haalbaar? Wat kan je van een ziekenhuis, van een verpleegkundige, van een gemiddelde arts verwachten? Veel ziekenhuizen hebben in die tijd ook online modules of allerlei lesjes enzovoort gemaakt: 'Intensieve zorgen en beademing for dummies.' .. En de zomer… ons voornaamste doel of opmerking daar is om verpleegkundigen bijvoorbeeld uit de operatiezaal nu de kans te*

[ee] Militair Hospitaal Koningin Astrid/ l'Hôpital Militaire Reine Astrid (Neder-Over-Heembeek) is a military hospital that falls within the competences of the Ministry of Defence and not under the Federal Public Service Health, Food Chain Safety and Environment. As a consequence, the budget (e.g. financing medical and nursing staff) is provided by the Ministry of Defence. However, special arrangements (i.e. Ministerial Decree of 12.07.2007, last update Ministerial Decree of 30.01.2012) provide a contribution to the national health insurance system such that Belgian citizens can make use of its services. Its flagship is a burn unit with 26 beds: 8 high care, 14 medium care and 4 low-risk care.

geven… dat je een aantal mensen opleidt tot ICU-verpleegkundige, zodat we tegen de piek in de herfst op zijn minst dat hebben gedaan." **(HTSC committee member)**

In one interview it was also stated that a model of training should be developed in parallel with an organisational model. According to this respondent it seems worthwhile to develop a pool of staff, active in regular medical care over the entire Belgian territory, that can be deployed in case of specific crisis situations. This will require education and training. Such a pool could consist of voluntary staff (including physicians, nurses, psychologists, managers, cleaning staff) that have the adequate skills that are developed and maintained (e.g. within such a national crisis hospital). Such plans were, according to a respondent, discussed before but never received political support. Besides specifically trained staff (e.g. surgeons who are able to perform all types of emergency medical procedures) a general education and training module for all staff of specific disciplines (e.g. emergency departments; ICU) needs to be provided to ensure the basic skills.

"Voilà. En dus, in het piramidaal systeem moet u denken… enfin, wat mij betreft hé (lacht), moeten we denken aan een capaciteit die vrij moet gemaakt worden in bepaalde omstandigheden op niveau van de lokale ziekenhuizen. Een tweede laag zou kunnen bestaan uit de ziekenhuisnetwerken, en binnen het ziekenhuisnetwerk iets groter te kunnen organiseren. Maar in allerlei domeinen kan het, van ICU-bedden tot aan de klassieke verpleegeenheid. En een derde laag is dus een ziekenhuis, een structuur die effectief de zwaarste gevallen zou kunnen opnemen." **(HTSC committee member)**

Role of hospital networks

The opinions about the role of hospital networks for next waves or crises are discussed in section 4.2.8.2.

4.2.3.5 Role of the army in hospital and transport surge capacity

As described in the previous section, the military hospital has a potential role to play in the provision of crisis capacity according to some respondents. Yet, several suggestions were made about other surge capacity related roles of the army in crises like the COVID-19 pandemic. Respondents stated that the role of the medical branch of the army should be further specified in crisis plans.

During the first wave of the COVID-19 pandemic they supported (in a complementary way) medical transport of critically ill patients. Yet, respondents stated that the army could also have a complementary role in other domains: creating fast (temporary) additional capacity in case of disasters or large epidemic crises (e.g. field hospitals as a temporary measure, national crisis hospital, air transport of patients abroad). During the past crisis field hospitals were not required (it is a last resort) and patients were not transported abroad. Yet, a respondent stated that it is preferable to transfer ICU patients (in case of a capacity shortage in a given area) to other ICUs across the territory rather than setting up field hospitals. Respondents suggested that it would be useful to evaluate and describe, for instance, what capacity they can deliver immediately in terms of medical transport and within a crisis hospital and to what capacity they can scale up at short notice, but the focus should not only be on respiratory diseases (e.g. also CBRNe).

Respondents stated that the army has a role to protect the Belgian citizens. In that sense they can have a specific role in a national pandemic plan (e.g. initial upscaling of capacity of the military hospital but also at the end of the epidemic curve so that general hospitals can switch to regular care).

"Nu zijn we wreed op respiratoire infectieziekten gefocust, maar ja… Als Doel [Nuclear Energy Plant] ontploft dan gaat het ook weer iets anders zijn, en dan komen we altijd weer in die discussies over: hoe organiseren we de CBRNE? Dan zitten we meer in dat verhaal. Dat is iets generieker. Waar dat dan ook vragen naar boven kwamen hè, van het noodhospitaal. ... Eigenlijk zou je toch aan je medische component van het leger moeten kunnen zeggen van: 'jullie moeten in staat zijn om een noodhospitaal voor bijvoorbeeld weet ik veel wat 500 mensen te

activeren binnen zoveel tijd, en dat moet dan naar 1000 kunnen gaan. En jullie moeten eigenlijk in staat zijn om daar redelijk 'versatile' allerlei soorten risico's te kunnen beantwoorden." **(HTSC committee member)**

"A ce propos là, je voudrais quand même faire un petit aparté sur le rôle de la Défense, l'armée. Donc la Défense, vous avez vu qu'il y avait plusieurs personnes de la Défense qui étaient présentes dans notre Comité, ce qui est bien, ce qui est normal. Mais la Défense, n'a pas eu, à mon sens, le rôle qu'elle aurait pu avoir. Donc ils ont joué un rôle, je dirai d'aide, ok, notamment dans les transports. Ils ont joué un rôle aussi, peut être en partie dans les maisons de repos, au niveau de la Région, au niveau des Provinces, avec une pseudo réquisition des Gouverneurs de Province. Mais je pense qu'ils auraient pu jouer un rôle, ou du moins, dans un plan pandémique, ils devraient jouer un rôle plus structurant, notamment si on devait faire des structures intermédiaires, si on devait avoir un pavillon pandémique de 300 personnes, par exemple. Ça, c'est quelque chose qui devrait pouvoir être réalisé, fait, à l'hôpital militaire ou dans une structure, en dur, je veux dire, car les structures en tente, c'est quand même pas top. (…). Mais je pense que c'est un rôle qu'ils pourraient jouer. On pourrait se dire que dans un plan pandémie, on devrait donner des moyens à la Défense pour avoir une infrastructure suffisante, pas pour 10 000 patients évidemment, mais qui pourraient jouer un rôle au début,à la fin, ou en mesure intermédiaire par rapport à ça. Elle n'a pas joué ce rôle-là. Alors que, la Défense sur pied de paix, on n'est pas en guerre, certains disent qu'on est en guerre contre le virus, mais on n'est pas en guerre 'guerre'. Mais sur pied de paix, la Défense a un rôle à jouer, qui peut être un rôle de protection. Elle joue, c'est un rôle de protection de sa population sanitaire également un peu plus en avant que ce qu'elle a fait." **(HTSC committee member)**

4.2.4 Medical transport

Although medical transport was clearly within the scope of the HTSC committee it was less prominently discussed during the HTSC committee meetings. Several of the interviewed respondents indicated that they had no major issues to report but added that their knowledge about medical transport was limited. Yet, several issues could be identified based on the interviews of some experts within the committee.

Starting point before COVID-19 crisis: a complex landscape with a role for federal and federated entities

Both the federal and the federated entities are involved in the organisation of medical transport. The federal level is responsible for the 112 transport or urgent medical transport. The federated entities are responsible for non-urgent medical transport including interhospital transport. There is one exception: when non-urgent medical transport is not available but the transport to another hospital is time-critical the 112 services can be used. In that case the 112 ambulance will have to bring the patient to the nearest most adequate hospital. A respondent stated that this does not always match the logic of a loco-regional network.

A respondent pointed to the confusing terminology: the federal level is responsible for urgent medical transport (which can be non-urgent from a medical point of view: a patient calls 112 for a non-urgent problem) while the federated entities are responsible for non-urgent medical transport (which can involve a time-critical interhospital transport which is urgent from a medical point of view). In addition it was mentioned that, especially for non-urgent medical transport, there are many actors involved (e.g. hospitals, private companies, not-for-profit organisations) with heterogeneous models (e.g. staff and vehicle provided by hospital; staff provided by hospital but vehicle by private company). A respondent stated that some private companies are only available on hours that are profitable (daytime). As such, hospitals that collaborate which such private companies risk to have to call-in the support of 112 services for time-critical transport outside daytime hours. Another practice that was reported is that hospitals with 112-ambulances use their 112 transport for interhospital transport (and indicate these services as unavailable for 112 services).

COVID-related (interhospital) transport: actions by the HTSC committee

A respondent from the HTSC committee summarizes the medical transport related actions taken by the committee as follows: provision of protocols for 112 services, provision of additional transport capacity (dedicated ambulances for COVID-19 patients) that was used in a variable way across regions (see below), financial support for interhospital transport via the hospital budget (Budget of Financial Means or BFM) to avoid that financial barriers would slow down interhospital transport, (limited) capacity of the army to transport critically ill patients. The COVID-patients transported via 112 ambulances (e.g. from home to hospital) were financed as before.

"En dus om samen te vatten. Wat hebben we als transport gedaan? We hebben de 112 voorzien van de nodige protocollen en van de nodige extra capaciteit, die afhankelijk van de regio dus minder of meer gebruikt is. We hebben het interhospitaal via de handle van de financiering en BMF een deel gaan ondersteunen en ervoor zorgen voornamelijk om die capaciteit, door het feit dat het voor het ziekenhuis gratis wordt om te transporteren, dat dat al de drempel niet meer is om een patiënt niet weg te sturen, dat hij geld zou kosten. En in dat interhospitaal transport hebben we dan andere middelen gaan aanbieden. Als het ziekenhuis er niet in slaagt om zijn patiënt op een degelijke manier op transport te krijgen, hebben wij alternatieven aangeboden, zijnde 112, of in tweede alternatief voor het heel zwaar kritisch transport, was het dan Defensie dat mee ingeschakeld wordt." **(HTSC committee member)**

A respondent explained that the financial support for COVID-related interhospital transport is stricto sensu to be situated in the grey zone of the competency of the federal level. In fact a transport of a patient to another hospital who returns the same day to the initial hospital is part of the per diem reimbursed by the hospital budget. Yet, for COVID-related transport this was more extensively interpreted: COVID-patients transported to another hospital (e.g. from ICU to ICU) or from hospital to home (e.g. a bedridden patient admitted for COVID transported home to free up capacity on the COVID-unit). The latter option was, according to a respondent, rarely used. The hospital could use the regular transport resources (e.g. own transport, private companies). No limitations were set by the HTSC committee according to a respondent. The federal health inspectors were reported to play an important role in facilitating interhospital transport. When the HTSC committee identified capacity problems in a hospital and the hospitals took no proper initiative, the federal health inspector contacted the hospital. It was reported by an interviewed committee member that the federal health inspectors took contact with these hospitals in a pro-active way but that the transport was never forced. At least, no legal levers were used to make sure transport took place. According to several respondents this seemed to have worked.

"We hebben daar wel zitten aan sleutelen nu bij de pandemie. En waarom hebben we daar kunnen aan sleutelen? Dat is dan een beetje de grijze zone of de hefboom die wij gebruikt hebben. Dat is dat als een patiënt van ziekenhuis A naar ziekenhuis B vervoerd wordt en diezelfde dag terugkeert naar ziekenhuis A, dan is het transport ten laste van de ligdagprijs. .. Dus binnen het budget Financiële Middelen van de Ziekenhuizen is er een hoofdstukje Transport. En met dat hoofdstukje Transport betalen we een deel van het transport dat op dezelfde dag heen en weer is van een patiënt, maar ook het intern transport binnen het ziekenhuis. Die interpretatie zijn we dus wat breder gaan zien, en we hebben gezegd: gezien we binnen het budget Financiële Middelen al interhospitaal transport voor een deel, en in-hospitaal transport voor een deel financieren, kunnen we dat nu voor de pandemie ook doen. patiënten die binnen het netwerk getransfereerd worden, omwille van plaats tekort of anderen. Of patiënten die omwille van COVID naar een ander ziekenhuis getransfereerd worden, gaan we die kost dragen binnen het budget financiële middelen. Dus daar hebben we een eerste stap genomen. Dat is eigenlijk een zuiver financiële stap, om de patiënt die door COVID getroffen is te behoeden van grote facturen omdat het ziekenhuis vol ligt en dat wij de patiënten gaan verdelen, omdat dat ook op een bepaald moment beslist is geweest, van: ondanks het feit dat een bepaald ziekenhuis toch nog plaats heeft gaan we, omdat de druk op dat ziekenhuis te groot wordt, patiënten gaan verdelen naar andere ziekenhuizen. …. Maar met een duidelijke diagnose COVID. Dus als het om COVID gaat en de patiënt komt niet dezelfde dag terug, maar wordt naar een ander ziekenhuis getransfereerd en blijft daar; dat

transport zijn we ook gaan financieren binnen het budget financiële middelen." **(HTSC committee member)**

Dedicated COVID medical transport: variation across regions

Linked to the triage-protocols for 112 transport (to identify COVID-suspected transports), a respondent pointed out that the HTSC committee financed 36 dedicated COVID-19 ambulances on top of the regular transport. In Flanders an arrangement was made with the Red Cross to provide these transports while in Brussels the partner was the Fire Brigade (and other partners: hospitals) and in Wallonia there were different partners depending on the area (e.g. private companies). The objective of the HTSC committee was to work with one partner per region, since it allows to harmonize education and training of staff (e.g. use of PPE). Nevertheless, in practice the dedicated transport for COVID-19 turned out to work better in Brussels and Wallonia. A potential explanation that was given is that in Flanders the entire handling and follow-up of the transport had to be delegated to the Red Cross while in Brussels and Wallonia this transport was embedded in the routinely performed operations. This in combination with a drop of non-COVID 112 calls (and less workload for 112 services) caused, according to a respondent, the bypassing of the dedicated COVID-19 ambulances in Flanders.

"Over die specifieke COVID-capaciteit zijn er al een aantal conclusies. Omdat we ook geconfronteerd werden met een tekort aan beschermingsmiddelen en noem maar op. Om te kunnen garanderen in een periode van tekorten aan beschermingsmiddelen, hebben we gezegd van: we gaan proberen die mensen, of die specifieke COVID-ziekenwagens zoveel als mogelijk binnen één organisatie te plaatsen. Dan is het veel gemakkelijker om die organisatie, of die mensen die dan daar specifiek ingezet worden, om die goed te trainen en uit te rusten. Het had moeilijker geweest om op alle ziekenwagens diezelfde training en datzelfde materiaal te gaan leggen. In Vlaanderen is dat gelukt door eigenlijk heel het COVID-transport toe te vertrouwen aan het Rode Kruis …. In Brussel… 98% van de ziekenwagens in Brussel zijn de ziekenwagens van Brandweer Brussel. Dus daar is onze partner Brandweer Brussel geweest. Maar Brandweer Brussel heeft heel snel ook … de paar andere partners die er zijn, … mee in hun boot genomen om te gaan zeggen van: oké, we gaan jullie dezelfde opleiding geven, hetzelfde materiaal geven. En dus zij hebben mee daarin gedraaid. In Wallonië is het ons niet gelukt om op één partner te kunnen beroep doen. ..Dus daar zijn we dan eigenlijk wel moeten gaan toestappen naar de lokale partners, en in de ene zone was dat dan de privaatdienst waarmee we in zee gegaan zijn, in andere regio's was dat een hulpverleningszone van de brandweer; dus daar zat het verspreid. Wat hebben we nu gezien achteraf? In Wallonië is het systeem van de dedicated ziekenwagens heel goed gebruikt geweest. In Brussel is het systeem van dedicated ziekenwagens heel goed gebruikt geweest. In Vlaanderen is het amper gebruikt geweest. .. Waarom? .. Het was in Vlaanderen eigenlijk de regel dat de 100-centrale die oproep aan de Rode Kruiscentrale doorgaf en de Rode Kruiscentrale ging die oproep of interventie dan verder afhandelen. Dat is door de 112-centrales eigenlijk zeer slecht ervaren want hun normale opdracht is die interventie op te volgen tot dat de patiënt in het ziekenhuis is. En hier geven ze die af aan een andere centrale, en ze hebben er geen zicht meer over. Dus het feit dat enerzijds die 112-centrale die controle in Vlaanderen niet meer had van A tot Z. En anderzijds dat de lokale diensten eigenlijk met hun vingers zaten te draaien en geen interventies hadden, heeft gemaakt dat ze in Vlaanderen veel sneller gezegd hebben: 'ja maar, het Rode Kruis gaat te laat komen; we gaan een gewone ziekenwagen sturen.' En daardoor is eigenlijk de dedicated capaciteit in Vlaanderen veel minder gebruikt geweest dan in Brussel en in Wallonië. Waarom? Omdat in Brussel en Wallonië de routinediensten, die capaciteit in eigen huis hadden, en dat ze konden zeggen: 'nu eens een COVID-opdracht? Oké, dan pakken we ziekenwagen die rechts staat, want daar ligt al het materiaal in. En nu is het een gewone opdracht? Oké, dan pakken we de ziekenwagen die links staat en die heeft dat materiaal niet nodig.' Dus dat is dan, naar 112 toe, extra middelen gecreëerd om dat te doen." **(HTSC committee member)**

Medical transport was insufficiently used to distribute the burden of the epidemic across the territory

Respondents reported that for hospitals that were hit hard during the first wave quite a lot of transfers for COVID-19 patients were organised while in other hospitals this was rather limited as the maximum capacity was not reached. For all types of transport specific measures (PPE/decontamination, etc.) were required but especially the transport of critically ill patients is labour-intensive (requires assistance of medical and nursing staff for which there was a high need within the hospitals themselves). Respondents reported that academic and large hospitals admitted quite a lot of patients via interhospital transport. Nevertheless, there is a perception that a better distribution of the epidemic burden across hospitals was possible if medical interhospital transport would have been intensified. It was reported by one HTSC committee member that during the first 5 months only about 500 interhospital transports for COVID-19 patients were undertaken. This is only a small portion of total interhospital transport. Reasons given were an appreciated but only limited support from the army, an initiative for a large part left to the hospitals while they did not dispose of the data of hospital capacity occupation in other hospitals, lack of solidarity, etc. The federal health inspectors played an important role in the regulation of medical transport but were reported to be confronted with under-staffing of their service.

> *"Er werd gezegd: [het leger] kan tot vier transporten begeleid gaan doen naar andere provincies. Dat kwam dan maximaal neer op twee uiteindelijk; dus dat liep veel te traag voor de snelheid van patiënten die zich aanboden. Dus dan moesten wij onderling in contact gaan treden met ziekenhuizen binnen de provincie, die zelf zwaar getroffen waren en die dus ook niet noodzakelijk snel konden overnemen. Dus dan moesten we gaan kijken in de provincie enzoverder. Dus je moest heel veel zelf initiatief nemen en hopen op goodwill van anderen, terwijl: moest dat vanuit de overheid worden opgelegd, dan zou het allemaal veel gemakkelijker gegaan zijn. En dat is wel iets wat ik gemist heb. Ik moet zeggen… De gezondheidsinspecteur heeft die rol wel correct gedaan, maar die botste natuurlijk ook op limieten."* **(Hospital sector)**

> *"(…) ça coinçait un peu par rapport aux transferts des patients, certains hôpitaux n'acceptaient plus les patients qui étaient transférés par d'autres hôpitaux donc ça coinçait un peu."* **(HTSC committee member)**

4.2.5 Regular medical activities

4.2.5.1 Lockdown

Large support for drastic measures during the first wave of the epidemic

The guidance to stop all non-urgent, not immediately necessary medical activities is nowadays perceived as a very drastic measure taken in a context of catastrophic images from abroad (i.e. hospital capacity shortage in Northern Italy), an exponential rise in COVID-19 positive cases and hospital and ICU admissions, a shortage of PPE and testing capacity, and many unknown factors (about the disease, its treatment, epidemiological data, etc.). In retrospect, keeping all these factors in mind, respondents expressed their general support for the fact this measure was taken during the first wave. It was perceived as essential to enable the creation of sufficient and additional hospital and ICU capacity (see above) for COVID-19 positive patients.

> *"Maar op dat moment wisten wij ook niet: voor hetzelfde geld is er de dag erop een gigantische uitbraak in de regio waar we net de Limburgers naartoe hebben gevoerd, en zitten we daar dan in de problemen. Dus die onzekerheid was eigenlijk heel groot. Dus bottomline, conclusie: ik denk niet dat we anders hadden gekund, maar dat heeft wel voor wat onrust gezorgd."* **(HTSC committee member)**

Variation between hospitals in how strict this measure was implemented

Yet, despite the directive nature of this guidance respondents declared that hospitals interpreted "medical activities that were not immediately necessary" differently: some (too) strict while others more liberal. At the start it was, according to the respondents, not clear what the terminology (semi-urgent, etc.) exactly covered and what not. It lasted until the launch of exit measures when guidelines (from the professional organisation of medical specialists (VBS – GBS), were released before guidance on this topic was given.[24] In any case, this measure resulted, according to interviewed respondents from the hospital sector, in lengthy discussions and negotiations between the CMO and the medical staff within the individual hospitals. The indicative list of urgent and non-urgent care provided by the professional organisation of medical specialists resulted, according to interviewed respondents, in local lists of urgent and non-urgent activities.

> *"(…) 13 maart 's avonds hebben we dan de vraag gekregen om die niet-dringende zorg uit te stellen. We zijn daar heel radicaal in gegaan, en zo goed als alles is uitgesteld, behalve de zaken die – als we die uitstelden – zouden leiden tot overlijden. Die zaken zijn doorgegaan, dus echt de urgente zaken. Naderhand zijn er dan inderdaad de semi-urgente zaken bijgekomen. Was dat duidelijk genoeg voor iedereen wat dat betekende? Nee. We hebben daar veel vergaderingen over gediscussieerd, over wat dat dan kon zijn, een semi-urgent electief; dus waar die grens lag. Er is dan verwezen naar een aantal documenten van het VBS. Ik denk toch VBS..? Ja hè?….Maar, ja… Zo lang heeft het dus geduurd: tot er duidelijkheid was."* **(Hospital sector)**

> *"De prioriteitslijsten hebben vooral de aanzet gegeven aan elk ziekenhuis om een vorm van prioriteitlijst voor zichzelf op te zetten. Om dus te beseffen dat er dus een prioriteitenlijst moest zijn."* **(Hospital sector)**

Some respondents raised the hypothesis that the group of hospitals with a more liberal interpretation were mainly hospitals located in areas with less COVID-related hospital admissions. Moreover, respondents described that larger hospitals had more flexibility in creating additional capacity (e.g. turning regular ICUs into COVID-ICUs unit per unit), allowing them to continue more regular medical activities compared to smaller hospitals. According to the respondents these hospitals should not be blamed because they mostly took up their responsibility by helping out hospitals from areas with a high COVID-19-incidence and/or by supporting nursing homes in their area.

In that sense, the communication of public authorities that they would perform an audit on the continuation of regular activities (letter of 17/04/2020) was not well perceived by the hospital sector.

> *"Ook omdat we toch hebben gezien dat… ja, er zijn een aantal ziekenhuizen die niet zo hard zijn getroffen en die eigenlijk wel alles hebben stilgelegd, wat zowel voor hen als voor de patiënt niet ideaal is. Dus daarom ben ik ook nogal mild als ik zie dat sommige ziekenhuizen nog redelijk veel activiteit hebben aangehouden; …Maar ja, [ziekenhuis X] was niet zwaar belast, en dan is de vraag: heeft [ziekenhuis X] voor de rest zijn verantwoordelijkheid genomen door gevallen van andere ziekenhuizen op te nemen? Door de woonzorgcentra te gaan helpen? Ja, ze hebben dat gedaan. Dan ga ik hen niet verwijten dat ze ook nog wat reguliere zorg hebben voortgezet, zelfs al was dat eigenlijk niet de bedoeling. Zeker achteraf bekeken ben ik eerder blij dat ze dat hebben gedaan. Als het natuurlijk allemaal was ineen gestuikt, gingen we daar op een andere manier naar kijken. Dus ik denk dat het moeilijk wordt voor de algemene directeurs en de hoofdartsen om dat nog eens te doen, en ook voor de overheid, op dezelfde manier."* **(HTSC committee member)**

Large impact on hospitals, physicians & other healthcare professionals and population health

Respondents assessed the impact of this lockdown of medical activities to be enormous on several aspects. First, since in retrospect also necessary care (e.g. oncological care, cardiac care) seems to have been postponed there will be an impact on public health due to late diagnosis, (in-)sufficient treatment and deterioration of existing problems (see Chapter 6). This was not only due to the measures taken by the HTSC committee and the implementation by hospitals and the healthcare professionals but also because of a fear among the general population to be infected by the virus when visiting hospitals and healthcare professionals.

Second, there was also a serious impact for physicians with a large share of non-urgent, not immediately necessary care in their portfolio. These physicians were confronted with a huge drop in their activities resulting for most (i.e. when self-employed) in a loss of income. While some of them were active on COVID-units (as physicians performing medical activities or in some cases supporting nursing staff with nursing activities) this was not the case for all. In some hospitals this resulted in large discussions between medical staff and the hospital management while in others these discussions were less prominent (either by the impact of the crisis or by financial arrangements from the start: mutualisation of financial revenue across medical disciplines).

> "*Sinon pour le reste les gens avaient plutôt bien compris et puis très très tôt chez nous on a réfléchi à la solidarité entre les médecins, (…) Donc le problème financier avait été évacué, on a tous des indépendants mais je leur ai fait comprendre que ça ne sert à rien de te battre et tuer tout le monde pour travailler plus, ce n'est pas pour ça que ça que tu vas retoucher plus d'honoraires. Puisqu'on va remettre ça dans un pot commun et on a été bien soutenu par le conseil médical qui a compris et avec la direction générale, on a très rapidement fait des réunions avec le conseil médical et on a fait comprendre ça aux médecins et ça a permis de calmer un peu le jeu. "* **(Hospital sector)**

> "*Mais dans tous les autres hôpitaux où ils paient les médecins à l'acte, c'était la grosse bagarre car ils voulaient tous recommencer un peu plus vite les uns que les autres."* **(Hospital sector)**

Also other healthcare professionals were impacted by this loss of medical activity. A large group of nurses from units with elective care were active on COVID-units while some units had to close down and in several hospitals nurses were "technically unemployed", according to some respondents.

Third, since the hospital income largely depends on deductions of physician fees (and patient supplements) the reduction in medical activities had a large financial impact on hospitals. While hospitals had to make additional investments to deal with COVID-patients (e.g. PPE, architectonical changes, purchasing additional equipment), there was a substantial loss of income. Respondents feared this will result in financial problems for many hospitals of which many already had poor financial results before the COVID-19 crisis, despite substantial compensations.

A scenario that should not be repeated anymore

Despite the general support, there is consensus among the interviewed respondents that such a scenario should be avoided at any cost in the future. Hospitals are, according to them, now better prepared (e.g. separate patient flows in place, more PPE, agreements between different hospitals) to continue regular medical activities.

> *"C'est compliqué pour l'arrêt des activités, je n'ai pas non plus un point de vue. Je pense que l'on ne pourra pas arrêter une deuxième fois comme on l'a fait, ça a fait beaucoup trop de dégâts. (…) C'est difficile, je trouve, de réécrire l'histoire mais on ne peut pas le recommencer comme ça. Il y a trop de patients qui ne se sont pas soignés et ça on va le payer."* **(Hospital sector)**

Foreign patients

Although there was, according to the respondents, some political pressure to put Belgian hospital capacity at the disposal of other countries (as a public relations strategy), the HTSC committee decided to be very restrictive and not to allow admissions (COVID-related or other) from abroad during the first wave of the epidemic. This decision was perceived as too restrictive and a lack of solidarity, causing frustration among the medical staff from some hospitals that are used to admit patients from abroad. After a couple of weeks it was decided to make some places available in academic hospitals to admit complex patients from abroad. Yet, it is unclear from the interviews if this possibility was used.

"De mate waarin we uit het buitenland patiënten gingen opnemen, waar we eigenlijk vanuit het Surge Capacity Comité geen voorstander van waren. We hebben daar ook wat moeten tegengewicht bieden omdat… toen we nog in stijgende curves zaten, wilde eigenlijk de politiek, ...Maar men wou eigenlijk die capaciteiten gebruiken in een soort van politieke marketing, en internationaal Europese agenda. En daar hebben wij ons wel tegen verzet. Op een bepaald moment is dat dan tot een conclusie gekomen, na een

aantal weken discussie, over het feit dat we wel een aantal plaatsen zouden voorzien, maar vooral tertiair, want universitair hadden we wat meer plaats ook nog wel dan de anderen, en dat we eventueel wel konden overwegen om zo'n aantal van die meer complexe gevallen wel op te nemen uit het buitenland, maar of dat dat gebeurd is, dat weet ik niet echt zo." (**Hospital sector)**

4.2.5.2 Exit strategy

Slow and conservative restart of regular activities

Based on the interviews with hospital sector representatives there seems to be a perception that the HTSC committee has been reluctant far too long to restart regular medical activities. The required buffer capacity, at the time when the epidemiological figures improved drastically, was large. In addition, the ability of hospitals to create additional capacity at short notice was said to be underestimated. Some hospitals were reported to have restarted faster with the uptake of regular medical activities. According to a respondent this was, in retrospect, maybe not a bad move on the condition that their medical and nursing staff were physically and emotionally sufficiently recovered.

> *"De nuance die ik wou aanbrengen was vooral in het relanceplan, dat er omwille van veiligheidsmaatregelen, dat men toch heel sterk lang vastgehouden heeft tot een grote capaciteit van bedden en opnamecapaciteit voor COVID-patiënten te behouden, ondanks het feit dat uw aantal patiënten daalde, en dat eigenlijk tegelijkertijd ook al een stevige druk kwam om patiënten te verzorgen die hun pathologie en ook hun zorg een beetje uitgesteld hadden. Dus je kreeg dat fenomeen, en tegelijkertijd een equipe die stand-by moest blijven voor bedden die niet allemaal gevuld waren, dat was ook psychologisch een heel moeilijk element hè. Je moet dan eigenlijk een equipe stand-by houden, bij wijze van spreken reservisten, van: je weet nooit, want het is niet stabiel. We vermoeden dat er nog nieuwe opstoten kunnen zijn dus iedereen moet maximale capaciteit intensieve zorgen hebben met je percentages en hoeveelheden, de berekening daaraan gekoppeld. Je moet alles beschikbaar houden, inclusief expertise. En ik denk dat daar het iets te mathematisch was, en te weinig – dat was ons gevoel – te weinig pragmatiek vanuit de lokale ziekenhuizen kwam. En pas een beetje later kreeg men door: we mogen het al een beetje loslaten want eigenlijk is het wel mogelijk om binnen de zoveel uur weer een afdeling te kunnen opstarten enzovoorts. Wij hebben die flexibiliteit, dus het is niet… Elk ziekenhuis heeft een zekere flexibiliteit, maar de schrik in die cel was toch wel een beetje dat dat niet mogelijk was."* **(Hospital sector)**

A differentiated approach is indicated

The conservative attitude from the HTSC committee to restart regular activities came, according to interviewed committee members, from a fear to have insufficient hospital capacity and material and because the committee did not have data at its disposal about what medical activities were performed and required. As such the interviewed committee members stated that pressure from hospitals on the HTSC committee to relax the measures increased. In retrospect, they admit that a more differentiated approach probably would have been better, allowing hospitals in less affected areas to restart regular activities earlier. A general consensus seems to exist among the respondents (hospital sector and committee) that in the future a reduction of regular medical activities should be phased and proportionate to the local epidemic situation. During the first wave the interpretation in most hospitals was, according to interviewed respondents, very strict: urgent or necessary care was interpreted as "urgent and necessary care can be continued". According to respondents it is important that, in future, necessary or urgent care can continue. Also the restrictions on elective non-necessary care can, according to respondents, be less severe: e.g. continue with elective care and patient profiles that do not require ICU capacity if sufficient anaesthesiology capacity is available. Respondents suggested a differentiation depending on the local epidemic situation and the required resources for the medical activities (ICU versus non-ICU). Such a differentiated approach would have less impact on public health, hospitals (budget, organisation, etc.) and physician income and functioning.

"Dat is ook een moeilijke. Er begon druk te stijgen vanuit ziekenhuizen, want 'wij willen hier terug opstarten.' Bij ons was het eerder een sfeer van: 'jullie zijn zot zeker? We zijn er nog lang niet voorbij.' We hadden ook wel wat schrik dat we nog lang niet aan ons… allez, dat we nog niet oké waren. We kregen ook heel veel signaal: 'er is dit tekort, dat tekort, daar gaat het mis.' Dus wij waren absoluut nog niet klaar om dat te doen. Wij zijn daar nogal rigide in geweest denk ik in het begin. Terwijl we misschien sneller hadden kunnen kijken naar individuele ziekenhuizen en plaatselijk misschien wel dingen hadden kunnen laten doorgaan. Maar in de realiteit was het wel zo dat wij totaal geen idee hadden: gebeurt daar nu iets of niet? En wat is het dringendst. Die discussie daarrond… ja, medisch, beoordeel het maar hè. Wij hadden daar gewoon geen data over, punt." **(HTSC committee member)**

Hospitals restarted regular activities at a different pace

Respondents mentioned that the impact of the epidemic on the hospital and hospital staff influenced the pace at which hospitals restarted their regular activities. In hospitals that were heavily impacted they reported that a slower start was taken because their medical, nursing and other staff was often exhausted and not yet ready for the job. Yet, this strategy was not followed everywhere and some hospitals, under pressure by loss of income for both the hospital and physicians, restarted too drastically. They did, according to some respondents, insufficiently take into account the potential negative impact on the wellbeing of their nursing staff that was heavily affected by the COVID-19 crisis.

"Les hôpitaux qui n'ont pas été fortement impactés par le COVID étaient pressés par leurs médecins de recommencer les activités. Et les hôpitaux qui ont été fortement impactés par le COVID, ils étaient un peu fatigués et je pense qu'ils auraient bien aimé avoir plus de temps." **(HTSC committee member)**

4.2.6 Visitor restrictions

Context urged for far-reaching restrictions but this resulted in very painful situations

Although visitor restrictions have some advantages from a hospital perspective (e.g. less workload for staff), in general respondents stated that the visitor restrictions had a large impact on hospital staff and patients. According to interviewed committee members, the far-reaching visitor restrictions were, in first instance, a consequence of the lockdown decisions taken by the National Security Council. As such the HTSC committee had, according to its members, little room to manoeuvre. In addition, the shortage of PPE at the start of the crisis made it necessary to prioritise the use of PPE by healthcare professionals and made it virtually impossible to allow visitors. Nevertheless, although the far-reaching visitor restrictions were perceived as required, they were also perceived as inhuman and not to be repeated in the future especially in palliative care situations, for psychiatric patients and other vulnerable groups. Some hospitals were reported to have created conditions where limited and safe visits were made possible (also during the lockdown) while in other hospitals this was not the case. Respondents from the hospital sector reported also that they missed a national communication to the general public about the rationale of the visitor restrictions.

When visitor restrictions are again needed in the future it is, according to interviewed respondents, important to have measures in place that allow contact between patients and their relatives (e.g. video-meetings, specific visitor rooms with plexi wall panels, extra efforts to update relatives about the patients' conditions via phone, etc.).

"Donc à terme, à minima, pouvoir organiser des contacts de manière systématique avec des moyens modernes de technologie, de l'information, de la communication, c'est quelque chose à structuraliser à minima, des visites derrière des parois, des chambres avec des vitres, voyez comme on a parfois dans certaines unités, ça c'est quand même très important, avec des parlophones." **(HTSC committee member)**

Relaxing the visitor restrictions as part of exit strategy lockdown

As part of the exit strategy from the lockdown also the visitor restrictions were relaxed. Yet, different opinions existed within the hospital sector. Some thought it was too early to relax any restrictions as it would cause an additional workload on the already highly burdened hospital staff. Others thought it was urgently needed from a patient perspective especially for vulnerable groups. Psychiatric hospitals were the first that wanted to re-open their hospitals for visitors.

> *"Donc on avait quand même des hôpitaux qui nous disaient que voilà, pas les hôpitaux généraux car au début on n'a pas ouvert les visites dans les hôpitaux généraux car ils nous ont dit que ce n'était pas possible pour mettre en place un système vraiment, on va dire, adapté par rapport à la sécurité des patients, du personnel aussi."* **(HTSC committee member)**

From the interviews with committee members it is clear that a proposition made by one hospital umbrella organisation served as working document during the discussions within the HTSC committee. Yet, it was reported to be difficult to find consensus within the HTSC committee around this topic. As a result the guidelines left a lot of freedom to the hospitals. A date from which the visitor restrictions could be relaxed was defined by the HTSC committee on the condition that hospitals were ready to accommodate visitors (e.g. visitor code, procedures). As a consequence, the degree to which the visitor restrictions were relaxed varied across hospitals. At the start only necessary companions were allowed. As this is susceptible for interpretation it was also a source of frustration and discussion (between hospital staff and visitors) in some hospitals.

> *"Maintenant sur la reprise des visites, ça a été plus compliqué. Je pense que certaines entités [membres du comité] voulaient aller plus vite que d'autres. Et donc, là on a plus modulé en disant que, les hôpitaux pouvaient rouvrir sous certaines conditions et en fonction de leurs possibilités. Voilà, donc l'arrêt des visites ça a été contraignant. La reprise des visites n'a pas été contraignante. On leur a dit, vous pouvez reprendre les visites à partir de cette date-là, mais il faut que les hôpitaux soient prêts à le faire."* **(HTSC committee member)**

4.2.7 Surge capacity policy perceived as a success

4.2.7.1 Effective policy intervention with the knowledge and information available at the time

HTSC committee guidance helped hospitals to create surge capacity

Given that there were many unknowns and rapid action was needed, respondents stated that the HTSC committee succeeded in creating a general framework for hospitals that guided them in the implementation of measures to create the required surge capacity.

> *"Je pense que partant de zéro, je trouve, si vous me demandez un avis global, que le fait de nous avoir mis ces points de balise, même s'ils sont simplistes et rustres, ça mobilisait les gens autour d'une balise de critiques. Par rapport à la France, par exemple, je trouve que ce genre de directives a été plus efficace que rien du tout. Donc moi je trouve que ça n'a pas été mal globalement. Cette espèce d'obligation d'un carcan."* **(Hospital sector)**

Merit of hospital management and healthcare professionals

There is a general perception among the interviewed respondents that the surge capacity policy was effective. Yet, it should be stressed that this is, according to the respondents, in the first place the merit of the hospitals themselves. The HTSC committee was said to have created a general policy framework but it is thanks to the hospitals, their efficient hospital management structures and dedicated, motivated and well-educated staff that the surge capacity was created at such a short notice.

> *"Onze hoofdopdracht was de Surge hè, te voorzien dat er voldoende bedden waren en de juiste bedden. Niet alleen maar gewone COVID, maar ook intensieve en ook ademhalingstoestellen, de ECMO's en andere zaken. Transport organiseren tussen ziekenhuizen, tussen regio's, zien dat er capaciteit is. Ik denk dat we daar in geslaagd, dat dat ook goed gelukt is. Ik denk dat er ook niemand zegt dat we dat niet goed gedaan hebben … dus ik zeg het met een b mol: Ja, we hebben dat goed gedaan, maar we hebben het ook goed gedaan omdat het*

ziekenhuizen waren. Ziekenhuizen zijn supergespecialiseerd. De meesten hebben staf, IT, directies, artsen, epidemiologen, noem maar op; dat loopt daar allemaal rond in ziekenhuizen. Dus we hebben dat goed gedaan, dankzij de ziekenhuizen denk ik. En hun expertise, en hun eigen pro-activiteit om dingen op te nemen enzovoorts. Zich te organiseren ook zeer snel, ik denk zelfs sommigen sneller dan dat de Surge het heeft gedaan." **(HTSC committee member)**

Hospital capacity: high starting point

It also helped, according to a respondent, that the hospital capacity (and ICU beds) in Belgium is higher than in most other comparable countries. In that sense, it helped that the announced reforms to reduce the available hospital capacity drastically were not yet fully implemented. Nevertheless, respondents acknowledged that an overcapacity of hospital and ICU beds cannot be permanently maintained just in case of a potential epidemic crisis or disaster. Respondents stated that this crisis made clear that some spare capacity is useful and that mechanisms should be put in place to enable a rapid and flexible creation of hospital and ICU beds to admit patients in case of a crisis.

"Je pense que la Belgique est bien passée à travers car on était qu'au début des réformes et qu'on n'avait pas encore pu mettre en place toute une série de plans qui étaient là-derrière." **(Hospital sector)**

The spectre of severe hospital capacity problems as seen in the North of Italy created a sense of urgency

An important element, according to several respondents, in the policy process was that Belgium, in terms of incidence rates, was running two weeks behind Italy. The images of severe ICU capacity and hospital capacity problems in general (emergency hospitals on hospital parking lots, critically ill patients lying on trolleys in hospital corridors, etc.) created a sense of urgency among Belgian policymakers, managers and healthcare professionals. It clearly created a flow of measures and historical and unprecedented efforts (e.g. type and extent of decisions, pace of implementation, impact on daily functioning) that were required.

"Een tweede succesfactor, dan meer voor deze crisis, was natuurlijk dat… Men moet dat toch niet onderschatten, dat… We zouden niet klaar geweest zijn op dezelfde manier als Noord-Italië niet eerst was gekomen. Want eigenlijk… Ja, ik denk dat wij tien of veertien dagen achterliepen ofzo; of zelfs een paar dagen meer, ik weet het niet exact. Maar eigenlijk was net dat de tijd die we nodig hebben gehad om ons echt goed voor te bereiden. Want veel ziekenhuizen waren al individueel gestart in januari, maar ik denk toch wel dat er veel ook nog niet gestart waren. Dus dat is toch wel een eerste factor." **(HTSC committee member)**

Shutting down regular activities and interhospital transport

Shutting down all non-urgent medical activities is, in retrospect, assessed as a measure that was justified but maybe too blunt. Yet, it clearly created a pool of staff and resources available for hospital capacity dedicated to COVID-19 patients. When individual hospitals encountered capacity problems patients were transferred to other hospitals (see section 4.2.4).

"Car il y a quand même eu des transferts et des transports qui ont été faits et d'autre part car on a arrêté toutes les activités qui n'étaient pas dites essentielles, urgentes ou nécessaires." **(HTSC committee member)**

Evaluation of results required to make firm conclusions

As mentioned above, many of the interviewed respondents stress the importance of making a formal evaluation based on HSMR to verify if this perception is correct.

4.2.7.2 Communication style

Soft regulation that was perceived as mandatory

The publication of the Royal Decree of 30 April 2020[9], that made the daily ICMS and the Sciensano hospital surveillance registration (i.e. aggregated data at the hospital level) compulsory, was the first and only legal instrument to impose it measures. Despite this rather soft regulation the measures were, also by the large impact of the crisis, perceived as mandatory by the sector. The respondents doubt that, in case of consecutive waves, the imposed measures will be accepted that easy again. They expect more resistance and variation in the application of future measures.

> *"Regulatie was wel echt soft hè. Dus we hebben niets gereglementeerd, behalve dat ze moesten hun registraties doen. Dat is de enige KB die we hebben genomen, dat ze verplicht waren om dagelijks hun gegevens over te maken in ICMS en in de Sciensano-survey, en voor de rest hebben wij geen enkele juridische maatregelen genomen in het kader van die Surge Capacity; geen énkele."* **(HTSC committee member)**

Directive communication style which sometimes lacked a clear rationale/objective for the imposed measures

The communication from the HTSC committee to the hospitals was perceived as very directive by interviewed hospital representatives. While some respondents stated that this has the advantage of creating a clear framework to implement measures and enforce the necessary changes within their hospitals, others complained that this communication style was not a sign of trust from the public authorities in the capability of hospitals to deal with the required surge capacity. What's more, some respondents criticized the fact that the underlying rationale or objective of the measures ('why a measure was decided', 'with what purpose') was not always clear.

> *"Het was ook niet altijd… Ik moet eerlijk zeggen… Heel specifiek dan over intensieve was het ook niet altijd even duidelijk in het begin wat de overheid exact wou. (lacht). Van vrijhouden….…Maatregelen op zich en hoe ze uitgelegd werd. Er werd gegoocheld met percentages van erkende bedden: zoveel moet je bijhouden, zoveel moet je bij creëren… De uitleg die daaraan gegeven werd was in het begin zeer verwarrend."* **(Hospital sector)**

4.2.8 Role of hospital networks

4.2.8.1 During the first wave the hospital networks did not take up a large role to manage the surge capacity

During the first wave, and especially when the epidemic peaked, the role of the loco-regional hospital networks was reported as being rather limited. Respondents stated that most of these networks were either quite recently created and many of them (especially in Wallonia and Brussels) were not officially licensed yet. As a consequence, most respondents pointed to the lack of maturity as one of the reasons for this. During a crisis situation it is crucial that fast decision making takes place. This was hampered, according to respondents, since the governing bodies of the networks were not installed yet or require a lengthy negotiation process (within the network governing bodies with feedback loops to the governing bodies of each individual hospital). In addition, respondents stated that in several networks hospitals that used to be competitors are now supposed to work together, while hospitals (sometimes belonging to different regions) that belong to different networks have a larger tradition of working together. This requires an atmosphere of mutual trust which generally takes some time and success experiences to develop. Furthermore, important organisational agreements (e.g. triage, support of nursing homes) with primary care were needed and by the respondents it was seen as an obstacle to do this at the level of hospital networks since in several cases there is a mismatch between primary care zones and loco-regional hospital networks.

> *"We hebben een aantal gesprekken gehad met ons netwerk. Maar als je echt heel snel moet schakelen, …. ja, op 24 uur, om het heel cru te zeggen, iets regelen op netwerkniveau? Dat gaat niet. Dat kan je alleen maar als je het mandaat hebt op ziekenhuisniveau door bestuur en directie en zeggen van: 'Kijk, je hebt de vrijheid om het op te lossen.' Zoiets regelen op netwerkniveau, dat gaat gewoon niet. Daarvoor zijn die nog niet matuur genoeg."* **(Hospital sector)**

In addition, an important reported barrier to take far-reaching decisions at the network level is that the hospital budget is still attributed to individual hospitals. In addition, the financial arrangement between hospitals and physicians might differ across hospitals from a same network. These conditions do, according to respondents, not encourage solidarity between hospitals.

> *"En ik denk dat het wat te maken heeft met het feit dat men onvoldoende zicht heeft op wat het betekent op het financiële vlak. Want uiteindelijk komt het erop neer… allez, je moet het zo zien: op dit ogenblik komt het voornamelijk neer op het vrijhouden van capaciteit, terwijl dat daar heel vaag een verhaal wordt verteld van: we gaan daar iets tegenover stellen financieel."* **(HTSC committee member)**

As such, respondents stated that it may not come as a surprise that only in a limited number of loco-regional networks active decision making regarding the surge capacity at the network level took place. Every individual hospital did a maximal effort to manage the crisis within its own hospital and try to survive.

> *"Ce qu'on a observé pendant la crise, c'est un repli de chacun sur soi mais (…), qui n'était pas agressif vis-à-vis des autres, qui n'était pas parce que on ne voulait pas collaborer, c'était plutôt l'urgence. Quand votre maison brule, vous éteignez l'incendie avec vos moyens et vous vous occupez de la maison du voisin quand vous avez fini d'éteindre chez vous, c'est un peu ça qui s'est passé."* **(Hospital sector)**

In several instances collaboration and solidarity between hospitals transcended the network level and took plase (after intervention of the federal health inspector or at the initiative of hospitals themselves) at the level of provinces or beyond.

4.2.8.2 Role of hospital networks in consecutive waves

The HTSC committee gradually increased the (potential) role of networks in their measures

When the incidence of hospital admissions started to decrease during the first wave, it was reported that the HTSC committee started to give loco-regional hospital networks an explicit role in managing the surge capacity (see Chapter 3.3.3.6). This was, according to an interviewed HTSC committee member, one of the first times a policy measure includes the opportunity to make arrangements at the loco-regional network instead of at the individual hospital level. In that sense, it is in line with the reforms that were started during the last five years. From the interviews it seems that in some networks this opportunity was taken (to a certain extent) while in others not. It appears to be mainly used in loco-regional networks with a certain maturity where arrangements are made regarding the buffer and reflex capacity (mainly on ICU). It is described by respondents that the larger hospitals can alleviate the pressure on smaller hospitals by taking up (part of) the ICU capacity required for COVID-19 cases. As such smaller hospitals can continue to perform regular activities which would otherwise not be possible (they often have few ICU beds; therefore when they have to admit COVID-19 patients on the ICU they have to shut down quite quickly all elective activities that require ICU).

> *"Vous avez laissé une possibilité en réseau de s'organiser pour atteindre le but, ça c'est aussi très bien, car je suis un grand hôpital donc on a beaucoup de souplesse, mais des petits hôpitaux, ils nous ont tout de suite dit qu'en phase 2, ils n'avaient pas l'architecture, les murs ne permettaient pas de faire ça. Donc en ayant permis de faire une montée au réseau, je trouve ça très bien. Sincèrement la dernière circulaire et l'avant dernière, pour moi elles sont tops et il n'y a pas que pour moi. Quand j'ai discuté avec tout le réseau de l'hôpital et l'autre réseau aussi, tout le monde est content de la manière dont c'est écrit."* **(Hospital sector)**

Possible scenarios for future collaboration at the network level

One of the scenarios that circulate is to work with COVID and non-COVID hospitals at the network level. The reasoning is that the non-COVID hospitals could continue with other medical activities avoiding a total shutdown of non-urgent medical care. While this idea is supported (by some respondents) and even reported as being implemented in some hospitals with multiple sites during the first wave, such a scenario is, however, considered as unrealistic given that the hospital payment system is still at the level of individual hospitals. Respondents stated that hospitals and physicians would compete to be the non-COVID hospital in fear of income loss and a negative image, etc. Moreover, when the magnitude of the epidemic is of the size as the first wave, all hospitals will have to play a role in order to ensure enough capacity. A limiting factor is the limited mobility (across hospitals) of medical and nursing staff that is required to deal with COVID-patients.

> *"Maar het zal mij ook persoonlijk benieuwen hoe [COVID versus non-COVID ziekenhuizen op netwerkniveau] dat zal gaan, want dat rekent er dus op dat dat netwerk op zich goed en solidair functioneert. Niet voor alle netwerken gaat dat lukken, daar ben ik van overtuigd. … Ja, sommige van die netwerken zijn pure papierennetwerken, en zeker waar het gaat over COVID versus non-COVID zorg, dat is een enorm spanningsveld, want we weten natuurlijk allemaal dat die COVID-zorg lastig is, heel veel reputatie of geen reputatie met zich meebrengt ook. Ik bedoel: je kunt je patiënten ermee afschrikken als jij binnen het netwerk hét COVID-ziekenhuis bent. Ja, dan kunnen die andere ziekenhuizen, kort door de bocht even, zich ontpoppen als: 'Wij zijn de propere ziekenhuizen en wij doen alle makkelijke dingen.' Wij doen de cardiologie, de chirurgie. Die ziekenhuizen draaien en hebben een heel ander type inkomsten en activiteiten dan als je een COVID-ziekenhuis bent, waarin je eigenlijk veel minder kostenefficiënte zorg kunt leveren."* **(HTSC committee member)**

Arrangements between hospitals and primary care can also be taken up by the network level instead of by individual hospitals. A respondent stated that especially in areas with a dense hospital landscape this is required. Otherwise the risk exists that rules and arrangements between hospitals and primary care (e.g. support of nursing homes) within one geographical area differ according to the actors involved. A prerequisite, according to several interviewees, is that hospital networks and primary care zones (Flanders) are matched.

> *"Maar we kunnen dat ook niet doen hè. Dus er zijn sommigen die gaan zeggen: 'Ja maar, waarom moet je die transmurale aanpak… waarom doe je dat op netwerkniveau? Laat dat over aan de individuele ziekenhuizen.' Maar dan kom je opnieuw tot het punt dat in Aalst… bon, ik hoor dat ze toch met elkaar spreken om misschien op een dag één ziekenhuis te worden, maar je hebt daar twee ziekenhuizen. Ja, we willen toch niet dat twee ziekenhuizen afzonderlijk beginnen afspraken te maken met de woonzorgcentra. Dan beland je toch weer bij het netwerk…. Dus ik denk eigenlijk dat het locoregionale netwerk wel goed zou zijn om dan eigenlijk naar eerstelijnszones in Vlaanderen te outreachen, want ook dat… Ik vind dat Vlaanderen een kans heeft gemist om de eerstelijnszones niet helemaal te activeren."* **(HTSC committee member)**

From a policy point of view it makes sense to organise several issues at the network level but hospital networks need to become more mature

Although it was reported by some respondents that there exists reluctance among hospital managers and medical staff, they stated that from a policy point of view it makes sense to organise several issues (PPE stock management, medication, education modules for staff, etc.) at the network instead of the individual hospital level because of the advantages linked to the larger scale. This will not only result in cost savings (e.g. purchasing power) but also offers more flexibility (e.g. bed management). Of course, to make this work several preconditions need to be fulfilled (payment at the network level, culture of trust, performant governing body at network level, etc.)

"In de toekomst denk ik effectief dat er een belangrijke rol weggelegd is voor de netwerken; daar moeten we zeker naartoe. Het past in de discussie die we daarstraks gehad hebben over het uitbouwen van capaciteit en afspraken die je gaat maken over de manier hoe dat pathologie verdeeld wordt, hoe je ook in de toekomst de reguliere activiteit verder kunt laten lopen en dat soort zaken. Maar het gaat breder dan dat: het gaat ook over het bundelen van krachten naar apotheek toe, naar magazijnbeheer toe, … de decentrale voorraden, van persoonlijke beschermingsmiddelen - die denk ik nu niet altijd zo geweldig goed gelopen hebben, en het ieder voor zichzelf was. Euh… ja, er zijn toch wel wat uitdagingen die daar liggen. Die op netwerkniveau beter zouden kunnen aangepakt worden dan dat ieder het voor zichzelf moet doen. Ik blijf nog altijd met dat beeld van een ziekenhuis met 150, 200 bedden die al die dingen zelf moet doen zitten. En dan denk ik: dat is niet verstandig. Je moet niet zelf met de rotary club proberen om mondmaskers binnen te halen via een of andere relatie met een Chinees. Je moet dat op een meer geaggregeerd niveau kunnen doen, dat je steviger staat, robuuster je werk kan doen. En dat geldt evenzeer voor opleidingen. Nu heeft elk ziekenhuis apart zijn mensen moeten opleiden voor nieuwe functies die ze moeten vervullen. Bundel dat. Probeer dat inderdaad te poolen." **(HTSC committee member)**

Treat a patient at the most appropriate level

Respondents also stated that clinical arrangements can be made at the network (or supra-regional) level. After all, the level of expertise to treat critically ill patients is not the same in all hospitals. Therefore (as is already done nowadays but insufficiently), the hospital networks have the opportunity to enhance this practice by creating clear transfer protocols. As indicated above, the lack of differentiation in admission policy (i.e. all hospitals had to admit complex cases) can have resulted in variation in outcomes. Yet, it is important to take into account the result of hospital transfers (e.g. some hospitals received transfers of very critically ill patients while others did not) and to develop a solid risk-adjustment model when the patient outcomes are compared across hospitals.

4.2.9 Support from hospitals in nursing homes

4.2.9.1 HTSC committee: only general guidance for hospitals to support nursing homes

Initial plans to set up an interfederal committee were stopped

Already mid-March plans for a "nursing home committee" at the interfederal level were developed according to an interviewed HTSC committee member. Nevertheless, it was decided by the RMG that such interfederal committee for nursing homes was not needed because it is an exclusive competence of the federated entities. The representatives of the federated entities stated that they already took the necessary measures for nursing homes. In retrospect, this seemed not (or at least not sufficiently) to be the case.

"Maar dan was het eigenlijk ook ons plan, of de nood, om inderdaad een derde comité op te richten over die woonzorgcentra. ….de bezorgdheid geuit van: wat is daar aan de hand in die woonzorgcentra? En dan spreek ik over medio maart hè, dus dan wisten we nog niet veel, van: 'wie heeft daar data over? Wie houdt daar de vinger aan de pols? Is daar genoeg materiaal? Is daar genoeg opleiding? Kunnen ze daar corhorteren? Weten ze hoe ze dat moeten doen? Al die vragen… bijna dagelijks gesteld, maar die vragen zijn dan wel op de RMG gesteld geweest, omdat dat eigenlijk heel uitgesproken regionale materie is. En op de RMG is er dan een eerste verslag gekomen van die werkgroep rusthuizen. … En die bracht daar toen verslag van uit op de RMG, en toen zeiden mensen van de regio's: 'Ja maar, kijk eens, dat is echt regionale materie. Wij hebben geen nood aan een interfederaal comité daarvoor. …Wij regelen dat wel verder met de woonzorgcentra; daar is niet zo'n comité voor nodig.' Dat is voor mij een eeuwige frustratie gebleven, want we hebben gezien wat er daarna met die woonzorgcentra gebeurd is. Ik zeg niet dat het veel beter zou geweest zijn als dat comité zou bestaan hebben; dat weet ik niet, dat durf ik niet zeggen. Maar dat is mijn persoonlijke frustratie." **(HTSC committee member)**

All energy and focus of the HTSC committee in the early weeks went to their prime mission: ensuring sufficient hospital capacity

The interviewed HTSC committee members stated that all attention and energy of the HTSC committee went to ensuring sufficient hospital capacity. It was not certain for a long period whether this mission could be accomplished. Therefore a strong emphasis of the discussions and measures was on the provision of hospital capacity and ICU capacity in particular.

> *"Il faut être franc, notre objectif était d'assurer la capacité hospitalière suffisante, de ne pas se retrouver dépassés en soins intensifs et ne pas devoir faire des choix éthiques, clairement c'était ça, fort influencé par ce qui se passait ailleurs. Ça c'était l'objectif premier. On a tout mis en place pour ça."* **(HTSC committee member)**

The HTSC committee respondents stated that there has never been a policy to refuse the admission of nursing home residents in hospitals. In fact, the admission and discharge policy was left to the hospitals and healthcare professionals. For nursing homes residents, the federated entities gave instructions on outflow (certificate of being not contagious anymore was a prerequisite) but this was not discussed within the HTSC committee.

> *"Oui et donc c'était les maisons de repos qui ne devaient plus accepter le retour de leurs résidents que s'ils avaient ce certificat, ça n'a pas été concerté avec le comité, ça a été pris un weekend. Mais bon, ça n'a pas été concerté avec le comité, et évidemment, les hôpitaux ont réagi en disant que c'était impossible pour eux de certifier que la personne n'était pas contagieuse puisque déjà, ils ne testaient pas l'ensemble des personnes qui sortaient des hôpitaux et ce n'était pas parce que la personne était asymptomatique qu'elle n'était pas contagieuse (..). Et donc ça a suscité beaucoup de remous, de discussions politiques, etc. et je pense que c'est aussi après ça que l'on s'est dit, il y a quelque chose à faire au niveau des maisons de repos."* **(HTSC committee member)**

Yet, some stated that they, due to a lack of knowledge of the sector, overestimated the capacity of nursing homes to deal with COVID-19 (e.g. expertise in infection prevention and control). In any case (besides the initial attempt to create an interfederal committee for nursing homes) during the first couple of weeks of the first wave, it can be deduced from the interviews that no active policy measures were taken or advice was given by the HTSC committee to hospitals on how they could support nursing homes. The interest of the HTSC committee in nursing homes clearly evolved when it became clear how dramatic the situation in nursing homes was. Moreover, the interviewed respondents stated that hospitals started to take initiatives to support nursing homes (see below) on their own. When these initiatives started, also the HTSC committee started to discuss how hospitals could support nursing homes which resulted in a letter to the hospitals (see section 3.3.3.7). This letter depicted some possibilities but did not include (let alone impose) specific measures. Some interviewed respondents had the perception that the HTSC committee shifted the responsibility to the hospital sector.

> *"En tout cas, je pense qu'on s'est dit, qu'est-ce qu'on peut faire ? Donc il y a cette problématique où c'est la catastrophe dans certaines maisons de repos. Qu'est-ce qu'on peut faire au niveau des hôpitaux pour apporter quelque chose et donc ce qu'on a trouvé (…) les hôpitaux pourraient fournir de l'expertise. Je sais que dans le débat, on s'est posé la question, est ce que les hôpitaux peuvent détacher du personnel pour aller dans les maisons de repos ? Donc, du personnel infirmier, etc. (…) Et ce qu'on a pu faire c'est donner des recommandations sachant qu'on ne pouvait pas obliger les hôpitaux à aller dans les maisons de repos et qu'on ne pouvait pas non plus obliger les maisons de repos à accepter l'aide des hôpitaux."* **(HTSC committee member)**

Nevertheless, plenty of reasons were mentioned during the interviews why the HTSC committee did not focus more on nursing homes: it was not within their scope and mission, initial efforts to set up an interfederal committee on nursing homes were unsuccessful, the federated entities are competent for nursing homes, ensuring sufficient hospital capacity required all their time and energy, etc. Despite these explanations several interviewed respondents were frustrated that they could not do more for nursing homes.

4.2.9.2 *Hospitals took initiatives to support nursing homes themselves*

Several hospitals started with initiatives to support nursing homes in their area. The interviewed hospital representatives stated that they considered it as their duty to support nursing homes wherever they could. While it was not their main motive to support nursing home, hospitals have, of course, some benefits (e.g. less admissions would be the result, which is important at a time capacity is under pressure) to support nursing homes. Respondents referred to this argument but stressed that this was not the main objective of hospitals.

Expertise and beyond

From the interviews it can be deduced that the support was mainly focused on expertise sharing (e.g. infection prevention and control, management skills) including the efforts of various hospital professionals (e.g. hospital managers, physician and/or nurse responsible for infection prevention and or control, nurses, psychologists). Yet, according to the respondents many hospitals also provided PPE and equipment, helped with testing, medication (e.g. morphine), psychological support, etc. Respondents stated that in some hospitals, as a result of shutting down the elective medical activities, there was a pool of staff available that could help out in nursing homes. Some hospitals allocated staff from this pool (those who volunteered) to nursing homes. Yet, this is seen as a temporary crisis measure which should not become structural as hospitals also face capacity problems.

> *"We hebben eigenlijk op verschillende vlakken ondersteund. Testing… De eerste week was het vooral rond testing en testmateriaal aanleveren ook; de wissers. Twee… Adviezen rond infectiepreventie natuurlijk ook. Drie, beschermingsmateriaal. En daar waren we heel restrictief in omdat we natuurlijk zelf beperkingen hadden. En vier, personeel. Dus we hebben echt verpleegkundigen naar daar gestuurd."* ***(Hospital sector)***

> *"Ce qui a été fait par les hôpitaux, pas toujours, mais je pense, d'une manière quand même majoritaire, c'est l'aide qui a été donnée par les équipes d'hygiène hospitalière des hôpitaux aux maisons de repos."* ***(HTSC committee member)***

Hospitals are larger organisations with more expertise at the central level

The size of nursing homes is much smaller than that of hospitals. Respondents stated that the number as well as the level of (clinical) expertise is often lower than in hospitals and in many nursing homes the management has no clinical background. In addition, they referred to the fact that there are more nursing homes than hospitals. Although nursing home groups (private and public) exist, there is often only limited support at the group level. Consequently, the interviewed respondents stated that it is not a surprise that more (clinical and management) expertise is available at the central level of hospitals compared to nursing homes. Some attributed the problems in nursing homes also to a chronic lack of attention from policy makers and insufficient investment in staff.

> *"Maar ik denk dat ziekenhuizen door hun aard en door hun grootte wel belangrijke spelers moeten zijn lokaal om in crisis van die omvang een de leiding te nemen. Ik denk… Allez… Je kan dat niet verwachten van individuele woonzorgcentra dat die de capaciteit hebben, ook op management vlak, om daar echt de baas mee te zijn. Kan je dat verwachten van groepen van woonzorgcentra? Ja, meer."* ***(Hospital sector)***

4.2.9.3 *Future collaborations*

Functional agreements between hospitals and nursing homes are insufficient for far-reaching collaboration

From the interviews with hospital representatives it seems that the nursing homes who have a functional relationship with hospitals were given priority for support but most hospitals went beyond that. In any case respondents stated that the "functional relationship" is more an administrative requirement than a real collaboration agreement: more far-reaching collaborations are required in the future.

"en functionele binding… Elk woonzorgcentrum is verplicht om dat te hebben. Er zijn een aantal afspraken die ze moeten maken voor de gevallen waarin patiënten ziekenhuiszorg nodig hebben, dat dat op een vlotte manier gebeurt, en omgekeerd wordt het dan ook vaak gebruikt vanuit de ziekenhuizen om snel bewoners te… Allez, patiënten te kunnen plaatsen in een woonzorgcentrum. Dus veel verder gaat dat niet. Allez, ook wat advies rond infectiepreventie en dergelijke meer, maar het is natuurlijk een gevoelige discussie hè, omdat je daar ook met de bevoegdheidsverdeling…" ***(Hospital sector)***

Short-term solutions

At the short term hospitals and nursing homes can build on the collaboration experiences during the first wave of the epidemic. Several respondents suggested that this collaboration could be brought to a higher level by identifying the domains where support was given and by evaluating how this can be perpetuated. One example given by a respondent is to appoint a network of specialists across the territory (e.g. infection prevention and control, geriatric care) which the nursing homes can consult.

"Dus op middellange termijn – laat ons het zo zeggen – ga je eerder vanuit functies en personen moeten redeneren denk ik. Je hebt specialisten infectiepreventie, je hebt bepaalde geriaters, je hebt spoedartsen. Ik denk dat je op lokaal vlak – en misschien hebben de gemeenten, als het over grote gemeenten gaat, daar een rol in. Die worden geïdentificeerd op voorhand: Kijk, als er zich een nieuwe outbreak voordoet voor die regio… Voor mijn part zijn dat de eerstelijnszones hè, maar dan kunnen zij beroep doen op die en die en die experten." ***(Hospital sector)***

Long term: matching hospital networks with primary care zones

Currently individual nursing homes have functional relationships with individual hospitals. The switch, according to some respondents, needs to be made to agreements between loco-regional networks and nursing homes. This will require that nursing homes have to choose with which loco-regional network they collaborate. If such a choice is not made it will be difficult to harmonize processes and procedures. The interviewed respondents stated that this will not be an easy process since the starting point is not optimal (e.g. in Flanders the primary care zones not always match with the area covered by the hospital network). Also the fragmented responsibilities after the 6th State Reform do not help according.

"Wat geen probleem is, is dat woonzorgcentra afspraken maken met verschillende ziekenhuizen uit een zelfde network. Maar wat ik wel wil voorkomen is dat er buiten het ziekenhuisnetwerk nog een functionele binding is met een ziekenhuis uit een ander netwerk en dan met ons, maar dat ze dan aan het twijfelen zijn van: 'waar moet ik nu terecht?' Ja, dan moet je beter wat kleur bekennen denk ik, en kiezen voor ofwel het ander netwerk, ofwel bij ons. Maar dat je probeert van dat netwerk een beetje vorm te geven." ***(Hospital sector)***

5 PERCEPTION AND IMPLEMENTATION OF MEASURES IN HOSPITALS: RESULTS FROM AN ONLINE SURVEY

Key Findings

- Although criticized as bureaucratic, theoretical and not reflecting the reality on the field, instructions from the HTSC committee were overall evaluated as clear. Clarity was nevertheless hampered by the fact that instructions came from several entities.
- Despite clarity, instructions were not always considered as feasible. In particular, the availability of nursing staff with a specific expertise in ICU was clearly a bottleneck to scale up capacity.
- Major problems reported to increase capacity during the first wave concern equipment (including drugs and PPE) and staff.
- Increasing hospital capacity during the first wave required staff adjustments. In particular, hospitals have deployed nurses from other units to work at the ICU and have composed mixed teams of nurses both with and without ICU expertise. Increasing the patient-to-nurse ratio has only been reported by a small proportion of hospitals. Also, hospitals largely needed additional non-caring staff and allied health professionals.
- To increase ICU capacity during the first wave, hospitals have mainly transformed Post Anaesthesia Care Units and recovery rooms into ICU. Medium care units and operating theatres have also been transformed into ICU.
- During the first wave, hospitals purchased additional ventilators or re-activated old ones. Yet, due to the global impact of the COVID-19 pandemic there was a shortage on the market.
- Some hospitals jointly managed drugs that are essential in ICU at the network level, but it occurred much less in Flanders than in the other regions.
- To free hospital beds by limiting the number of patients, hospitals, especially small ones, used criteria (such as age or comorbidities) in the decision to admit or not a patient in ICU or at the hospital. Some hospitals, almost exclusively in Flanders, set up intermediate care structures. Many hospitals had agreements with nursing homes regarding discharge from hospital back to nursing homes.
- In case of a crisis such as the one of COVID-19, public authorities' involvement is requested by a large majority of hospitals to ensure sufficient hospital capacity. In particular, all respondents agreed that public authorities must keep a strategic (rotating) stock of PPE as well as increase the attractiveness of the nursing profession, via better staffing standards (i.e. less patients per nurse). Almost all agreed that public authorities should organise an external liaison with nursing homes and with GPs.
- Although almost all hospitals have their emergency plan ready, most of them have not been formally approved yet by the municipal authorities. Anyway, hospitals used them during the first wave, with many of them activating the action phase before it was required by the HTSC committee. The hospital coordination cell (with core members supplemented by ad hoc participants) held daily meetings in most hospitals.
- Hospitals are in favour of adding a pandemic plan to the hospital emergency plan (which is already the case for half of the hospitals).
- Hospitals plead for simplification, automatisation and centralisation of capacity data. ICMS should be more user-friendly and evolve towards an automatic extraction from hospital information systems which match other data collection

systems. It should be simplified to reduce labour intensity of a manual coding system and redundant data requests should be avoided. The coding instructions should also be simple and clear.

- **During the first wave hospitals collaborated, in particular to transfer patients and exchange PPE or drugs. These collaborations took place mainly at the loco-regional network level, but also at the provincial level. Only the joint investment in equipment took exclusively place at the loco-regional network level. Yet, several respondents reported that loco-regional networks were not yet mature enough and fulfilling the necessary precondtions (e.g. fast-acting governing body) to manage a crisis efficiently.**
- **Very limited collaboration took place regarding exchanges of staff and non-COVID activities. Nevertheless, hospitals believe collaborations regarding staffing are relevant to cope with a COVID-like crisis. Also, less than half of the hospitals collaborated to distribute the required bed capacity during the first wave.**
- **Splitting-up hospitals into two groups (such as COVID and non-COVID ones) is perceived as an inappropriate measure to deal with such a crisis by a large majority of hospitals.**
- **According to the respondents, many measures can be taken at the loco-regional network level that would be relevant to deal with a crisis such as the COVID-19 pandemic. In particular, it would be relevant to jointly provide PPE and drugs at the network level, to organise the emergency plan and support nursing homes at the network level, and to enhance collaborations related to staff such as joint training and exchanges.**
- **When asked whether public authorities should oblige hospitals to collaborate within their loco-regional network in case of a crisis such as the COVID-19 pandemic, most hospitals in Wallonia are favourable to mandatory collaboration, while opinions are divided in the other regions. If collaboration is made mandatory, the following areas are priorities: joint provision for PPE and drugs, repartition of bed capacity, network emergency plan and support to nursing homes.**
- **In the perspective of a resurgence of the pandemic, hospitals were mostly concerned by the impact of the reduction of non-COVID activities: the impact of delays in care on the patients' health status, the postponement of elective care and the hospital financial situation. Well-being, especially of nursing staff, was also a major concern.**

5.1 Methods

5.1.1 Aim of the survey

A survey was carried out in order to understand how the measures taken and communicated by the Hospital & Transport Surge Capacity (HTSC) committee were perceived and implemented in Belgian hospitals during the first wave of the COVID-19 pandemic. Given time constraints of survey participants, not all measures were covered in the survey (see section 5.1.3.2). Therefore, the results of this chapter have to be read in parallel with the results from the interviews (see Chapter 4).

5.1.2 Data collection process

The survey was conducted online (web-based) using Lime Survey©, an open Source Survey Software for the creation and administration of online surveys.

The Chief Medical Officer (CMO) of all 98 Belgian acute hospitals[ff,gg] was contacted by e-mail and was invited to participate in the online survey. The CMO was encouraged to do so in collaboration with the most suitable person(s) in the hospital (for instance the coordinator of the hospital emergency plan or the head of the ICU). Each hospital (via the CMO) received an access code that could be used by several persons in the institution to complete the survey, so that only one unique response could be sent for each hospital. At the end of the questionnaire, respondents were asked to list who participated in the completion of the questionnaire.

The invitations were sent on 2 September 2020. In total 54 e-mails were sent in Dutch and 44 in French. A reminder was sent on 10 September 2020 to those who did not respond yet and the deadline was extended from 11 September to 14 September. Additional phone calls were made to encourage those who started answering the survey to pursue before the deadline as well as to encourage hospitals in less represented provinces to participate. The online survey was open from 2 September 2020 to 14 September 2020, but a few respondents asked for an extension of the deadline.

5.1.3 Data collection tool

5.1.3.1 Questionnaire development

Based on insights from the interviews (see Chapter 4) and the analysis of the letters from the HTSC committee (see Chapter 3), the questionnaire was developed and distributed both in Dutch and French. The usefulness and the formulation of each question was discussed within the research team and tested with other KCE members. In particular, special attention was paid to avoid redundancy with questionnaires from other surveys (see Chapter 6). The technical aspects were tested by the same persons. A pilot online version of the survey was sent to three CMOs of acute hospitals (one in Flanders, one in Wallonia and one in Brussels) in August 2020. Comments and suggestions from the pilot respondents were taken into account to develop the final version of the survey that was sent on 2 September 2020. In particular, one section was supressed, to ensure the length of the questionnaire was reasonable.

5.1.3.2 Structure of the questionnaire

The complete set of questions asked in the questionnaire is available in Appendix 2.2. The questionnaire is composed of four main parts: hospital capacity; hospital emergency plan; collaboration between hospitals; and future.

Questions on hospital capacity were divided in three sub-topics:

- Assessment of the clarity and feasibility of several measures taken by the HTSC committee. To that purpose, direct quotes from the letters sent by the committee to the hospitals were transcribed in the questionnaire. The quotes were selected to cover a variety of topics (ICU beds, non-ICU beds, staff, etc.) all related to surge capacity within the period from 1 March to 30 April 2020. Insights from the interviews

[ff] Some specialised hospitals were also contacted, because they were on the list of hospitals to whom the letters of the HTSC committee (see Chapter 3) were sent. However, none of them participated in the survey.

[gg] One hospital has two different licence numbers but the same CMO; these two institutions were considered as one hospital.

(on the lack of clarity or feasibility of the measures) were also used to select the most relevant quotes.

- Strategies implemented in hospitals during the first wave of the COVID-19 pandemic to guarantee sufficient capacity in ICU and possible problems to increase ICU capacity during this first wave.
- The (future) role of the public authorities regarding hospital capacity in times of crisis.

Regarding the hospital emergency plan, questions were related to the status of the hospital emergency plan in the respondent's hospital, the way it was implemented during the first wave, a possible evaluation of this plan, and the registration of data into the "Incident Crisis Management System" (ICMS) platform.

Questions on collaboration between hospitals were about actual collaborations during the first wave of the COVID-19 pandemic, past collaborations, relevant collaborations during a crisis, and the level of these collaborations (at the loco-regional network level or not). Respondents also had to reflect on whether or not collaborations within the loco-regional network should be mandatory or not.

Finally, in the last part of the survey, respondents were asked about their major concerns in case of a resurgence or second wave of the COVID-19 pandemic.

The majority of the questions are closed questions (either single or multiple choice) but in most cases an "any other comments" open question allowed respondents to identify new issues not captured in the closed questions. The questionnaire also includes a small number of open questions where respondents were encouraged to answer in their own words. No closed or open question was mandatory.

5.1.3.3 Anonymity

Although the access code to the questionnaire was linked to the name of the CMO and the license number of the hospital (in order to be able to match the online survey information with other data), it was guaranteed that this information will only be made available to the KCE research team, that responses will be treated with confidentiality and will not be linked to the hospital name in published documents.

5.1.4 Analysis

Responses to each closed question (single or multiple choices) were first analysed separately. As no question was mandatory, the number of responding hospitals may be different for different questions or even for different items within the same question. Percentages are calculated with respect to the number of respondents for each particular question (*n*) which is specified in the following figures and tables. For some questions, respondents were asked to give their perception on a four-point scale with two positive and two negative items. Responses to these questions are presented in figures showing the percentage of positive answers on the right side and the percentage of negative ones on the left side.

Most closed questions were followed by the possibility to add a comment or an additional item when relevant. If recurrent, these items were analysed in the same way as the suggested items, and included in the figures and tables. Otherwise, the answers are summarised in the results section of this chapter.

In addition to the univariate analysis, a complementary analysis was carried out to explore the link between responses and some characteristics of the responding hospitals. The following characteristics were taken into account:

- the region and province of the hospital
- the type of hospital (university or not)
- the total number of licensed beds in March 2020, in four categories (less than 200, 200-299, 300-449, 450 and more) for non-university hospitals
- the number of licensed ICU beds on 1 April 2020

- the number of extra ICU beds (surge) created in the hospital on 1 April 2020
- the presence of ECMO devices in the hospital
- the presence of neonatal intensive care (NIC)-beds in the hospital.

Data regarding these characteristics were provided by the Federal Public Service (FPS) Public Health.

The full-text answers to the open questions were analysed by one researcher. Based on a thorough reading of all answers, the major themes were summarised. A second researcher, who has also read the answers to the open questions, critically reviewed this summary.

5.1.5 Limitations of the survey

Due to the limited number of questions, the information retrieved from the questionnaire can only be partial. In particular, we asked hospitals about the measures they implemented to increase hospital capacity. We have, however, no information on the frequency or duration of these measures. In the same way, we have no information about the frequency and duration of collaborations reported by hospitals within or outside their loco-regional network.

Also, we asked respondents to assess if a selection of measures taken by the HTSC committee were clear and feasible. Although we selected measures to reflect a variety of topics related to surge capacity, not all measures were evaluated. We cannot determine if the assessment of these selected measures is representative of the evaluation hospitals would have given to other measures.

Finally, the survey took place in September, a few weeks after the interviews took place. Although we mainly asked respondents to reflect on the past period (first wave), differences in results emerging from the two methods may reflect differences in perceptions because the context (and the stage of the pandemic) changed.

5.2 Results

5.2.1 Response rate and participants' characteristics

Among the 98 contacted hospitals, 59 completed the survey (20 without reminder, 26 after the reminder and 13 after the deadline). In addition, one hospital that only partially completed the survey formally stated that the partial answers could be used for the analysis.

Also, from the pilot phase, we retrieved information from two hospitals, as they stated their answer could be considered as final. Although these hospitals were formally invited to take part in the final version of the survey, they were ensured it was not necessary. This process provided us with exploitable responses for 62 hospitals (38 from Flanders, 19 from Wallonia and 5 from Brussels), corresponding to a 63% response rate (73% in Flanders, 54% in Wallonia and 45% in Brussels).

Table 3 shows some descriptive statistics for the hospitals who responded to the survey, compared to the contacted acute hospitals. Data regarding the number of beds refer to the number of licensed beds in March 2020 (FPS Public Health). When a hospital has sites in several provinces (or regions), the considered province (or region) is the one of the principal site.

Table 3 – Response rate by region, province, hospital type and number of licenced beds

	Survey responses	Acute hospitals	Response rate
Region			
Flanders	38	52	73%
Wallonia	19	35	54%
Brussels	5	11	45%
Province			
Antwerpen	9	14	64%
Brabant Wallon	1	2	50%

Brussel-Bruxelles	5	11	45%
Hainaut	9	14	64%
Limburg	5	7	71%
Liège	5	10	50%
Luxembourg	1	3	33%
Namur	3	6	50%
Oost-Vlaanderen	13	14	93%
Vlaams-Brabant	4	6	67%
West-Vlaanderen	7	11	64%
Hospital type			
Non-university	47	74	64%
University	4	7	57%
University like[hh]	11	17	65%
Number of beds (for non-university hospitals)			
< 200 beds	6	10	60%
200-299 beds	11	18	61%
300-449 beds	19	27	70%
450 beds or more	22	36	61%

[hh] These are acute hospitals without a medical school that are allocated a number of university beds.

In almost all hospitals, the CMO was involved in the completion of the survey but in roughly half of the cases also other persons helped to complete the questionnaire. The persons most often involved are the coordinator of the hospital emergency plan, the Chief Nursing Officer (CNO) or the Chief Executive Officer (CEO). Other persons were sometimes involved such as the human resources officer, a hygienist physician or nurse, the head of ICU, a cluster manager, a policy advisor, administrative services, ICT, purchasing department, etc.

5.2.2 Evaluation of the clarity and feasibility of the instructions from the HTSC committee

From the letters the HTSC committee sent to the hospitals, we selected nine measures (see Table 4) and asked respondents to evaluate their clarity as well as their feasibility, on a four-point scale. Instructions on hospital capacity were also given by other entities during the first wave of the COVID-19 pandemic. We asked hospitals if that led to a lack of clarity for them.

Table 4 – Selected measures from the HTSC committee

Measure	French	Dutch
Measure 1: Immediate release of inpatient beds (17 March)	*« En outre, vous devez libérer immédiatement un nombre maximal de lits d'hospitalisation, à raison de 3-4 lits d'hospitalisation par lit de soins intensifs. »*	*"Daarenboven moet u onverwijld maximaal hospitalisatiebedden vrijmaken, a rato van 3-4 hospitaalbedden per ICU bed."*
Measure 2: Proactive measures for transfers (17 March)	*« Les hôpitaux sont invités à prendre des dispositions proactives, au moins au niveau du réseau locorégional, concernant les orientations possibles lorsque la capacité maximale d'un hôpital est dépassée. »*	*"Ziekenhuizen worden uitgenodigd om minstens op locoregionaal niveau proactief afspraken te maken inzake eventuele verwijzing wanneer de maximale capaciteit van een ziekenhuis overschreden wordt."*
Measure 3: Release 60% of ICU beds (25 March)	*« Chaque hôpital doit garder au moins la capacité suivante disponible pour les patients COVID-19: 60 % du nombre de lits agréés ayant un caractère de "soins intensifs" (lits intensifs). En annexe à cette lettre, vous trouverez par hôpital le nombre de lits pour adultes agréés (ou déclarés par les hôpitaux en tant que lits de soins intensifs) sur lequel se basent les entités. Les autres lits intensifs agréés, par exemple pour les enfants en pédiatrie, ne sont pas pris en compte dans notre régulation, mais peuvent bien sûr être considérés comme une capacité supplémentaire d'appoint et utilisés si nécessaire. »*	*"Elk ziekenhuis dient minstens volgende capaciteit vrij te houden voor COVID-19-patiënten: 60% van het aantal erkende bedden met een karakter "intensieve zorgen" (intensieve bedden). In bijlage bij deze brief vindt u per ziekenhuis het aantal erkende bedden voor volwassenen die door de overheden als basis gebruikt worden. De andere erkende intensieve bedden, bv. voor kinderen binnen E-diensten, nemen we in onze regulatie niet in rekening, maar kunnen uiteraard als bijkomende "surge" capaciteit worden beschouwd en ingezet, wanneer dat nodig zou blijken."*
Measure 4: Release 4 inpatient beds per ICU bed (25 March)	*« Pour chaque lit ayant un "caractère intensif" (agréé), 4 lits non intensifs doivent être prévus dans les hôpitaux. Nous encourageons, en vue d'un bon flux de patients à l'hôpital, d'appliquer le même ratio pour les lits intensifs "surge". »*	*"Voor elk bed met een "intensief karakter" (erkend) dienen 4 niet-intensieve bedden voorzien te worden in de ziekenhuizen. Wij moedigen, omwille van de doorstroom van patiënten in het ziekenhuis, aan om ook voor de "surge" intensieve bedden dezelfde ratio toe te passen."*
Measure 5: Transfers in case of bed capacity saturation (25 March)	*« Dès que 75% de la capacité d'utilisation des lits intensifs (agréés et "surge") ET/OU non intensifs disponibles pour les patients COVID-19 est atteinte, ET/OU s'il ne reste plus que 3 lits intensifs, l'hôpital commencera les renvois sur la base de la concertation avec les hôpitaux du réseau hospitalier locorégional. »*	*"Zodra 75% bezettingsgraad van de voor COVID-19 beschikbare capaciteit van intensieve (erkend en "surge") EN/OF niet-intensieve bedden wordt bereikt, EN/OF er slechts 3 intensieve bedden meer resteren, start het ziekenhuis, op basis van samenspraak met de ziekenhuizen binnen het locoregionaal ziekenhuisnetwerk, de verwijzingen."*
Measure 6: Permanent reserve of hospital beds (24 April)	*« La réservation permanente d'au moins 4 fois la somme du nombre de lits intensifs agréés (a) et supplémentaires (b) réservés : ce nombre de lits (c) doit être réservé pour le traitement non intensif des patients COVID-19. »*	*"Het permanent reserveren van minimaal 4 maal de som van het aantal permanent gereserveerde erkende (a) en bijkomende (b) bedden met intensief karakter: dit aantal bedden (c) moet worden gereserveerd voor de niet-intensieve behandeling van COVID-19-patiënten."*
Measure 7: Extra reflex capacity (30 April)	*« Deuxième phase : le doublement de l'effort de la première phase, c'est la "capacité réflexe supplémentaire". La deuxième phase suppose que l'on soit prêt à doubler la capacité réservée en*	*"Tweede fase: het verdubbelen van de inspanning van de eerste fase, dit is de "bijkomende reflexcapaciteit". De tweede fase veronderstelt het verzekeren van een paraatheid om, binnen een periode van 7*

	permanence dans la phase 1 dans un délai de 7 jours calendrier suivant un signal du Comité. »	*kalenderdagen na een signaal vanwege het Comité, de in fase 1 permanent gereserveerde capaciteit te verdubbelen."*
Measure 8: Transfers in case of saturation reflex capacity (30 April)	*« Dès qu'un hôpital atteint un taux d'occupation de 75% de sa capacité réflexe et/ou qu'il ne reste que 2 lits à caractère intensif, l'hôpital commence les transferts sur la base d'une collaboration avec les hôpitaux du réseau hospitalier loco-régional. »*	*"Zodra een ziekenhuis een bezettingsgraad van 75% van zijn reflexcapaciteit bereikt en/of er slechts 2 intensieve bedden meer resteren, start het ziekenhuis, op basis van samenspraak met de ziekenhuizen binnen het locoregionaal ziekenhuisnetwerk, de verwijzingen."*
Measure 9: Staffing (30 April)	*« L'encadrement (staffing) des lits supplémentaires créés en plus de la capacité USI agréée (25 % dans la première phase jusqu'à 50 % dans la deuxième phase de la "deuxième vague") doit être identique à celui des lits USI agréés. »*	*"Wat de bestaffing van de bijkomende bedden (25% in de eerste fase tot 50% in de tweede fase van de "tweede golf") bovenop de erkende ICU-capaciteit betreft, dient deze te voldoen aan de bestaffing die voorzien is voor erkende ICU-bedden."*

Overall clear instructions…

As shown by Figure 4, overall respondents considered the measures to be clear. The measure that was considered as the least clear is the one related to the release of 60% of ICU beds (measure 3). However, the measure was considered as not clear (definitely not or rather not) by only nine hospitals.

Although the rule of 60% was clear, it was not clear for all respondents what the denominator (licensed ICU beds) was. Or, respondents stated that reality differed from the number of licensed beds known by the public authorities and it was unclear what number of beds had to be declared in ICMS. Since the number of licensed beds can be different from the number of "justified beds[ii]" or "operational beds", it was not clear from which point onwards a bed could be considered as a "surge bed": a bed created on top of operational beds or licensed beds?

> *"Le nombre de lits agréés intensifs n'était pas une notion connue jusqu'à cette date. Le nombre compté par le HTSC ne correspondait pas à la réalité. Même si cette instruction de 60% était clair, il n'était pas clair comment les enregistrer sur la plateforme ICMS."*

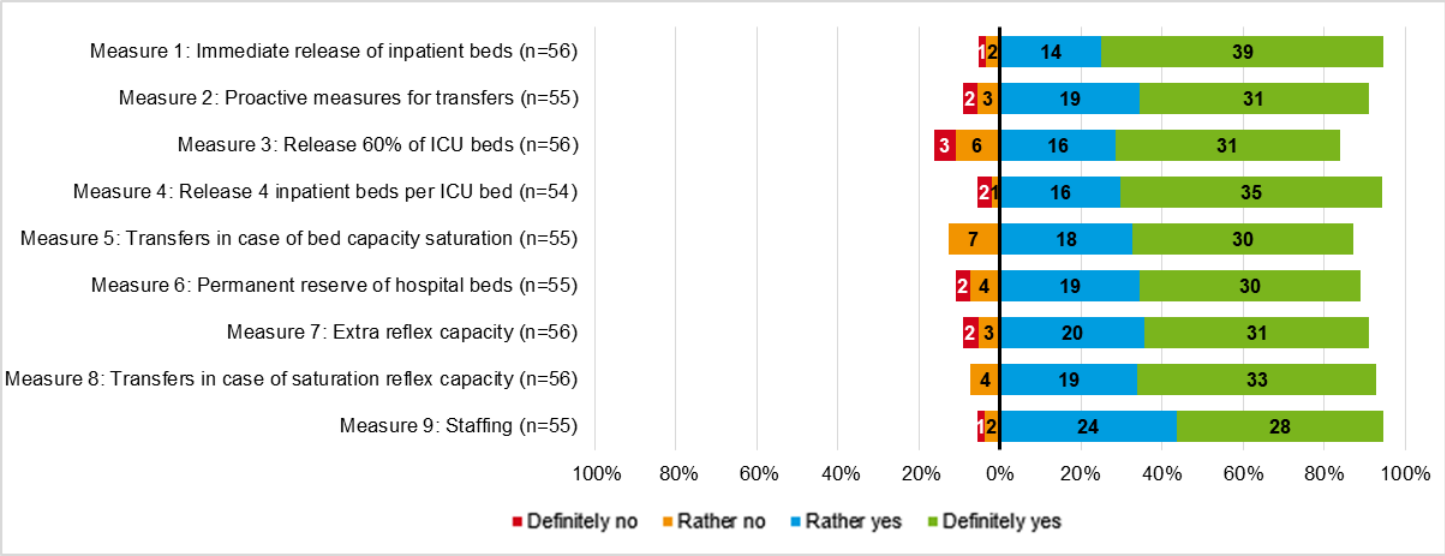
From the open-ended questions we learned that some hospitals perceived the language from the HTSC committee as bureaucratic, theoretical and not reflecting the reality on the field (for example for measure 6). In addition, it was pointed out that some of the terminology used was too vague. For example, no date was given to specify from what moment in time measure 1 had to be implemented. The letter only stated that the release of beds had to take place immediately ("onverwijld"/"immédiatement"), which has important practical implications. Another example is the terminology "pro-active measures for transfers at the loco-regional level" (measure 2). Since no specific guidance was given, some hospitals perceived the instruction as a signal from the public authorities that every hospital had to deal with the measure on its own.

> *"Vous êtes invités à vous débrouiller".*

In measure 4, it was not clear what was meant by "keeping free" (i.e. the timeframe in which these beds need to be available for COVID-19 patients).

[ii] Justified beds are a central concept in the calculation of the hospital budget for Belgian hospitals.

Figure 4 – Perceived level of clarity of the measures communicated by the HTSC committee



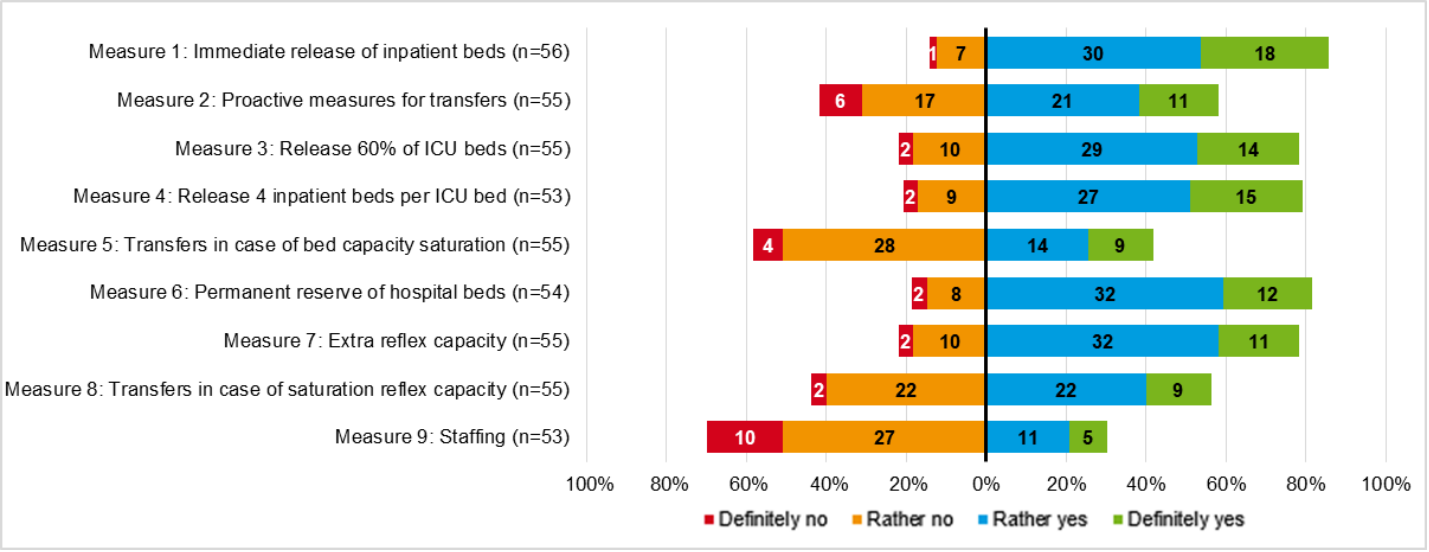
…but not always feasible

While in general the measures were well understood, the instructions were not necessarily perceived as feasible (see Figure 5). In particular, measure 9 stating that staffing for extra ICU beds should be the same as staffing for licensed ICU beds, has been judged as not feasible (definitely not or rather not) by 70% of the respondents, and by all respondents in the province of Hainaut, Limburg and West-Vlaanderen. Nurses with a specific expertise were clearly a bottleneck to scale up capacity. After all, hospitals, in general, match the operational beds and the required staffing levels for ICU with the number of beds that are financed via the hospital budget (i.e. the justified beds in the Budget of Financial Means). As such, the number of operational beds at intensive care units can be lower than the number of licensed beds. Since the staffing is based on operational beds, upscaling to the level of licensed beds (or beyond) can in general not be done with nurses with ICU expertise. Consequently hybrid models were deployed where nurses with similar (but not equal) expertise were used whether or not in combination and under supervision of nurses with ICU expertise (see also section 5.2.4 below).

Measures regarding the transfer of patients (measures 2, 5 and 8) were also difficult to implement (evaluated as definitely not feasible or rather not feasible by respectively 42%, 58% and 44% of the respondents). In general, the same hospitals faced difficulties to implement these measures, i.e. hospitals that found measure 2 and/or 8 was (definitely or rather) not feasible, stated the same for measure 5. Measures related to transfers were particularly difficult to implement in Hainaut, where seven out of the nine responding hospitals judged the three measures as definitely or rather not feasible, and in Limburg, where all five responding hospitals evaluated measure 5 as definitely or rather not feasible.

The hospitals who perceived these measures as unfeasible gave various reasons. One group of respondents stated that loco-regional networks were not mature enough and that prerequisites (efficient governance at network level to take operational decisions in time of crisis, licensed hospital networks, payment at hospital network, same admission criteria for ICU, culture of trust) were absent. Therefore, hospitals mainly focused on their own local situation and some regarded other hospitals (even in time of crisis) as competitors. Another group of hospitals (mainly from areas with very high prevalence rates during the first wave) stated that hospitals from the same loco-regional network were very soon all confronted with capacity problems due to a shortage of competent medical and nursing staff. As they are located in the same area they were all saturated at the same time, requiring action (and transfers) at the supra-regional level rather than the loco-regional level. One respondent stated that the pressure from the public authorities to make arrangements at the loco-regional network helped to start collaborations after the first wave. Others stated that a strong intervention from public authorities will be needed to force collaboration within (some) networks). According to some respondents, the federal health inspector played a facilitating role.

Figure 5 – Perceived feasibility of the measures communicated by the HTSC committee



The other five selected measures (1, 3, 4, 6 and 7), related to the release of hospital beds, were evaluated as definitely feasible or rather feasible by a large majority of the respondents (from 78% to 86%).

Concerning the immediate release of inpatient beds (measure 1), some stated that the natural daily flux allows to quickly respond to changing capacity needs. One hospital described the measure as disproportional. After all, keeping hospital beds empty causes delays in non-COVID care. Given that the average length of stay is 6 days it means that about one in six inpatient hospital beds are becoming available every day. Therefore, it is better to not keep these beds empty for COVID-19 patients when not required. Due to the daily flux of patients, it is possible when a pro-active policy exists to free up beds at short notice in case they are required. Others indicated that it takes time to free up occupied beds and cancel elective procedures. Moreover, a respondent stated that it was only possible to free up beds because there was a national guidance. Furthermore, measure 1 was also perceived as a blunt measure. In hospitals with a large number of inpatient beds for cancer patients, for instance, it is more difficult to make this capacity (3-4 non-ICU beds for each ICU bed) available by postponing elective care without collateral damage compared to hospitals that have a lot of inpatient hospital beds in use for elective (surgical) care.

As smaller hospitals usually have only a limited number of ICU beds, keeping 60% of their ICU beds for COVID-19 patients (measure 3) implied de facto that the entire ICU had to be reserved for COVID-19 patients. As a result, other hospital admissions requiring ICU were no longer possible or additional ICU beds had to be created (e.g. recovery rooms). Also, by larger hospitals it was reported that this measure caused problems for non-COVID patients requiring ICU that could not be postponed (e.g. stroke or AMI). Consequently, the ethical question “whether ICU beds could be claimed for COVID-19 patients at the expense of other patients requiring ICU” was raised.

Measure 4 imposed hospitals to keep empty 4 inpatient beds per ICU bed. Some respondents considered this measure unrealistic and disproportional, especially when the incidence rates decreased after the first wave. Moreover, since it was also asked to apply this rule to the potential (not filled) COVID-19 ICU beds (i.e. the ICU beds that were reserved for COVID-19 patients but not yet filled were also included in the calculation of the number of non-ICU beds that needed to be reserved for COVID patients). Especially for hospitals that reported to have a large proportion of ICU beds to their overall number of hospital beds (or surge ICU beds, which was strongly advised) it caused problems to staff these non-ICU COVID units with competent staff.

The theoretical number in measure 6 is perceived as not reflecting the reality on the field. In fact, with the restart of postponed care this was not realistic and hospitals did not comply because they assessed it as disproportional and too much affecting non-COVID patients. They prefer a more flexible approach and indicated that they are capable to free up non-ICU COVID beds when required at short notice.

A doubling of the capacity in seven days (measure 7) is said to be very difficult to achieve especially given that the backlog of postponed care needed to be treated. On the other hand it was indicated that when the epidemic curve increases at the pace of the first wave a period of seven days is probably too long in some areas.

Instructions coming from several entities hampered clarity

Although the instructions received from the HTSC committee seemed to be clear from the hospitals’ point of view, receiving instructions from multiple entities led to a lack of clarity for 67% of them (37 out of 55 responding hospitals).

Respondents who answered that receiving instructions from multiple entities hampers clarity, were asked to provide some examples. Some of the answers were not directly related to the question (i.e. instructions from different public authorities) but were pointing out to some general shortcomings and problem areas. Recurrent themes were the rapid changing instructions, the perception of the measures being theoretical and not matching what happened on the field, the lack of clarity and changing nature of data requirements (Sciensano and ICMS), the numerous ad hoc surveys and questions from public authorities and umbrella organisations (they gave the impression that public authorities were not well coordinated

and were perceived as a burden for hospitals in time of crisis) and the bad timing of communication (i.e. Friday evening).

5.2.3 *Issues to increase hospital capacity*

Major problems with equipment (including drugs and personal protective equipment) and staff were reported during the first wave

For a list of actions, we asked the hospitals to evaluate how the implementation of the hospital emergency plan went, on a four-point scale, from very difficult to very easy. Respondents who answered that the implementation of a given action was difficult or very difficult were invited to provide further explanation. Although this question was part of the hospital emergency plan section of the survey (see Table A. 7 in Appendix 2.2), it provides a good insight on the general difficulties faced by hospitals during the crisis.

Overall, nothing was easy during the first wave but all staff and departments did a lot of efforts to deal with the crisis. Several respondents stated that they had to install working groups around certain themes because there were not enough national guidelines (e.g. testing staff, visitor regulations, screening ambulatory patients).

As shown in Figure 6, finding personal protective equipment (PPE) was the most difficult action (evaluated as very difficult by 60% of the respondents and as difficult by 33%). Most hospitals also found that the management of drug stock levels was very difficult (17%) or difficult (52%). It was also difficult to find staff (evaluated as difficult or very difficult by 56% of the responding hospitals) and equipment such as ventilators (50%). Regarding the increase of length or frequency of staff shifts: 53% of the responding hospitals found it difficult or very difficult but it must be noted that 10 hospitals (all located in Flanders) said this situation did not apply to them.

Due to the global spread of the COVID-19 pandemic, there was a general shortage of ICU medication (e.g. sedation), ventilators, PPE, etc. In addition, the lockdown measures also caused practical problems (e.g. contractors in lockdown and not available for construction works required to make architectonical changes). These shortages also caused excessive prices for PPE, ventilators, etc.

On the contrary, actions related to patients were evaluated as easy or very easy by a majority of the respondents: the triage of patients was evaluated as easy or very easy by 80%; cohorting patients by 72% and cancelling elective procedures by 66%. However, regional differences were found for the latter: among the 20 hospitals that reported difficulties in cancelling elective procedures, 11 of them are located in Wallonia (61% of the Walloon responding hospitals) and 5 in Brussels (all responding hospitals in that region). Among the 36 responding Flemish hospitals, only 5 (14%) stated that the cancellation of elective procedures was difficult. Respondents encountered the following difficulties when cancelling elective and unnecessary care. First, many discussions were needed within hospitals to agree on which medical interventions could be postponed. Next, the annulation of so many appointments on such a short notice required a huge logistic/administrative operation.

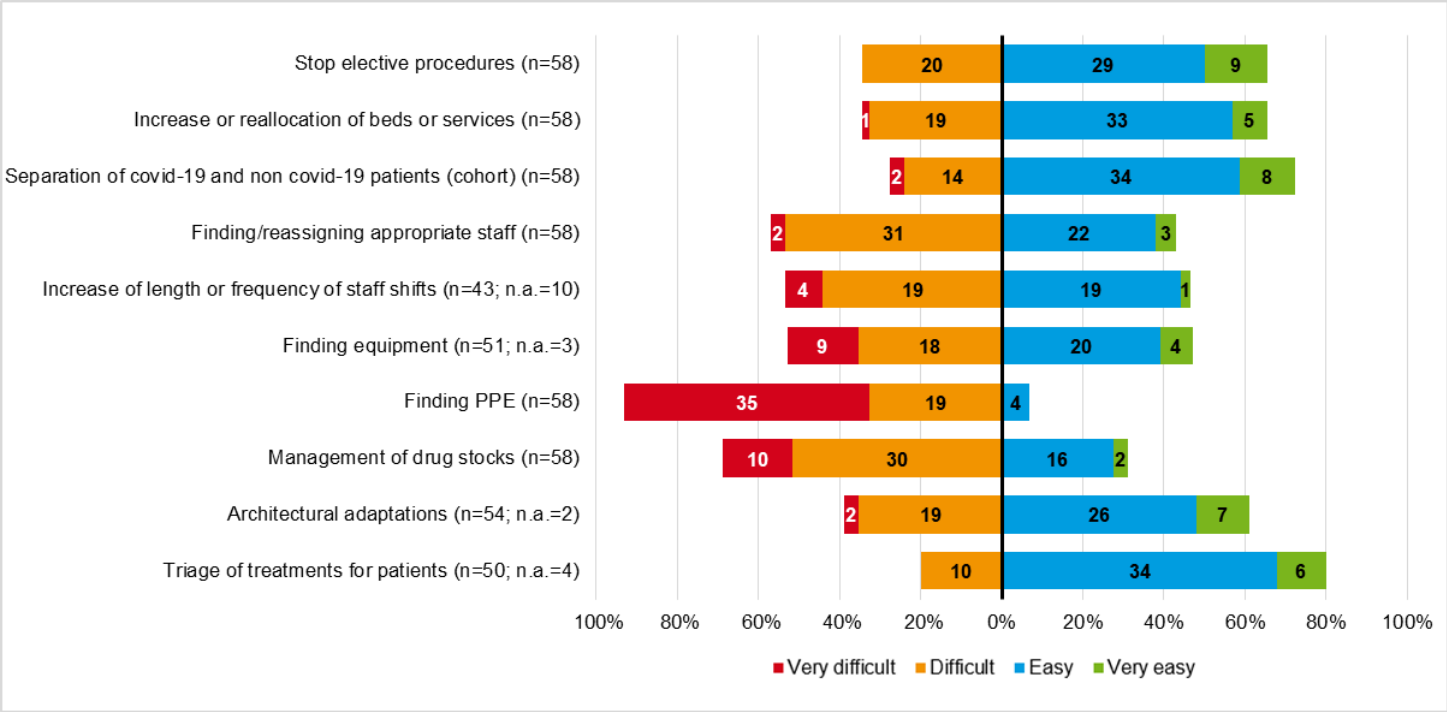
Actions concerning hospital beds did not seem to pose major problems either: 66% stated that it was easy or very easy to increase or reallocate beds or services and 61% to make architectural adaptations. Nevertheless, it was more difficult in Wallonia than in Flanders: 11 of 18 Walloon respondents (61%) found it was difficult to increase or reallocate beds or services and the same proportion found it was difficult to make architectural adaptations. In Flanders, only 8 out of 36 responding hospitals (22%) reported difficulties to increase or reallocate beds or services and 6 out of 32 (19%) to make architectural adaptations. In Brussels, the proportions are respectively 100% and 50% (out of four respondents).

The reallocation of units to COVID-units resulted in discussions within the hospital. First, in some hospitals there were discussions with the medical staff because they wanted to preserve the regular medical care. It also caused difficulties with staff having to change discipline (expertise, culture, etc.). Re-allocating staff was not easy because of competency problems (i.e. ICU competencies), staff being anxious, shortage of staff, concertation with social partners, and the lack of PPE did not help to motivate them to work on a COVID-unit. Although a large proportion of staff showed willingness to

work overtime or work more than the regular contract time, it was mentioned that working on COVID-units is physically (i.e. because of PPE) and mentally exhausting. Given the long duration of the crisis, it was mentioned that this is not the most appropriate strategy. Also some hospitals reported an increasing rate of absenteeism.

To separate (cohorting) COVID from non-COVID patients there were some practical infrastructural changes that caused problems (e.g. creating a separate entrance at the emergency department). Another problem was the lack of testing capacity and the period of uncertainty (awaiting test results).

Figure 6 – Perception of the ease to implement actions within the hospital emergency plan



Lack of nurses with ICU expertise, space and PPE were major issues to increase hospital capacity

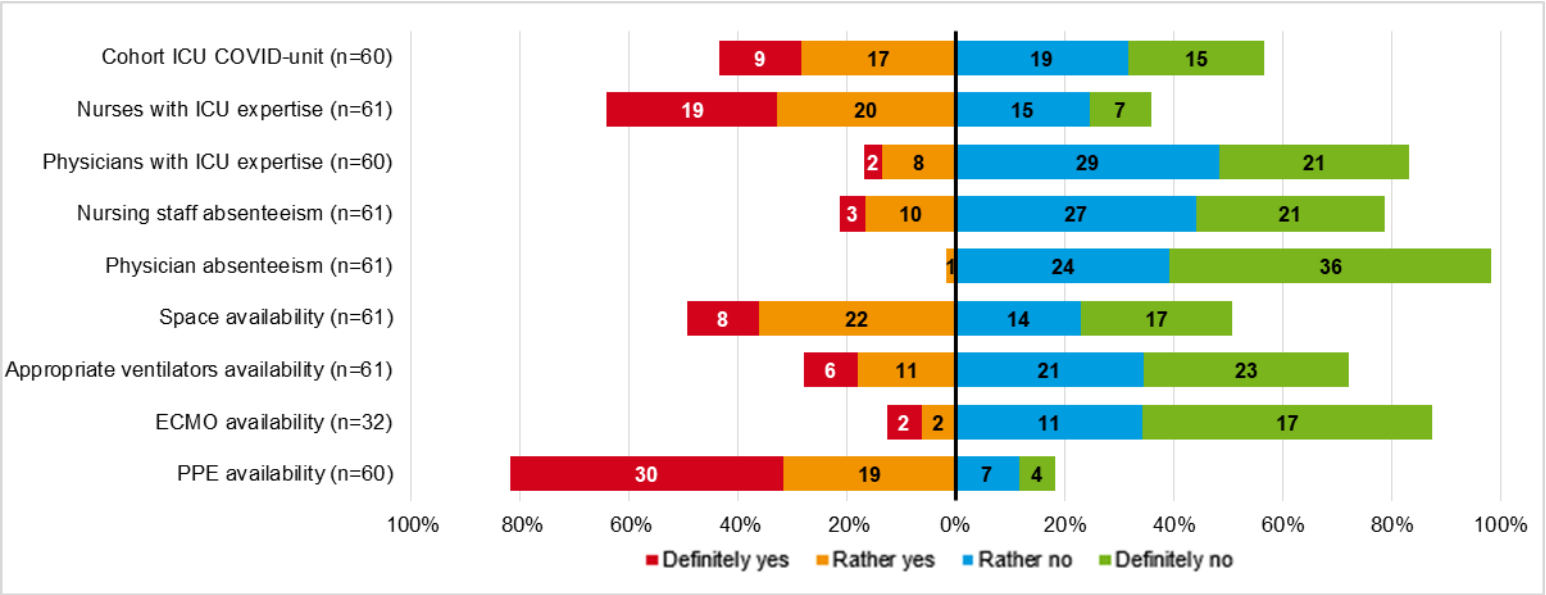
When asked to what extent they experienced problems to increase their ICU capacity during the period going form 1 March 2020 to 30 April 2020 (Figure 7), 82% of the respondents found that they had to deal with PPE availability issues. Several respondents emphasized that finding PPE was the major issue for them, certainly at the beginning of the crisis. For smaller hospitals (in terms of beds) it was more difficult than for larger ones.

Also, 64% of the respondents stated that the lack of nurses with ICU expertise was an issue, while this was not the case for physicians with such expertise (mentioned as a problem by only 17% of the respondents). Availability of sufficient space and the possibility to separate the ICU for COVID and non-COVID patients were judged as (definitely or rather) problematic by respectively 49% and 43% of the respondents. Two respondents mentioned that the cancellation of elective activity was a key reason explaining why they did not face space availability issues they would have faced otherwise. Cohorting was more difficult in hospitals with few ICU beds: among the nine respondents stating it was definitely problematic to separate ICU for COVID and non-COVID patients, the average number of licensed ICU beds is 14 (median is 9) while it is 24 (median is 14) for the 15 hospitals reporting it was definitely not problematic.

Staff absenteeism (physicians and nurses) appeared to be less a problem when ICU capacity had to be increased (evaluated as definitely or rather problematic by respectively 2% and 21% of the respondents). However, in the Brussels region, four out of the five responding hospitals stated that nursing staff absenteeism was rather problematic. The problem is also more pronounced in small hospitals: half of the responding hospitals with less than 200 beds marked nursing staff absenteeism as rather or definitely problematic.

Also equipment availability (ventilators and ECMO) did not appear as a major problem, as respectively 28% and 13% of the respondents evaluated this as definitely or rather problematic. In particular, the availability of ventilators was not an issue for university hospitals: all four responding hospitals stated it was rather or definitely not problematic. Note that only 32 hospitals answered the question regarding ECMO devices. Indeed, only 35 hospitals in Belgium dispose of such devices, 21 of them took part in the survey and they all answered to that particular question. Note that five hospitals without ECMO devices also answered the question.

Figure 7 – Problems experienced to increase ICU capacity during the period 1 March – 30 April 2020



The actual increase in ICU capacity is related to the problem experienced

From 4 March onward, hospitals were asked to register daily their hospital capacity data into the ICMS and from 17 March they were asked to do everything they could to create extra ICU capacity (see also Chapter 3). Using ICMS data from 1 April, we calculated the increase in ICU capacity as the ratio between newly created ICU beds and licensed ICU beds. The 62 hospitals that responded to the survey created extra ICU beds amounting to 66% of their number of licensed ICU beds (numbers on 1 April 2020; median is 59%, minimum is 0% and maximum is 250%).

As shown in Table 5, for each of possible difficulties to increase the number of ICU beds, hospitals that experienced problems created less extra capacity than those that for whom the establishment of extra ICU beds posed no problems. For instance, hospitals that stated that space availability was definitely problematic created on average 36% extra ICU capacity, while those reporting that space was definitely not problematic created on average 80% extra ICU capacity.

Table 5 – Extra ICU beds actually created on 1 April 2020, by problems experienced to increase ICU beds

Problems to increase ICU beds	Definitely yes	Rather yes	Rather no	Definitely no
	Average percentage of extra ICU beds created (median)			
Cohort ICU COVID-unit	38% (40%)	50% (63%)	79% (83%)	66% (77%)
Nurses with ICU expertise	53% (50%)	75% (59%)	66% (63%)	66% (77%)
Physicians with ICU expertise	46% (46%)	55% (48%)	62% (60%)	75% (79%)
Nursing staff absenteeism	38% (50%)	65% (59%)	61% (58%)	73% (77%)
Physician absenteeism		42% (42%)	67% (60%)	64% (58%)
Space availability	36% (38%)	64% (59%)	63% (55%)	80% (83%)
Appropriate ventilators availability	59% (41%)	62% (50%)	65% (63%)	67% (50%)
ECMO availability	35% (35%)	84% (84%)	60% (50%)	63% (50%)
PPE availability	57% (54%)	64% (50%)	68% (77%)	116% (83%)

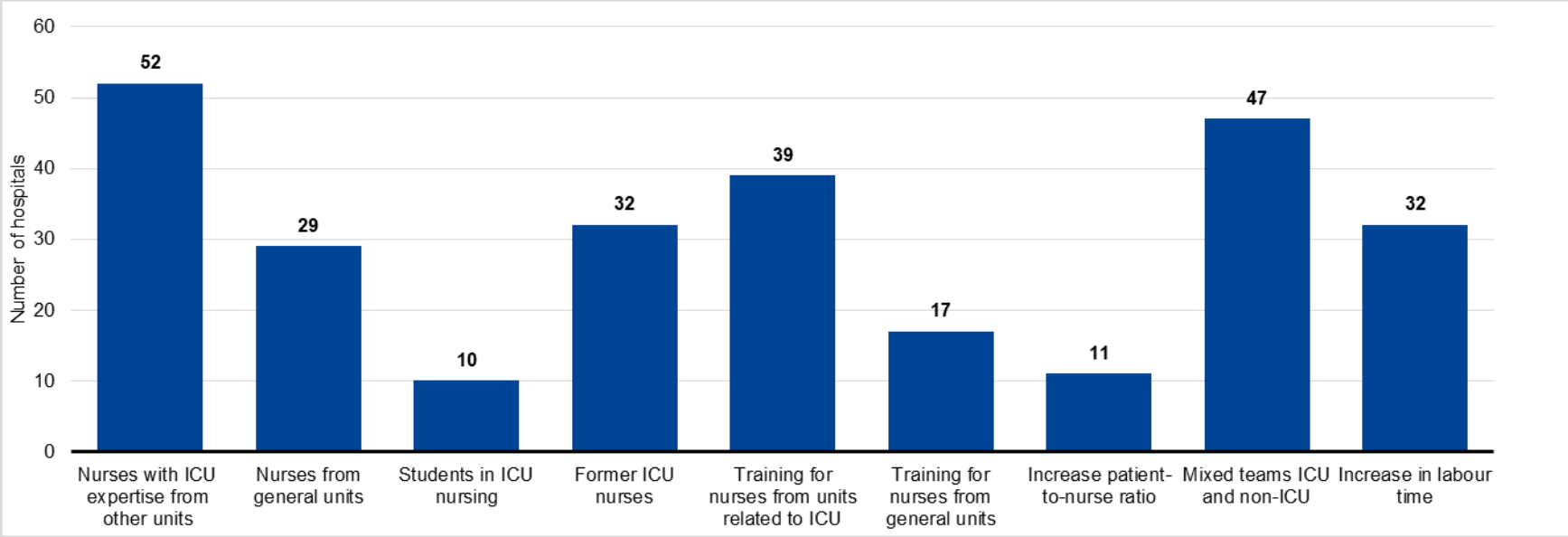
The number of respondents in each category is given in Figure 7. Source of data for extra capacity created on 1 April: FPS Public Health.

5.2.4 Strategies related to staff to ensure sufficient ICU capacity

Increasing hospital capacity required staff adjustments

Among all strategies to increase hospital capacity suggested in the survey (see questions C3 to C8 in Table A. 5 in Appendix), the ones related to staff (in particular nurses) were the most often pointed out by respondents. Virtually all respondents selected at least one of these strategies (see Figure 8). Adjustments in working agreements (i.e. increasing labour time) had to be made for nursing staff (Figure 8) as well as for physicians (Figure 9). Additional non-care staff was required, especially cleaning staff (Figure 10).

Figure 8 – Strategies related to nursing staff implemented by hospitals to ensure sufficient ICU capacity during the period 1 March – 30 April 2020



Mixed teams and training, but no increase in patient-to-nurse ratio

As shown in Figure 8, almost all hospitals (52 out of the 62 respondents – 84%) deployed nurses at the ICU who were not originally affected there but had an expertise in intensive care (such as those working in emergency departments, recovery rooms, operating theatres, etc.). They also had to create mixed teams including nurses both with and without expertise in ICU: 47 hospitals (76%) implemented such a strategy. Thirty-two hospitals (52%) relied on former nurses with ICU expertise and 29 (47%) deployed nurses from general units to work at the ICU during the crisis. On the contrary, only 10 hospitals (16%) deployed students. To work in an ICU, small hospitals (less than 200 beds) relied more than others on nurses from general units and much less on nurses from units with ICU expertise such as emergency departments or recovery rooms, on students and on former nurses.

Alongside, hospitals provided training to nurses from units related to ICU (39 hospitals – 69%) but to a lesser extent to nurses from general units (17 hospitals – 27%). Training to nurses from units related to ICU was much more common in Flanders than in the other regions (79% of the responding hospitals, compared to 40% in Brussels and 37% in Wallonia). Half of the respondents (32 hospitals – 52%) said they had to adapt working agreements (i.e. increase in labour time) of the nursing staff, but Flemish hospitals relied less on this solution than those in Brussels and Wallonia.

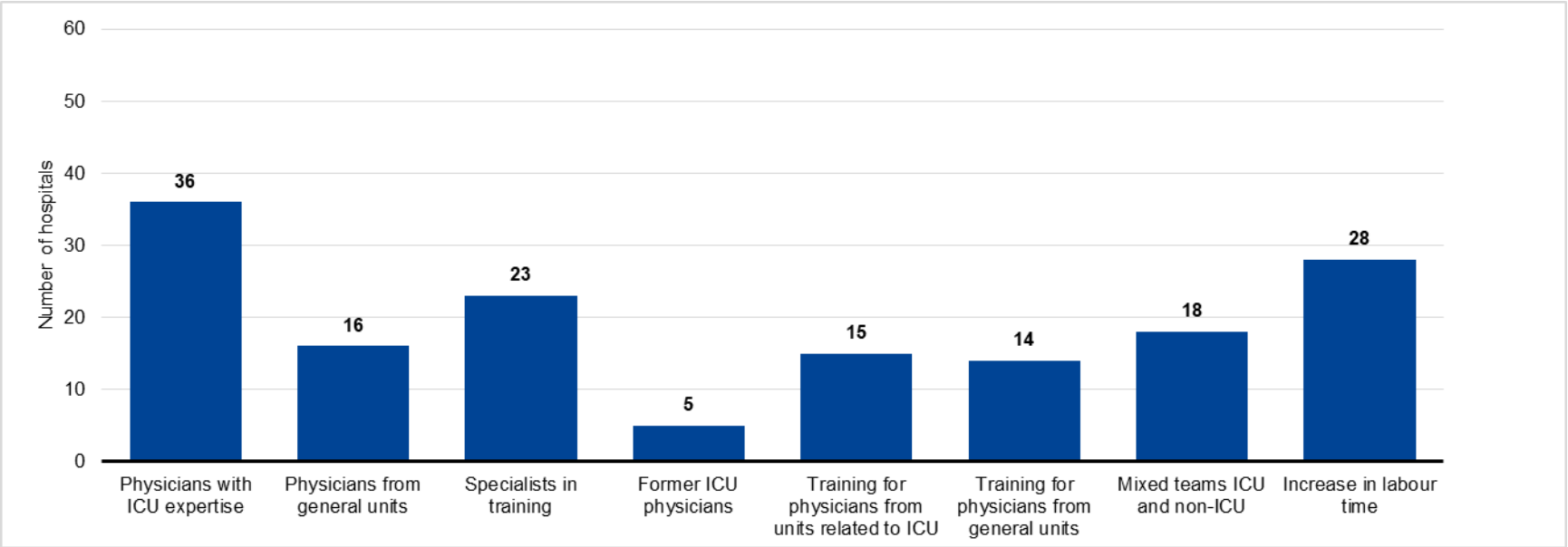
Among the other strategies related to staff that were implemented by the hospitals during the crisis, respondents cited the recruitment of temporary staff, the deployment of teachers in nursing or nurses working in other sectors as well as the transfer of some nursing tasks to available physicians. Another possible strategy was to increase the patient-to-nurse ratio. This strategy was applied by 11 hospitals (18%), mainly located in the province of Limburg, Brussels and Vlaams-Brabant. It is, however, not possible to ascertain whether the above-mentioned strategies to increase the number of nurses has had an impact on the necessity to adapt the number of patients per nurse.

Availability of medical staff was less an issue, and solutions existed, at least for large hospitals

As previously shown (Figure 7), hospitals experienced less issues in finding physicians with ICU expertise than nurses with such expertise. Several large hospitals mentioned that they had sufficient intensivists and therefore did not have to put any strategy in place in order to find physicians with ICU expertise. As shown in Figure 9, 36 hospitals (58%) relied on physicians who were not originally affected at the ICU but had an expertise in intensive care (such as anaesthetists or physicians working in recovery rooms or emergency departments). Among the ten hospitals reporting that the number of physicians with ICU expertise was problematic (Figure 7), eight relied on such strategy, and one small hospital transferred its COVID patients to another hospital. Sixteen hospitals (26%) reported deploying physicians from general units to work at the ICU. Globally, larger hospitals tended to rely more on physicians from units that are ICU-related, while small hospitals relied more on physicians from general units. When large hospitals deployed physicians from general units to work at the ICU, it was generally in addition to physicians from ICU-related units. Specialists in training were also deployed at the ICU in 23 hospitals (37%), mostly large or university ones. Only five hospitals relied on former ICU physicians.

As for nurses, training for physicians took place in some hospitals. Fifteen hospitals organised a fast-track training for physicians usually working in units related to intensive care, although only nine of them reported actually relying on such physicians to work in ICU during the crisis. In the same way fourteen hospitals (for a large part the same as the previous ones) organised a fast-track training for physicians working in general units, but only nine of them actually deployed them at the ICU. In addition, both kinds of training were much more common in Flanders than in the other regions. Only three hospitals in Wallonia (amongst the 19 responding hospitals) organised such fast-track training, and none in Brussels.

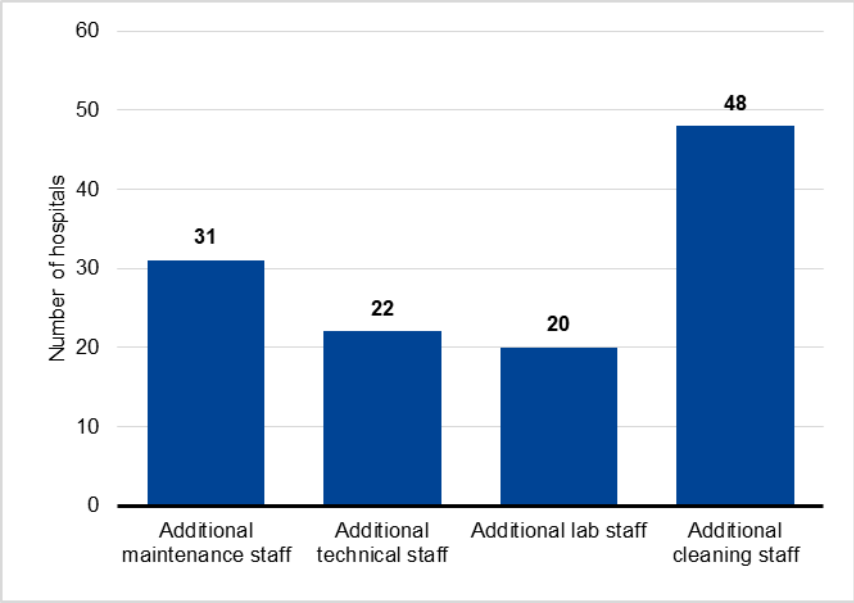
Figure 9 – Strategies related to medical staff implemented by hospitals to ensure sufficient ICU capacity during the period 1 March – 30 April 2020



Large involvement of non-caring staff and allied health professionals

Alongside nurses and physicians, hospitals heavily relied on additional staff in other domains (see Figure 10) such as cleaning staff (48 hospitals – 77%), maintenance staff (31 hospitals – 50%), technical staff (22 hospitals – 35%), laboratory staff (20 hospitals – 32%) but also logistic staff, administrative staff, paramedical staff, physiotherapists, speech therapists, occupational therapists or staff to monitor dressing and undressing procedures. In addition, one hospital mentioned that even if no additional staff was deployed, the current staff had to work many additional hours.

Figure 10 – Strategies related to other staff implemented by hospitals to ensure sufficient ICU capacity during the period 1 March – 30 April 2020



5.2.5 *Strategies related to beds to ensure sufficient ICU capacity*

Recovery rooms and PACU have been transformed into ICU

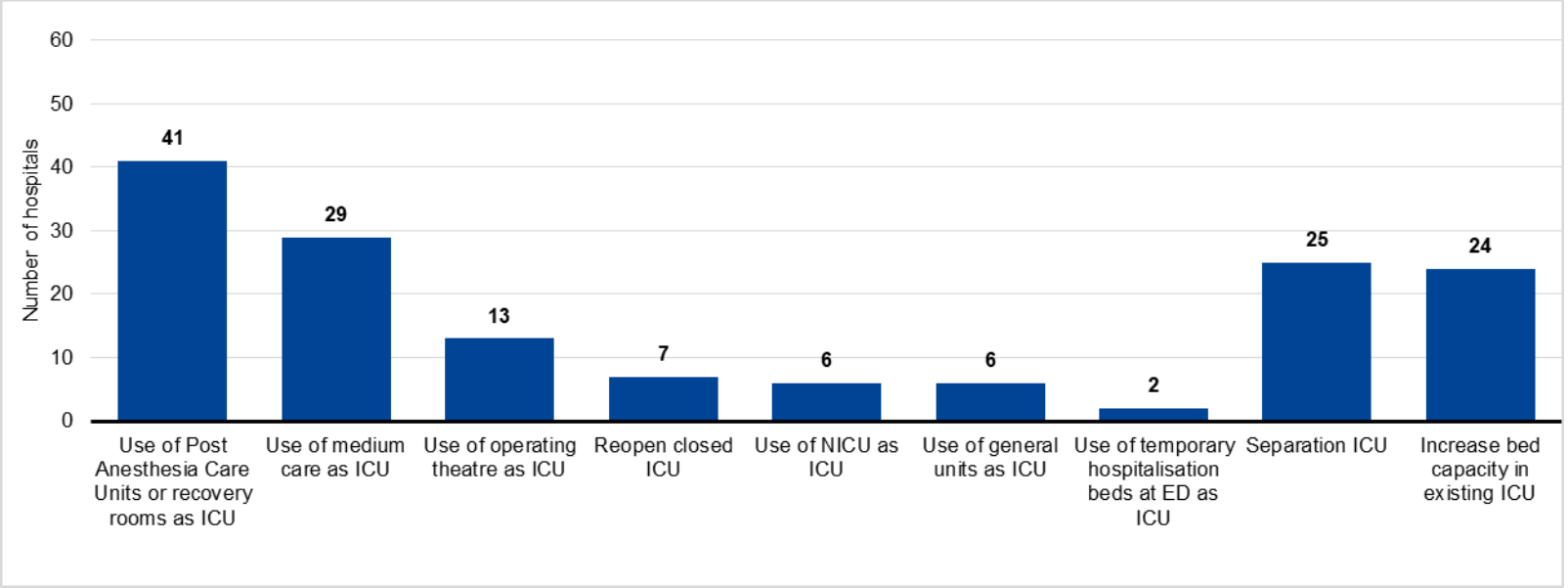
To create extra ICU capacity, most hospitals (41 hospitals – 66%) used Post Anaesthesia Care Units or recovery rooms as shown on Figure 11. Twenty-nine hospitals (47%), mostly large ones (with more than 450 beds or university hospitals), used medium care units. Some of the responding hospitals (21%) used operating theatres as ICU. One hospital mentioned that, although a recovery room was transformed into ICU, it was for non-COVID patients. Also, one hospital mentioned the transformation of a medium care unit into a general unit.

Other strategies were used exceptionally, for example: an ICU that was previously closed, a NICU[jj], a general unit, the temporary hospitalisation beds at the emergency department, the shock room at the emergency department, or a former catheterisation laboratory. In addition, these strategies were not used in combination: only one hospital used both NICU and general units as ICU.

In the existing ICU, 39% of responding hospitals increased the number of beds and 40% made small architectural adjustments to divide the unit into two separate areas (COVID and non-COVID) (14 hospitals – 23% – did both).

[jj] It must be noted that among the six hospitals that reported using NICU as ICU during the crisis, only three have licensed NIC beds.

Figure 11 – Strategies related to beds and services implemented by hospitals to ensure sufficient ICU capacity during the period 1 March – 30 April 2020



Note: 35 hospitals selected the strategy "use of Post Anaesthesia Care Units as ICU" in the survey and 6 additional hospitals mentioned they used recovery rooms as ICU, they were counted together. Use of temporary hospitalisation beds was not a suggested strategy in the survey but 2 hospitals added it. One hospital also mentioned using the shock room at the emergency department as ICU and one other using a former catheterisation laboratory as ICU (not shown on the figure).

5.2.6 *Strategies related to equipment to ensure sufficient ICU capacity*

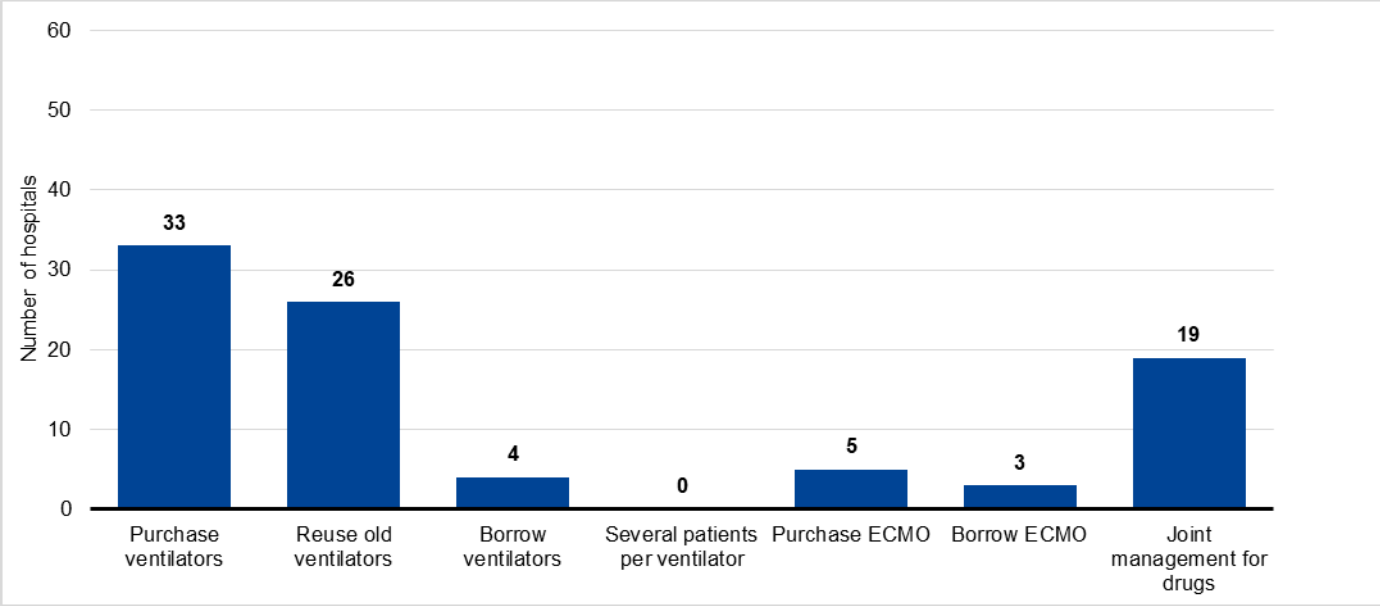
Additional ventilators were purchased or old ventilators were re-activated

Regarding equipment (Figure 12), 33 hospitals (53%) stated they purchased new ventilators and 26 hospitals (42%) re-used old ones. One hospital continued using ventilators that were prepared to be decommissioned. Another mentioned a partnership with nursing schools to recover old ventilators. Borrowing ventilators from other hospitals was exceptional (only mentioned by four hospitals).

The hospitals that purchased new ventilators are mainly located in Wallonia (79% of the responding Walloon hospitals purchased new ventilators compared to 45% in Flanders and 20% in Brussels). All responding hospitals in the provinces of Liège and Namur purchased new ventilators. Among the 17 hospitals that experienced problems regarding availability of ventilators during the crisis (Figure 7), 13 purchased new ventilators from which seven in addition re-used old ones. Although it was not suggested in the survey, seven hospitals spontaneously stated they used ventilators from other services, in particular from operating theatres and one mentioned renting additional ventilators. One hospital also said that it had purchased additional disposables required for using the ventilators and other equipment such as vapotherm, syringe drivers and volumetric pumps. One hospital stated it used optiflow and anaesthesia equipment. Five hospitals purchased new ECMO devices in addition to the ones they already have and three hospitals (one of them starting without any ECMO device) borrowed such machines from other hospitals. Also, one hospital mentioned fabricating its own airflow systems.

Finding mechanisms to use a ventilator for more than one patient is a strategy that has not been used in Belgium (see Figure 12). However, one hospital said it used one ECMO device for two patients.

Figure 12 – Strategies related to equipment implemented by hospitals to ensure sufficient ICU capacity during the period 1 March – 30 April 2020



Regional differences in networks jointly managing drugs for ICU patients

For drugs that are essential in ICU, 31% of responding hospitals (19 hospitals) used joint management at the loco-regional network level, although it occurred much less in Flanders (16% of the responding hospitals) than in Wallonia (53%) and Brussels (60%). Without going as far as to a joint-management, one hospital said that data were shared within the network to monitor drug stock levels.

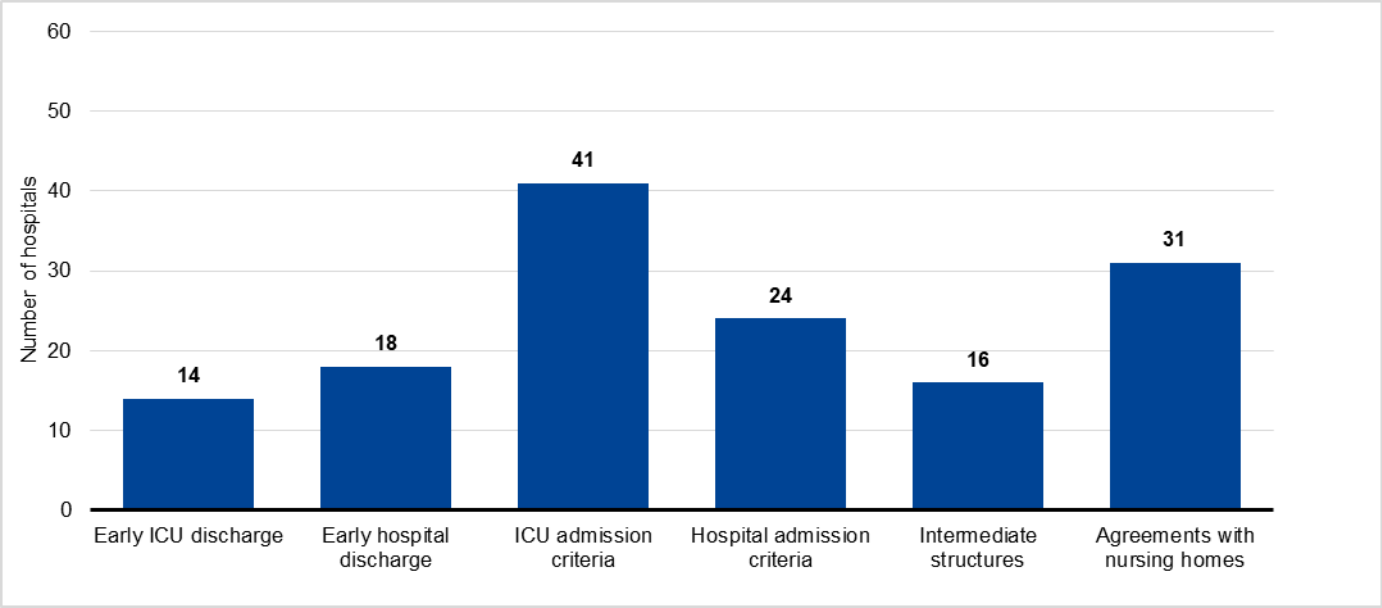
5.2.7 *Strategies related to patients to ensure sufficient ICU capacity*

Also strategies to restrict the number of patients were applied

Also strategies related to patients were questioned, such as strategies to free hospital beds by limiting the number of patients, either by restricting admissions or by reducing patients' length of stay. Ten hospitals (including three of the four responding university hospitals) did not implement any of the strategies suggested in the questionnaire. Two of them explicitly mentioned that such strategies were not necessary for them. One indicated that the regular criteria were sufficient.

Eighteen hospitals (29% of the respondents) said they applied a policy of early discharge from the hospital and 14 hospitals (23%) applied such a policy for discharge from the ICU (see Figure 13). One hospital mentioned clear "do not resuscitate" instructions for all admitted COVID-patients. Half of the hospitals (31) had agreements with nursing homes regarding discharge from hospital back to the nursing home. One hospital explained it created a nursing homes task force under the supervision of a retired pulmonologist. Another described the organisation and good adherence to advance care planning in collaboration with nursing homes (advance care planning for all patients and refinement based on an additional measurement tool).

Figure 13 – Strategies related to patients implemented by hospitals to ensure sufficient ICU capacity during the period 1 March – 30 April 2020



Small hospitals set up criteria for admission

Forty-one hospitals (66% of the responding hospitals) said they used criteria (such as age or comorbidities) in the decision to admit or not a patient in ICU (see Figure 13). Two hospitals mentioned such criteria had been defined but not used. In addition, 24 hospitals (39%) used such criteria for hospital admission. These strategies were mainly used by small hospitals: for instance five of the six responding hospitals with less than 200 beds implemented admission criteria at the ICU. Only nine of the 56 larger hospitals used such criteria. The same applies for hospital admission criteria (five out of six small hospitals vs 13 out of 56 larger hospitals).

Intermediate structures in Flanders

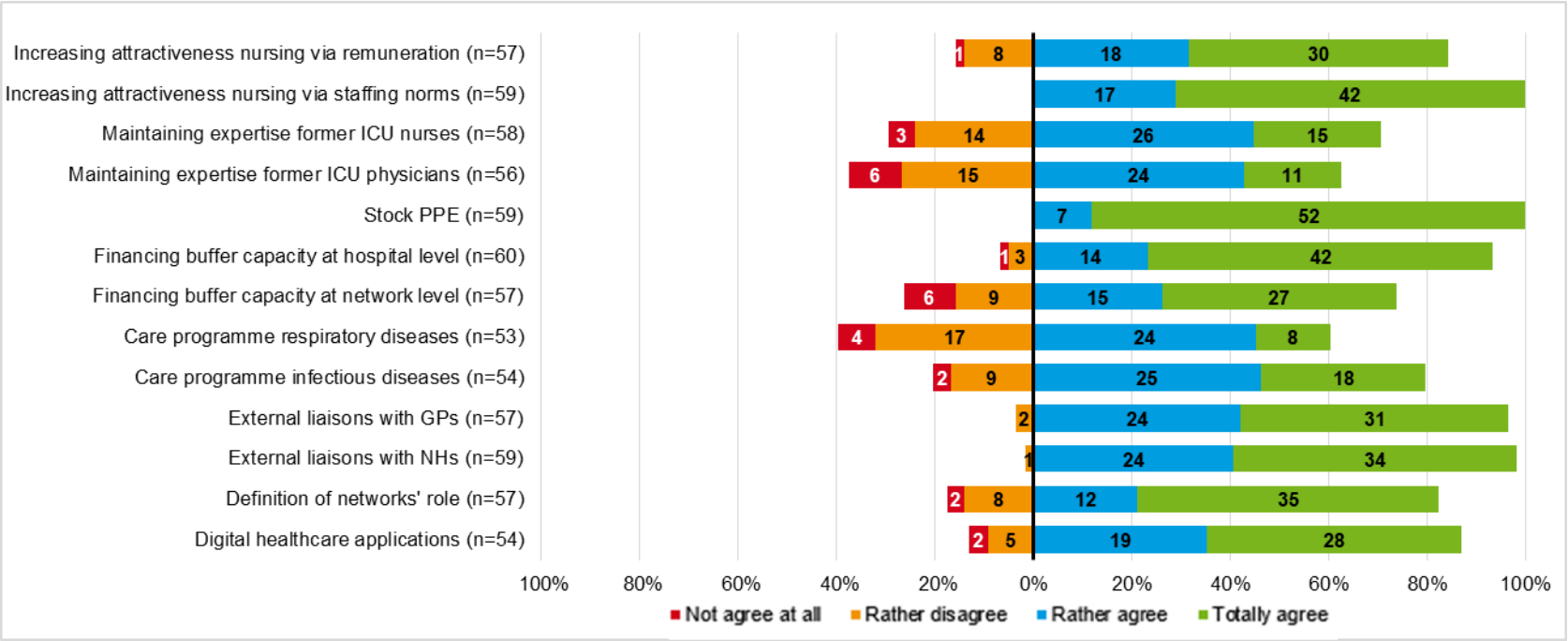
Intermediate structures refer to structures dedicated to patients in need of care (e.g. support activities of daily life) but no hospital care. Setting up such intermediate structures is a strategy that was used by 16 responding hospitals (26%) (see Figure 13). One hospital mentioned setting up a rehabilitation department for COVID patients after the contagious period. Nevertheless, only three out of the 19 responding hospitals in Wallonia set up such intermediate structure, and none in Brussels compared to 13 among the 38 responding hospitals in Flanders.

5.2.8 Role of public authorities to increase hospital capacity

A clear role for public authorities

We asked hospitals how they see the role of public authorities so that sufficient hospital capacity can be provided in case of a future crisis such as the COVID-19 crisis. Almost all responding hospitals totally agreed with at least one of the suggested areas of involvement. In case they did not agree, they were invited to explain why. As shown in Figure 14, in general, public authorities' involvement in various areas of action is demanded by a large majority of hospitals.

Figure 14 – Perceived role of public authorities to ensure sufficient hospital capacity in case of a crisis such as the COVID-19 crisis



Involvement of public authorities is requested in various areas

All responding hospitals agreed (totally agree or rather agree) that public authorities must keep a strategic (rotating) stock of personal protective equipment and increase the attractiveness of the nursing profession (see Figure 14). This attractiveness should be ensured through an improvement of the staffing norms rather than by an increase in remuneration (although still 48 respondents (84%) rather agree or totally agree with that option). The respondents that do not agree with "increasing attractiveness of the nursing profession via remuneration" indicated that salary is only a temporary motivator. They stressed that higher priority should be given to a change in working conditions by adapting staffing standards (i.e. less patients assigned to one nurse) and the content of the work (i.e. task substitution).

Almost all responding hospitals (rather or totally) agreed that public authorities should organise an external liaison with nursing homes (98%) and with general practitioners (GPs) (96%).

Most respondents also believed that public authorities should pay for having buffer capacity, at the hospital level (93%) more than at the loco-regional network level (74%). Financing buffer capacity is not regarded as an efficient or priority solution by all. Some respondents argued that financial means are limited and should not be used to finance empty beds. The respondents that were not in favour of financing buffer capacity at the network level referred

to the problems currently encountered with organising services at the network level. They consider the loco-regional networks as dysfunctional or too immature and therefore preferred to have buffer capacity at the level of individual hospitals. One respondent indicated that a more pragmatic approach than financing buffer capacity is to downscale elective and postpone non-necessary care in case of capacity needs.

For 87% of the respondents (47 hospitals), public authorities should guarantee the development of digital healthcare applications, although the terminology has been considered as too vague.

The creation of a care programme for infectious diseases is also something that public authorities should ensure, according to 43 respondents (80%). It is less the case for a care programme for respiratory diseases (selected by 32 respondents – 60%). The respondents that did not agree with a respiratory care programme as a potential solution for the future argued that in future crises respiratory problems might not be the main problem. In addition, a respondent indicated that infection prevention and control is already well structured in hospitals.

Forty-seven respondents (82%) stated that public authorities should ensure that the role of loco-regional networks is defined. Those who did not agree indicated that the crisis demands a supra-regional approach, that hospitals are professional enough to make arrangements at the most appropriate level when required, and that loco-regional networks do not work well.

Opinions were more divided regarding the role of public authorities in maintaining the knowledge and expertise of former ICU staff members, for example via additional training (71% agree for nursing staff, and 63% for medical staff). Maintaining expertise of former ICU nurses and physicians can be very difficult for several reasons. First, people who left the field have their reasons. Opponents argued that it will be difficult to motivate them to return to ICU care or to keep this specific expertise up to date when not involved in daily ICU practice. Several respondents indicated that it is important to improve working conditions such that retention rates improve. Moreover, for nurses the importance of improving staffing standards was emphasized as an important element to increase retention rates.

Only few additional suggestions were given. A recurrent theme was the reinforcement of primary care services (e.g. role of primary care zones, external liaison function of hospitals). Yet, respondents also stated that when these additional roles become structurally embedded, an appropriate payment is an essential precondition.

5.2.9 Hospital emergency plans

A hospital emergency plan (HEP) defines what needs to be done in case of a disaster inside (e.g. blackout, chemical accident, hospital bacteria, etc.) or outside (e.g. chain collision, flood, attack, etc.) the hospital. Each hospital must have such plan. We refer to Chapter 1 for a description of the procedure for approval and the content of a HEP.

Most plans were ready but not approved yet

One of the steps in the procedure of approval is the advice of the municipal authorities. This advice can be favourable, favourable with conditions or unfavourable.

As shown by Table 6, 92% of the responding hospitals submitted their HEP to the municipal authorities for approval but most of them (64% of the respondents) had not received a response on 1 March 2020. Most of the hospitals that received a response (for a large part between November 2019 and January 2020), the advice was favourable without conditions (25% of the respondents). None of the respondents had an unfavourable answer. One respondent (not accounted for in Table 6) mentioned that the status differed depending on the considered site of the hospital. Indeed, the HEP (and its approval) is made for each hospital site, while the survey has been carried out at the hospital level.

Table 6 – Status of the hospital emergency plan on 1 March 2020

	Flanders (n=32)	Wallonia (n=17)	Brussels (n=4)	All respondents (n=53)
Submitted but no response yet	20 (63%)	12 (71%)	2 (50%)	34 (64%)
Favourable	8 (25%)	4 (24%)	1 (25%)	13 (25%)
Subject to conditions	2 (6%)	0 (0%)	0 (0%)	2 (4%)
Unfavourable	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Not submitted yet	2 (6%)	1 (6%)	1 (25%)	4 (8%)

Hospitals activated the HEP action phase before it was required by the committee

Hospitals were asked to provide the date at which they activated the information phase, action phase 1 and, if they did so, action phase 2 of their HEP. Thirty-nine hospitals provided data about the three phases. On Figure 15, each line represents one of these hospitals. Twenty-four of them activated action phase 1 of their HEP before it was made mandatory on 14 March. For most hospitals this happened in the week before 14 March, but in some hospitals, action phase 1 was already activated at the end of February or early in March. These are mostly very large non-university hospitals: five of the nine hospitals who activated action phase 1 before 5 March have more than 450 beds.

Some hospitals activated action phase 1 after 14 March, but not long after (the last one on 19 March). From Figure 15, it can also be seen that some hospitals activated the information phase of the HEP quite early (the first one already in January). These are also mainly very large hospitals: among the 12 non-university hospitals who activated the information phase before March, eight have more than 450 beds.

Out of the 39 hospitals considered here, 22 activated action phase 2 (before 30 April). Most of them did it very shortly after 14 March, some of them even switched directly form information phase to action phase 2. A few hospitals activated the second phase later on.

Figure 15 – Date of activation of the HEP phases per hospital

Each horizontal bar represents one hospital (n=39).14 March 2020 is the date at which all hospitals were asked by the HTSC committee to activate the action phase of their HEP (see Chapter 1).

From 17 June, hospitals were authorized to scale down to the information phase provided that all hospitals of a loco-regional network do so at the same time. This is only possible if the entire network has a COVID-19 load (confirmed and suspected) of less than 15% of the licensed ICU beds. Between 19 June and 1 July, at least 19 of the 25 loco-regional networks in the country have confirmed scaling down to information phase (data FOD – SPF).

Hospitals are in favour of adding a pandemic plan to the hospital emergency plan

In half of the responding hospitals (27 out of 52), the current HEP already contains a pandemic plan (defined as a specific part of the HEP related to the occurrence of a large-scale infectious disease in the general population). The vast majority of the respondents (49 out of 53 – 92%) believed such a pandemic plan should be included in the HEP. However, one respondent stipulated that such a pandemic part could not provide an answer to all problems hospitals were faced with during the first wave (e.g. lack of PPE). All except one of the hospitals already having a pandemic part in their plan stated such part should be included.

Recurrent elements that should be included in such a pandemic plan are: identification outbreak infectious diseases (intern and extern) and activation of the plan, specification of different phases and thresholds, up- and downscaling of regular care, upscaling staff and (ICU) beds, composition of the hospital coordination cell, communication, isolation and cohorting of patients, PPE and medication stock management, collaboration within the loco-regional network and with primary care, visitor rules and instructions, instructions for ambulatory patients, education of staff, data collection and analysis, transition from acute phase towards a situation of long duration.

According to the minority that did not support the idea of adding a specific pandemic plan, the HEP has the objective to have processes in place in hospitals that enable them to react quickly in acute crisis situations. Although the acute onset of the COVID-19 pandemic created an acute crisis, the duration of the pandemic requires a different approach. A respondent stated that the pandemic preparedness (e.g. early warning systems, stock management) is more a role of the public authorities than that of individual hospitals. Another argument against a specific pandemic plan given by respondents is that the type of pandemic can differ.

Hospital coordination cell: core members supplemented by crisis-dependent participants

When the HEP is activated, the hospital coordination cell (HCC) takes over the coordination and command and makes subsequent decisions for the hospital. The mode of activation of the HCC and its nominative composition are mentioned in the HEP. However, additional members can be called upon depending on the emergency. Respondents to the survey had to list the persons who took part in the HCC in the period from 1 March to 30 April 2020. Some possible members were suggested, but respondents had the possibility to add more. As shown in Table 7, in all 57 responding hospitals, the CMO and the CNO took part in the HCC. In all but two Flemish hospitals, the CEO took part in the HCC and in two other ones there was no HEP coordinator in the HCC. In most hospitals, also a hospital physician or nurse hygienist and the head physician of ICU were member of the HCC. In addition to these suggested members, 22 hospitals added the head physician or nurse of the emergency department and 17 added someone from the communication department. These functions are among the ones that usually are a member of the HCC, whatever the type of crisis.

Apart from the usual members, pharmacists, infectiologists, pulmonologists and the logistic department were each cited as members of the HCC by nine hospitals. Many other participants were cited (those cited by 5 hospitals or less are not shown in Table 7) coming from diverse hospital departments: purchasing, technical, facility, clinical biology or labs, care management, ICT, administrative and financial, medical board, internal medicine, surgery and anaesthesia, prevention, biosafety, bed management, geriatrics, liaison with nursing homes, etc.

It is worth noting that several hospitals explained that at least part of the added members were not present at all meetings, but were invited when needed. In addition, one respondent stated that it is important to keep the HCC as flexible as possible, i.e. not increasing the list of mandatory

members, but let the opportunity to invite additional participants when needed, also depending on the type of crisis. For instance, although the involvement of infectiologists and labs was relevant in the COVID-19 crisis, it may not be in other cases. One hospital created two cells: a medical one and an organisational one. One large hospital with several sites mentioned the HCC was supplemented by a central working group and a hospital command post as decision-making body in each individual site.

Table 7 – Participants in the hospital coordination cell in the period 1 March – 30 April 2020

	Number of hospitals	% of responding hospitals (n=57)
Chief medical officer	57	100%
Chief nursing officer	57	100%
Chief executive officer	55	96%
Coordinator HEP	55	96%
Hospital physician hygienist	52	91%
Hospital nurse hygienist	42	74%
Head physician ICU	45	79%
Head (physician or nurse) emergency department*	23	40%
Communication department*	17	30%
Pharmacist*	9	16%
Logistic department*	9	16%
Infectiologist*	9	16%
Pulmonologist*	9	16%
Human resources department*	9	16%
Purchasing department*	6	11%
Technical department*	6	11%
Facility department*	6	11%
Clinical biology departments – labs*	6	11%

*Members with a * were not suggested in the survey but were added by the respondents. Members cited by 5 or less respondents are not shown in the table.*

The hospital coordination cell held daily meetings in most hospitals

As shown in Table 8, the HCC had daily meetings in 71% of the hospitals and three to six times a week in 26% of them. Four hospitals (from which two answered "daily" and two answered "three to six times a week") specified that the HCC met daily at the beginning or at the peak of the crisis, then decreased the frequency to three to six times a week. Four hospitals even reported that the HCC had more than one meeting per day at the peak of the crisis.

Table 8 – Frequency of HCC meetings during the period 1 March – 30 April 2020

	Number of hospitals	% of responding hospitals (n=58)
Daily	41	71%
3 to 6 times a week	15	26%
2 times a week	1	2%
Once a week	1	2%
Less than once a week	0	0

Letters from the HTSC committee were discussed within the hospital coordination cell

In almost all hospitals (57 out of the 58 responding hospitals) most, or even all, of the letters from the HTSC committee were discussed within the HCC: 55% discussed all of them and 43% most of them. The only hospital in which the letters were not discussed in the HCC pointed out that the letters were not comprehensible enough and contained irrelevant information. This hospital indeed ranked four of the nine measures in Table 3 as (rather or definitely) not clear (see Figure 4).

The HCC appealed to several existing or new committees for support

In an open-ended question, respondents were asked to describe the advisory committees that were set up by the HCC or existing committees it appealed to for support. Several committees were reported by the respondents. The most commonly reported was the hospital infection prevention and control committee, yet a plethora of other committees was reported such a nursing home support committee, HR committee, laboratory committee, PPE committee, etc.

Hospitals are engaged in internal evaluation processes

Most hospitals carried out an internal evaluation of their HCC (54 out of the 58 responding hospitals – 93%) and/or their HEP (44 hospitals – 76%).

Hospitals plead for simplification, automatisation and centralisation of capacity data

The HEP also defines data registrations on the available hospital capacity in the "Incident Crisis Management System" (ICMS) platform. In the letter of 4 March, the HTSC asked hospitals to register daily their hospital capacity data in ICMS and send these before 11am to the federal authorities.

In an open-ended question, respondents were asked to describe the main potential areas of improvement for the ICMS data in the context of a pandemic compared to the current registration (September 2020). Several respondents gave suggestions to improve the ICMS registration. Respondents stated that it is important to make the ICMS platform more user-friendly and evolve towards an automatic extraction from hospital information systems which match other data collection systems. They proposed to use one central data platform. Given the labour intensity of a manual coding system it was suggested to simplify the system (e.g. less variables, one data submission per hospital and not for each hospital site) and to avoid redundant data requests (e.g. ECMO data via ad-hoc survey and ICMS).

Other suggestions were to make the coding instructions simple and clear. Also, to enhance the motivation of hospitals to register the necessary data there should be a benefit in return (e.g. data transparency, feedback reports, dashboard at regional level). Although some respondents stated that the ICMS registration is too detailed, others suggested to register additional variables such as type of isolation rooms (negative and positive pressure), the total capacity of the ICU including the maximal number of additional capacity (not only the available beds). The frequent and fast changes in terminology and definitions were considered as a burden and a source of frustration for hospitals. Several respondents stated that this should be avoided in the future.

Another comment was that the ICMS data only give a static view on hospital capacity (one moment in a day) which can rapidly change. Nevertheless, several respondents questioned the appropriateness/usefulness of a daily ICMS data registration.

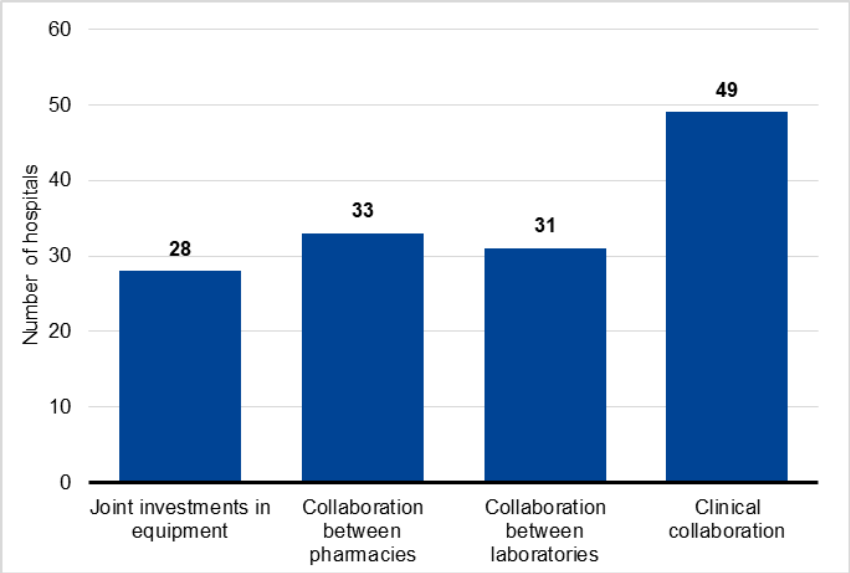
5.2.10 Collaboration between hospitals

Mainly clinical collaboration at the loco-regional network level before the crisis

When asked about the existing collaboration at the loco-regional network level before the COVID-19 crisis, only four hospitals (among the 58 responding hospitals) stated that there was no collaboration at all. For the vast majority of the responding hospitals (93%) at least a form of collaboration existed, although two of them mentioned that the collaborations did not coincide exactly with the boundaries of the loco-regional network. As shown by Figure 16, clinical collaboration was the most prevalent form of collaboration within the loco-regional network before the crisis: it existed in 49 hospitals (84%). Collaboration between pharmacies existed in 33 hospitals (57%) and collaboration between laboratories in 31 hospitals (53%).

Twenty-eight hospitals (48%) stated they had joined investments in equipment at the loco-regional network level before the crisis, however this practice was much more common in Wallonia and Brussels than in Flanders. Only 13 out of the 35 responding Flemish hospitals (37%) had joined investments in equipment at the loco-regional network level before the crisis compared to 11 out of 18 in Wallonia (61%) and four out of five in Brussels (80%). Other existing collaborations at the loco-regional network level before the crisis included: joint purchasing, patient care pathways, complementary trainings, exchange of information about good practices, joint quality improvement projects, ICT collaboration, collaboration regarding human resources and meetings between the management committees.

Figure 16 – Forms of existing collaboration at the loco-regional network level before the COVID-19 crisis



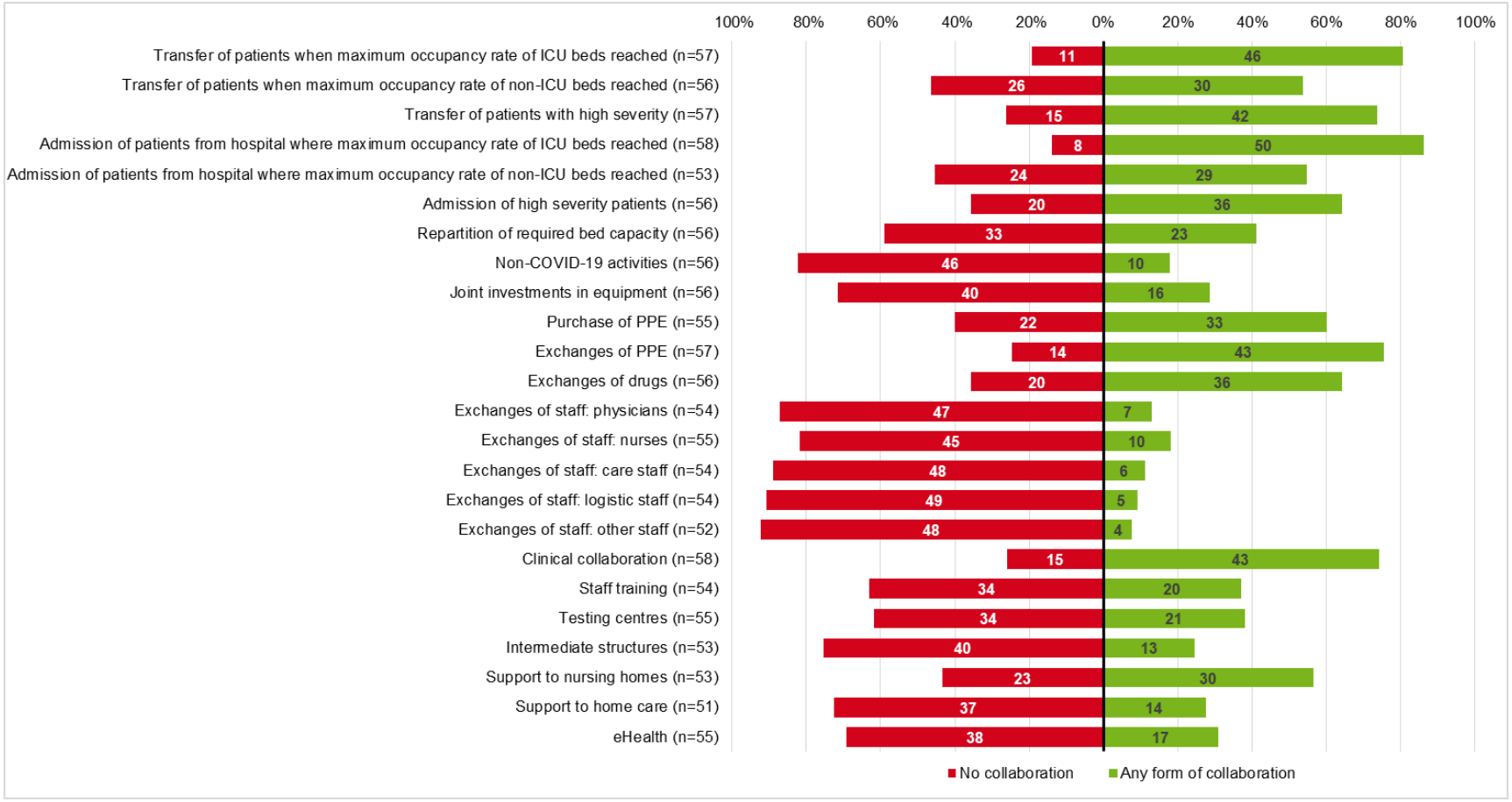
n=58.

Area of collaboration during the crisis: transfers of patients and exchanges of PPE

Several letters from the HTSC committee encouraged hospitals to collaborate with each other. In the survey, hospitals were asked, for several forms of possible collaboration, if they collaborated with hospitals belonging to their loco-regional network, hospitals within the same province and/or hospitals outside the province. For each suggested area of collaboration, the respondents had the opportunity to choose one or more options, as well as the possibility to indicate the absence of collaboration at any level.

Figure 17 shows areas in which hospitals said they collaborated during the first wave of the COVID-19 crisis, whatever the level at which this collaboration took place (loco-regional network level, provincial level or beyond). Most of the responding hospitals (74%) had a form of clinical collaboration with other hospital(s) during the crisis. This is not surprising as this form of collaboration was already common at the loco-regional network level before the crisis (see Figure 16). It is worth noting that eleven hospitals mentioned a clinical collaboration at the network level before the crisis, but not during the crisis. Reversely, five hospitals had no clinical collaboration at the network level before the crisis, only during the crisis. During the crisis, the large majority of hospitals collaborated with others for exchanging PPE and/or for the transfers and admissions of patients. However, little collaboration occurred to exchange staff.

Figure 17 – Areas of collaboration during the first wave of the COVID-19 crisis

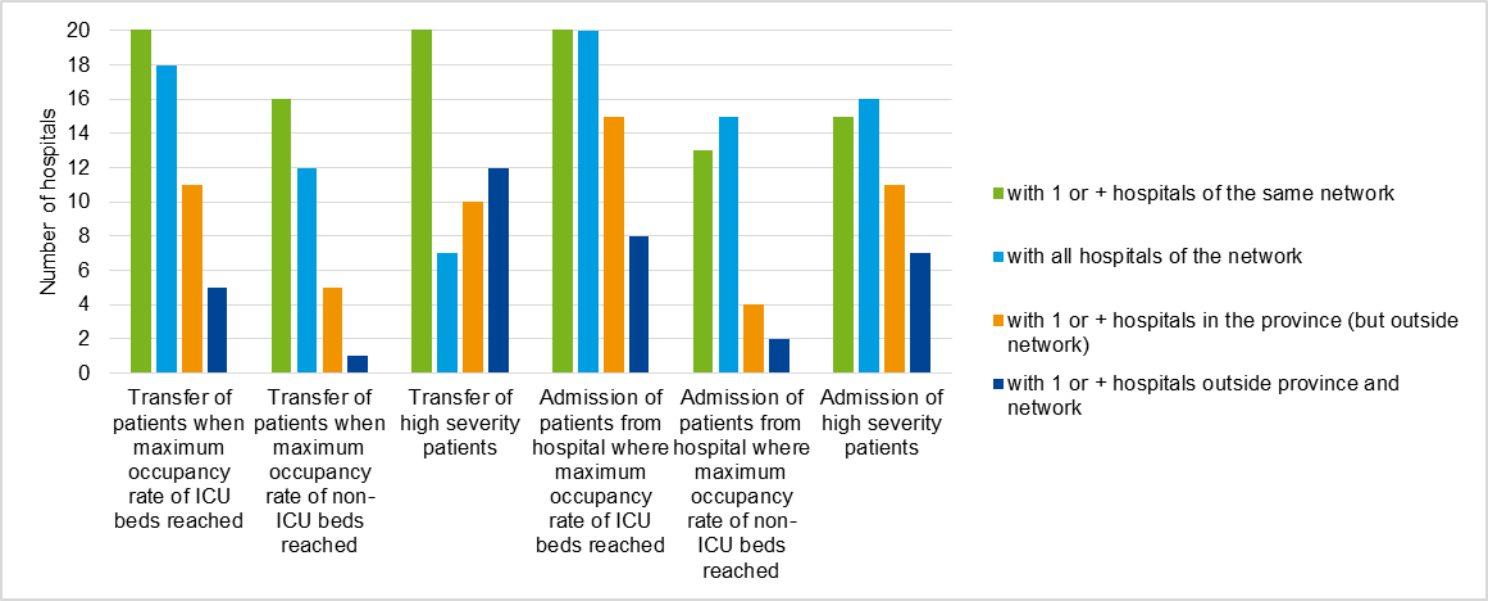


Note: for each category, hospitals that answered "no collaboration" but also chose one of the possible collaborations, were removed. This concerns one hospital in each of the following categories: “exchange of PPE”, “exchange of drugs”, “staff training” and “support to nursing homes”.

Transfer of patients: mostly at the network level, but also at other levels

During the first wave of the COVID-19 crisis, hospitals collaborated for transfers from and to the hospital, mostly for ICU patients (see Figure 17). Eighty-six percent of them collaborated to admit patients from hospital(s) that reached the maximum occupancy rate of ICU beds and 81% collaborated to transfer patients to other hospital(s) if their own maximum occupancy rate of ICU beds was reached. Concerning non-ICU patients, 55% of the responding hospitals collaborated to admit patients from hospital(s) that reached the maximum occupancy rate of non-ICU beds and 54% collaborated to transfer patients to other hospital(s) if their own maximum occupancy rate of non-ICU beds was reached. Collaboration for the transfer and admission of high severity patients prevailed in respectively 74% and 64% of the responding hospitals. As shown by Figure 18 such collaborations occurred mainly at the loco-regional network level (with some or all the hospitals of the network). In some cases, this collaboration took place outside the network, at the provincial level or even beyond. For instance, four out of the five responding hospitals in the province of Limburg collaborated to transfer ICU-patients to hospital(s) outside the network. All six small hospitals (with less than 200 beds) who responded to the survey reported collaborations to transfer ICU and high severity patients and five of them to transfer non-ICU patients.

Figure 18 – Transfer and admission of patients during the first wave of the COVID-19 crisis, by level of collaboration



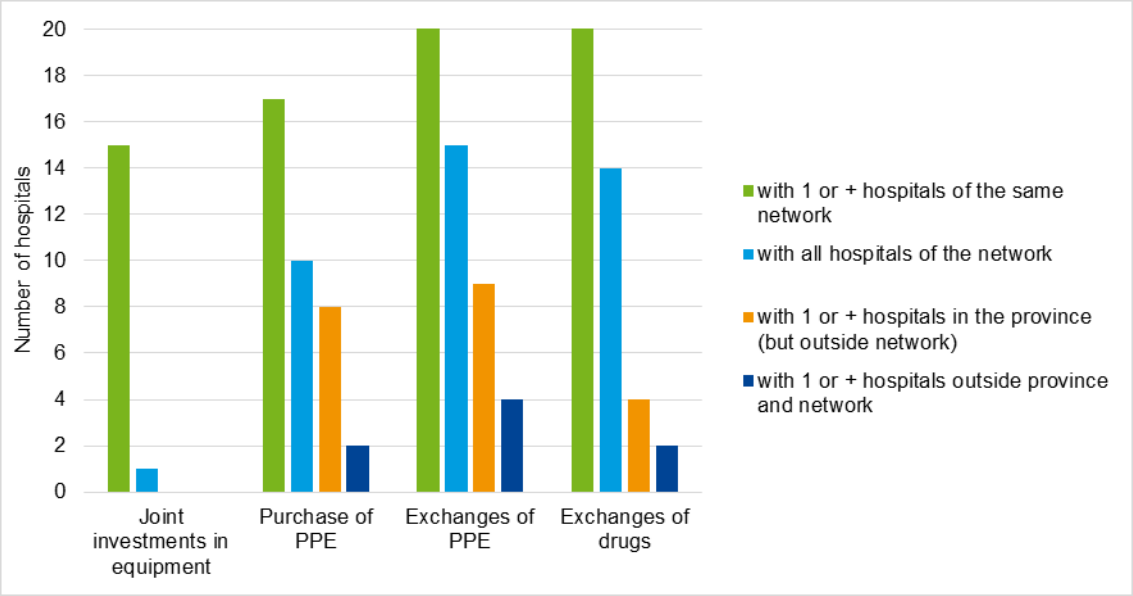
Most collaborations for PPE, drugs and equipment at the network level

As shown on Figure 17, also the exchange of PPE (75%) and to a lesser extent the exchange of drugs (64%) was the reason for collaboration. Sixty percent of the responding hospitals collaborated with other(s) to buy PPE, but only 29% made joint investments in equipment.

Collaborations for PPE and drugs took place mainly at the loco-regional network level, but also outside the network. However, joint investments in equipment only took place within the loco-regional networks.

Joint investments in equipment mainly took place in Wallonia and Brussels, and almost never in Flanders: among the 34 Flemish hospitals who answered that question, only four stated they had such a collaboration (compared to 8 out of 17 in Wallonia and four out of five in Brussels). It is worth noting that among the 28 hospitals who mentioned joint investments in equipment at the network level before the crisis (see Figure 16), only 11 did so during the crisis. Reversely, five hospitals had joint investments in equipment during the crisis, but not before.

Figure 19 – PPE, drugs and equipment during the first wave of the COVID-19 crisis, by level of collaboration



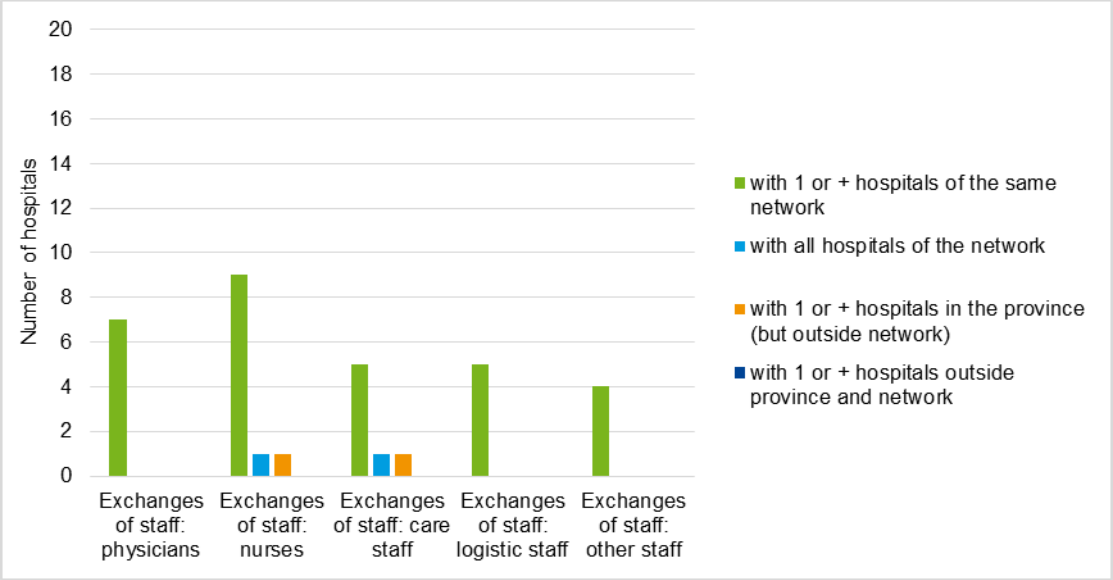
Note: for "exchange of PPE" and "exchange of drugs" one hospital who answered both "no collaboration" and "collaboration with one or more hospitals in the province but outside the network" was removed.

Limited exchanges of staff

Exchange of staff was not a major area of collaboration (see Figure 17): only 18% of the responding hospitals exchanged nurses with other hospital(s), 13% exchanged physicians, 11% care staff, 9% logistic staff and 8% other staff. Globally, only a few hospitals (11) said they collaborated to exchange staff during the crisis, but when they did, they exchanged several categories of staff. For instance, all hospitals who collaborated for exchanging physicians also exchanged nurses. When such collaboration occurred, they mostly took place at the loco-regional network level (see Figure 20). Only one hospital said it exchanged nurses and care staff with other hospital(s) within the province but outside the network.

In addition, collaboration for exchanging physicians and/or nurses occurred mainly in small hospitals: among the seven hospitals that exchanged physicians, three have less than 200 beds and among the ten that exchanged nurses, four have less than 200 beds.

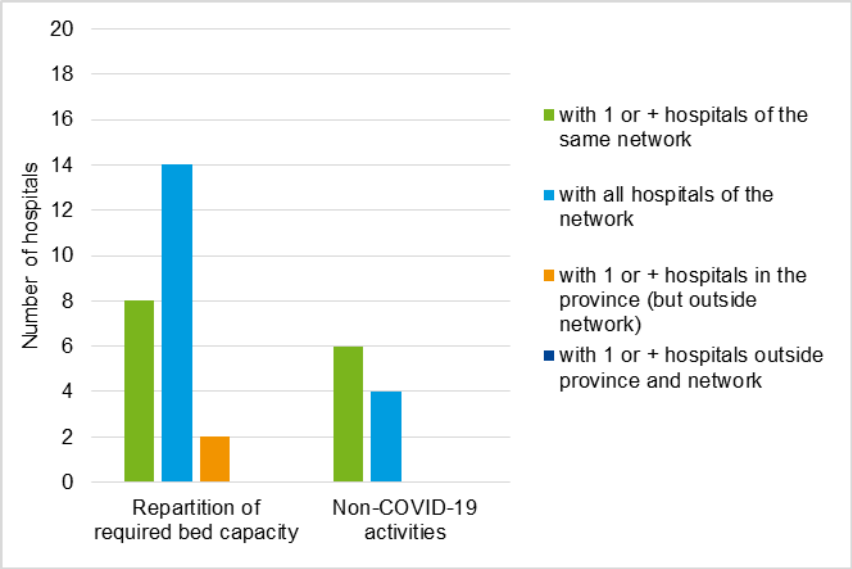
Figure 20 – Exchanges of staff during the first wave of the COVID-19 crisis, by level of collaboration



Repartition of required bed capacity: not the norm and mainly with the entire network

Among the responding hospitals, 41% said they collaborated with other hospitals for the repartition of the required bed capacity during the first wave of the COVID-19 crisis (see Figure 17). As shown by Figure 21, this collaboration mainly occurred at the loco-regional network level, and if it did, it most likely took place with all hospitals within the same network (contrary, for instance, to the exchange of PPE, which mainly occurred with some but not all of the hospitals within the network, see Figure 19).

Figure 21 – Repartition of required bed capacity and non-COVID activities during the first wave of the COVID-19 crisis, by level of collaboration



Limited collaboration for non-COVID activities

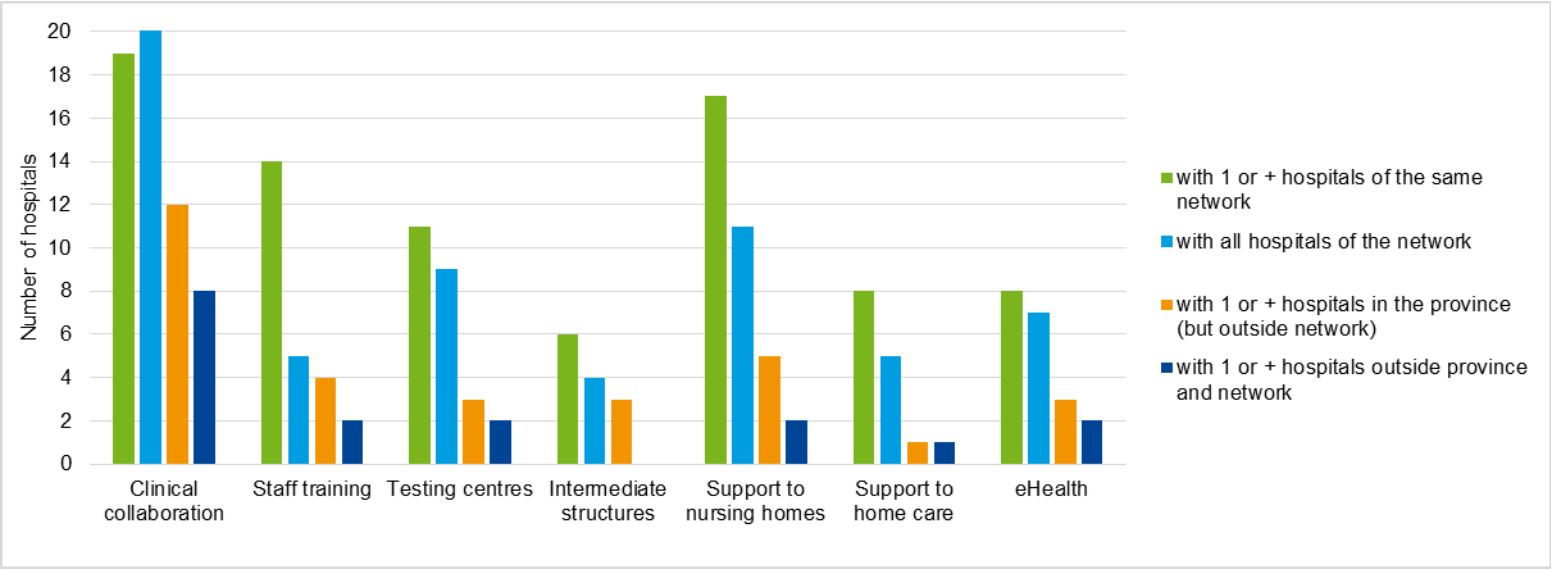
Only ten hospitals (seven of them being located in Wallonia) stated they had a collaboration for non-COVID activities (see Figure 17). When such a collaboration occurred, it only took place at the loco-regional network level, as shown in Figure 21.

Other collaborations mainly at the network level

Other areas of collaboration were pursued by some hospitals (see Figure 17): 57% collaborated for their support to nursing homes, 38% for the set-up of testing centres, 37% for the training of staff, 31% regarding eHealth possibilities, 27% for their support to home care and 25% for the set-up of intermediate structures. These collaborations took place at different levels: network, province or even outside the province (see Figure 22). However, for all of them, the major level of collaboration is the loco-regional network. Some regional differences appear: collaboration for the set-up of testing centres and for the support to home care were more common in Wallonia than in Flanders: ten out of the 17 responding Walloon hospitals (59%) collaborated for the set-up of testing centres compared to 8 out of 33 Flemish hospitals (24%) (for support to nursing homes: 9/17 – 53% in Wallonia compared to 5/26 – 16% in Flanders). On the contrary, as already mentioned, the set-up of intermediate structures is more common in Flanders. Among the 13 hospitals involved in a collaboration regarding intermediate structures[kk], 11 are located in Flanders.

[kk] Among the 13 hospitals that reported a collaboration for the set-up of intermediate structures (Figure 22), only five stated setting up intermediate structures as a strategy to ensure sufficient ICU capacity (Figure 13). A possible explanation is that a collaboration took place to set-up those structures, but that the additional capacity was not needed.

Figure 22 – Other collaborations during the first wave of the COVID-19 crisis, by level of collaboration



Note: for "staff training", one hospital who answered both "no collaboration" and "collaboration with one or more hospitals in the province but outside the network" was removed; for "support to nursing homes", one hospital who answered both "no collaboration" and "collaboration with one or more hospitals of the same network" was removed.

The loco-regional network is the major level of collaboration, but the province is sometimes more appropriate

As show in Table 9, in accordance with the previous analyses, most responding hospitals (88%) said that the hospital(s) with which they collaborated the most during the first wave of the COVID-19 crisis were members of the same loco-regional network. Six hospitals (11%) collaborated the most with hospital(s) in the same province but outside the network and only one out of the 56 respondents collaborated the most with hospital(s) outside the province and network.

Hospitals who have collaborated the most with one or more hospitals from their loco-regional network did so because some kind of collaboration already existed before the crisis: e.g. structural concertation between CEOs and CMOs of the network or between physicians; existing collaboration via joint purchasing of medical goods, pharmacy, etc. Another recurrent reason was that of geographical proximity. Collaboration beyond the network level took mainly place because of capacity problems (e.g. ICU beds saturated at network level) or specific patient requirements (e.g. ECMO needed) that could not be dealt with within the loco-regional network. Yet, a respondent stated that they collaborated at the level of the province because of a dysfunctional network.

However, when asked about the most appropriate level of collaboration during a crisis such as the COVID-19, 31% favoured the provincial level. Anyway, 50% found that the loco-regional network level is the most appropriate. Five hospitals mentioned other levels as the most appropriate: from the city or proximity level to regional and even country level. Four hospitals stated that the most appropriate level is a mix between the network and another level (proximity level or province) and one hospital preferred a mix between province and region.

The respondents that preferred the loco-regional network as collaboration level did this because they already know each other and because past collaborations resulted in a culture of mutual respect and trust. A respondent stated that an efficient governing structure is required to use the loco-regional network within the context of public health crises. In addition, a respondent stated that the federal health inspector had contacts with individual hospitals to manage the crisis at the provincial level. In future, the federal health inspector might need to have one contact per network and when a network risks to have capacity problems the collaboration with other networks will have to be started.

Several respondents also indicated that the capacity needs for a type of crisis such as COVID-19 go beyond the loco-regional network. They stated that it is better to organise the initial collaboration at the level of the province and when saturated switch to the national level. Moreover, several respondents stated that the level of the province is, in geographical terms, more homogeneous compared to some loco-regional networks which is an advantage when managing a public health crisis. Several respondents were suggesting a mixture (e.g. loco-regional network and province; province and regions) or preferred to immediately organise collaboration at the level of the regions or nationwide.

Table 9 – Main level of collaboration during the first wave of the COVID-19 crisis and most appropriate level of collaboration in case of such a crisis

	Flanders	Wallonia	Brussels	All respondents
Main collaboration partners during the first wave	**(n=34)**	**(n=17)**	**(n=5)**	**(n=56)**
Hospital(s) of the loco-regional network	29 (85%)	16 (94%)	4 (80%)	49 (88%)
Hospital(s) of the province	4 (12%)	1 (6%)	1 (20%)	6 (11%)
Hospital(s) outside the province	1 (3%)	0 (0%)	0 (0%)	1 (2%)
Most appropriate level of collaboration	**(n=35)**	**(n=18)**	**(n=5)**	**(n=58)**
Loco-regional network	20 (57%)	7 (39%)	2 (40%)	29 (50%)
Province	9 (26%)	8 (44%)	1 (20%)	18 (31%)
Other	6 (17%)	3 (17%)	2 (40%)	11 (19%)

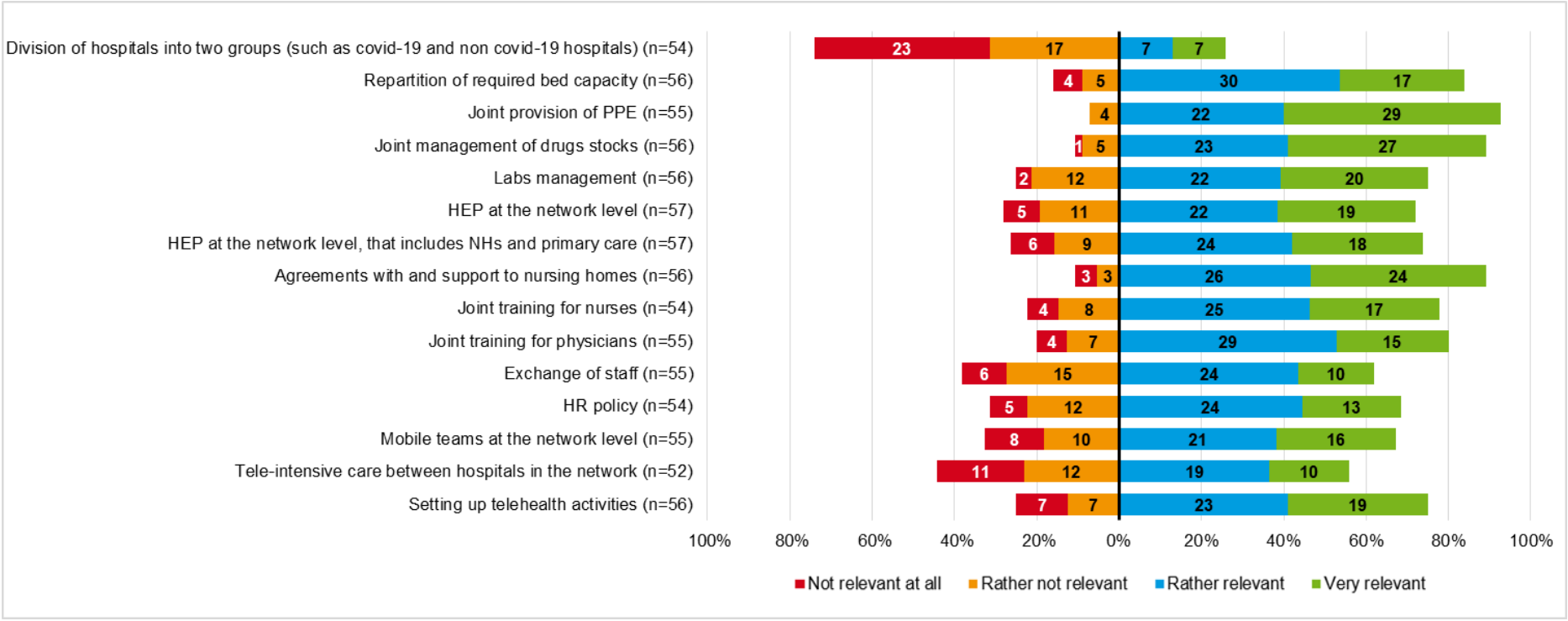
Many measures are perceived to be relevant at the loco-regional network, except splitting up hospitals into COVID and non-COVID ones

According to the respondents to the survey, many measures can be taken at the loco-regional network level that would be relevant to deal with a crisis such as the COVID-19 pandemics (see Figure 23). Three respondents mentioned that, although such measures are relevant, the loco-regional network level may not be the most appropriate one to implement them.

Among the list of measures suggested in the survey, only one has been judged as not relevant (not at all or rather not) by a majority of respondents (74% – 40 hospitals): the division of hospitals into two groups (such as COVID and non-COVID ones). One respondent explained that such a

splitting up of hospitals between COVID and non-COVID patients faces a lot of resistance, both from nurses and doctors. In addition, the transport of patients is not as qualitative and safe as it should be and it entails a higher cost for the patients. Another respondent mentioned that, even if the suggestion makes sense from a public health point of view, the possibility of a splitting up depends on the funding, as the cessation of non-COVID medical activity is causing important financial losses. Despite this, many respondents (84% – 47 hospitals) thought that a repartition of required bed capacity at the loco-regional network level is relevant to cope with a COVID-like crisis.

Figure 23 – Perceived relevance of the measures that can be taken at the level of a loco-regional network to deal with a crisis such as the COVID-19 crisis



Plead for joint provision for PPE and drugs

Joint management of PPE and drugs stocks were judged as (very or rather) relevant by the largest number of respondents: respectively 93% and 89% (see Figure 23). This is certainly not surprising considering it is the area where most collaboration actually occurred during the first wave of the COVID-crisis (see Figure 17 and Figure 19). Joint management of labs is considered less relevant than the joint management of PPE and drugs, but still (rather or very) relevant for many respondents (75% – 42 hospitals).

The emergency plan and support to nursing homes could be organised at the network level

The idea of an (hospital) emergency plan organised at the loco-regional network has been found relevant to deal with a COVID-19 like crisis by the majority of the respondents (72%, see Figure 23). If this plan includes nursing homes and primary care, it was also judged as relevant (by 74% of the respondents). One respondent specified that the (hospital) emergency plan is not the relevant response to a pandemic, organised at the network level or not, but stronger structural links with the nursing homes should be developed. And indeed, 89% of the respondents (50 hospitals) evaluated the loco-regional organisation of agreements with and support to nursing homes as (rather or very) relevant in case of a crisis. One respondent pointed out that it will even become more relevant in the future, given the increase of chronic care.

Although collaborations regarding staffing have been limited during the first wave, hospitals found it a relevant measure to cope with a COVID-19 like crisis

A shown in Figure 17 and Figure 20, very limited exchanges of staff between hospitals occurred during the first wave. Nevertheless, the majority of hospitals (62% – 34 respondents) judged such exchanges as a relevant measure to deal with a crisis such as the COVID-19 one, as shown in Figure 23. Those who did exchange staff during the first wave were also more likely to find it relevant in general. For instance, among the ten hospitals who were involved in a collaboration for exchanging nurses during the first wave, five found the suggested measure as rather relevant and four as very relevant. In addition, 67% of the respondents evaluated the idea of having mobile teams at the network level as (rather or very) relevant to deal with such a crisis. Human resources policy could also be organised at the network level according to 69% of the respondents.

In the same way, collaboration regarding staff training has been reported by 20 hospitals during the first wave (see Figure 17 and Figure 22) but joint training for physicians or nurses at the network level has been evaluated as (rather or very) relevant in case of a COVID-19 like crisis by respectively 44 and 42 hospitals (80% and 78% of the responding hospitals). Most hospitals stated that joint training in infection control and prevention would be relevant (95% of those saying that joint training for nurses is relevant, 84% of those saying that joint training for physicians is relevant) as well as for intensive care (respectively 81% and 73%). Joint training for nurses (resp. for physicians) concerning the geriatric liaison is judged as relevant by 52% (resp. 45%) of those who evaluated joint training for nurses (resp. for physicians) as appropriate to deal with a COVID-19 like crisis. Other suggested areas for joint training for nurses are: emergency, testing and triage, dialysis, individual protection measures and family. For physicians, the following additional joint trainings were suggested by respondents: crisis management, emergency planning, treatment protocols, instructions about single pathologies, hospital hygiene, and exchange of knowledge between pulmonologists. One respondent said that many types of joint trainings are relevant and could even be organised at the national level using digital tools.

Divided opinions regarding tele-intensive care

Setting up tele-health activities at the network level were judged as (rather or very) relevant by 42 respondents (75%). However, one respondent mentioned that the impact of tele-health seems rather limited, notably because it is not user-friendly and patients face a very steep learning curve. On the contrary, one respondent said that tele-health should be further developed in the future, in the same way as teleworking. Opinions are more divided concerning the organisation of tele-intensive care between hospitals of the network: 56% found it a rather or very relevant idea but 21% stated it is not at all relevant, particularly in Flanders. One respondent said tele-

intensive care may not be necessary in the Belgian context as all hospitals have well-trained intensivists. Another suggested that, although smaller ICUs should be able to rely on the expertise of the larger ones, tele-intensive aspects should not been set-up at the loco-regional level, but rather at the provincial or inter-provincial level.

Several networks took initiatives of collaboration in preparation for the second wave

In an open-ended question, respondents were asked to describe the initiatives of collaboration that were taken in their loco-regional network in preparation for the second wave. Several loco-regional networks made arrangements and intensified collaboration after the first wave in light of future waves. These included: daily exchanges of available bed capacity at the network level (ICU, non-ICU), joint ICU protocols and exchange of best practice (e.g. HEP, staffing ICUs), support of nursing homes (e.g. infection prevention and control training), ICU surge capacity arrangements at network level to preserve the continuation of elective care in each hospital as much as possible, purchasing equipment (e.g. PPE), strategic stock management and arrangements pharmacy, intensified collaboration between CEOs, CMOs and other actors (e.g. infection prevention and control, ICU physicians) of the network by more frequent structural meetings, informal contacts, setting up direct communication platforms such as WhatsApp groups between different actors.

No consensus on mandatory collaboration within the loco-regional network, with regional differences

When asked whether public authorities should oblige hospitals to collaborate within their loco-regional network in case of a crisis such as the COVID-19 pandemic, opinions were divided. As shown in Table 10, for 55% of the respondents collaboration should be mandatory. However, opinions varied according to the region: in Wallonia 71% of the respondents were favourable to mandatory collaboration.

Hospitals who were not in favour of mandatory collaboration provided several arguments: one said that the public authorities already oblige too many things, another said they should recommend rather than oblige, another that the collaboration would not be authentic if mandatory. One respondent said that the added value from collaboration is a better motivation than an obligation. Another one suggested that obligating hospitals to provide a certain capacity is sufficient: once saturation is reached, the deontological motivation will ensure collaboration. Two hospitals said that cooperation should go beyond the loco-regional network, and that an obligation at the level of the network would impede the implication of other partners. One respondent mentioned that loco-regional networks need time to be fully functional, but that a period of crisis, with the activation of the HEP, is not the right moment for that. Two hospitals explained that public authorities should not oblige collaboration but facilitate it, for instance collaboration should not be penalised by the loss of licensed beds or fees. Also, one of the hospitals in favour of mandatory collaboration mentioned that a legal framework is required for that.

Table 10 – Opinions on mandatory collaboration within the loco-regional network during a crisis such as the COVID-19 crisis

Public authorities should oblige hospitals to collaborate within the loco-regional hospital network during a crisis	Number of hospitals	% of respondents
Flanders (n=32)	15	47%
Wallonia (n=17)	12	71%
Brussels (n=4)	2	50%
All respondents (n=53)	29	55%

If collaboration is made mandatory, joint provision for PPE and drugs are the priorities

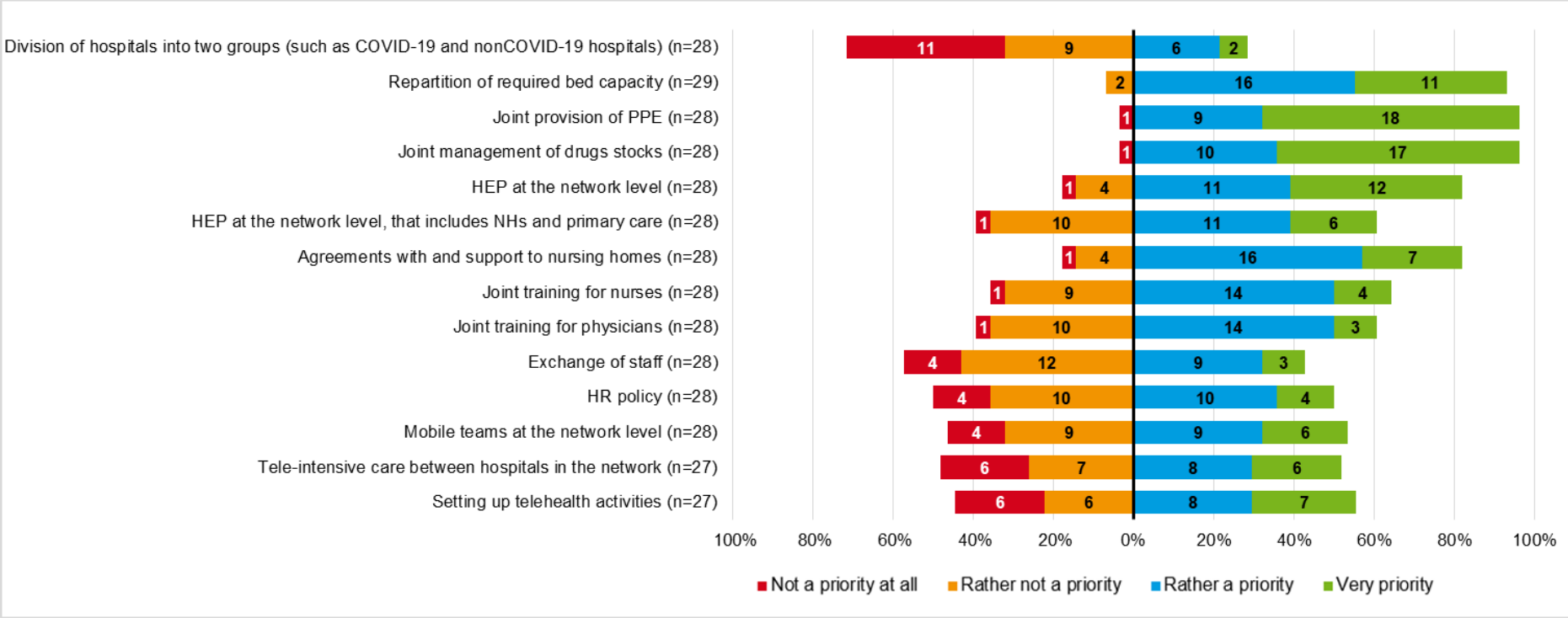
Those who answered that collaboration within the loco-regional network should be mandatory in case of crisis were further asked which types of collaboration should be made mandatory in priority (Figure 24). Responses are in line with the measures that were found to be relevant at the level of a loco-regional network level to deal with a crisis such as the COVID-19 crisis (Figure 23). Among the hospitals finding that collaboration should be mandatory, all but one (96%) evaluated joint provision of PPE and joint management of drugs as a priority (rather a priority or very priority).

Other priorities: repartition of bed capacity, network emergency plan and support to nursing homes

The obligation of dividing hospitals in two groups (such as COVID and non-COVID ones) is judged as not being a priority (not at all or rather not) by the majority of respondents (71% – 20 hospitals), in line with previous results. However, the repartition of required bed capacity within the network is a priority for almost all of those in favour of mandatory collaboration (93% – 27 hospitals).

The set-up of emergency plans at the network level is also a priority for the majority of the respondents (82%), but less if nursing homes and primary care are included in the plan (71%). Nevertheless, agreements and support to nursing homes were judged as a priority area for mandatory collaboration by 82% of the respondents. For the other suggested areas, the opinions were more divided (joint trainings, exchanges of staff, HR policy, mobile teams, tele-intensive care and tele-health).

Figure 24 – Perceived priorities if collaboration at the level of a loco-regional network level is made mandatory during a crisis such as the COVID-19 crisis



5.2.11 Concerns for the future

In the last part of the questionnaire, respondents were asked to evaluate (on a four point scale) to what extent they were concerned about a list of several elements in case of a resurgence or second wave of the COVID-19 pandemic. It is important to keep in mind that the survey was sent at the beginning of September 2020, so that respondents were supposed to express their concerns about the future when answering that question. One respondent mentioned that globally hospitals were better prepared for a second wave that they were for the first. Also, they had followed a good learning curve.

Major concerns are related to (the absence of) non-COVID activities

As shown in Figure 25, almost all responding hospitals were (rather or definitely) concerned by the impact of delays in care on the patients' health status (97%), the postponement of elective care (95%) and the hospital financial situation (93%). Many hospitals even said they were definitely concerned about these issues (respectively 77%, 60% and 75%, that is 46, 36 and 45 hospitals). The few hospitals who stated being rather not concerned by one of these elements are globally large structures (five out of six have more than 450 beds).

Well-being, especially of staff, is a major concern

In the event of a resurgence or second wave of the COVID-19 crisis, almost all hospitals said being (rather or definitely) concerned by the well-being of nurses and care staff (98%), of physicians (93%) and/or of non-care staff (93%), as depicted on Figure 25. Related to that, 50 responding hospitals (83%) said being concerned about the absenteeism of staff. Again, those who were (rather or definitely) concerned, tend to be larger hospitals (five out of ten have more than 450 beds, and one is a university hospital). Contamination of staff is less a concern, although 36 respondents (60%) stated being rather or definitely worried about it, still with smaller hospitals expressing more concerns than larger ones. Eighty percent of the responding hospitals expressed concerns about the well-being of visitors in case of a resurgence or second wave of the COVID-19 crisis.

Capacity is not the major concern for hospitals

Although capacity is still in an important concern for hospitals in case of a second wave, it is not the major one: 55% of the respondents said being (rather or definitely) concerned by hospital capacity, 62% by ICU capacity and 65% by emergency department capacity, that is respectively 33, 37 and 39 hospitals (see Figure 25).

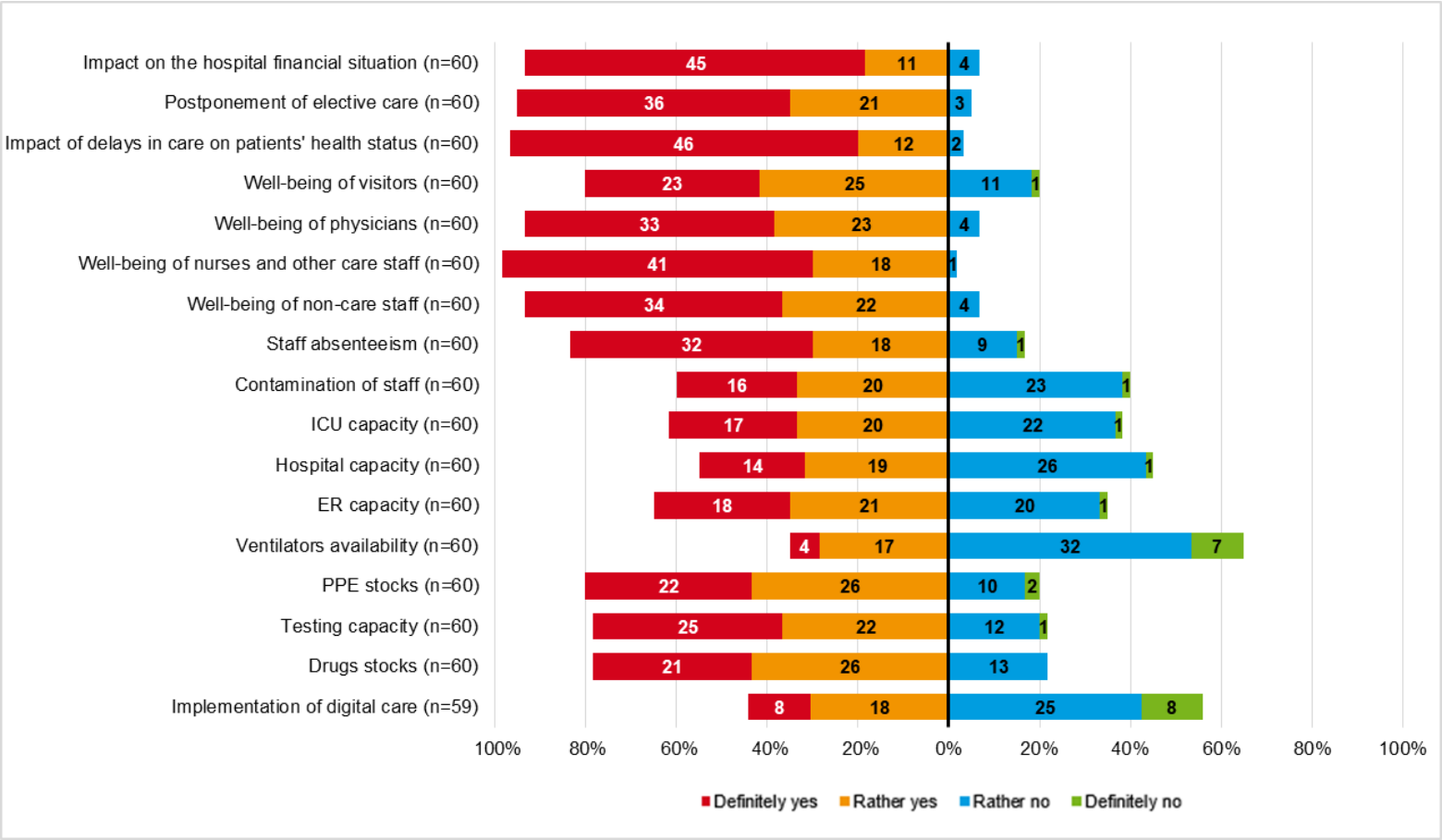
PPE, ventilators, drugs and tests: no large changes in perceptions since the first wave

As shown in Figure 6 and Figure 7, finding PPE was a major concern during the first wave of the COVID-19 crisis. According to Figure 25 it still is: most hospitals were still worried about the stock of PPE in the perspective of a second wave (80% of them – 48 respondents – were rather or definitely concerned). Hospitals are also worried about stocks of drugs and testing capacity: for each of them, 78% of the respondents stated being rather or definitely concerned. Ventilators availability was not a major problem during the first wave (see for instance Figure 7) and it is still the case for a second wave: most respondents (39 hospitals – 65%, see Figure 25) said they were rather or definitely not worried about ventilators in case of a resurgence of COVID-19. On respondent regretted that no decision was made on a mobile stock of ventilators.

Digital care

Regarding the implementation of digital care in case of a second wave, opinions were divided: 26 respondents (44%) stated they were rather or definitely concerned while 33 of them (56%) were rather or not concerned (see Figure 25).

Figure 25 – Concerns in case of a resurgence or second wave of the COVID-19 crisis



6 HOSPITAL RESPONSE TO SURGE CAPACITY MEASURES: RESULTS FROM OTHER BELGIAN STUDIES AND SURVEYS

Key Findings

- The existence of hospital emergency plans (HEPs) in all Belgian hospitals was an important element in the fast and professional reaction of hospitals. By the provision of a governance structure (i.e. hospital coordination cell) and thinking through several processes for crisis situations in a generic way, hospitals were able to respond quickly and in a flexible way when they were hit by the first wave of the COVID-19 pandemic. Yet, the COVID-19 crisis is a crisis with an unprecedented impact on hospital capacity and is of long duration. Therefore several hospitals plead to keep the HEP generic to allow an adequate response to several crisis situations, but also to add specific sections (e.g. pandemic, terrorist attack, CBRNe, ICT). Some hospitals plead for additional levers to enforce measures such as stopping elective care (e.g. increased legal power of the CMO).
- It is clear that the data systems were not ready for a hospital capacity crisis of this magnitude. This resulted in the set-up of ad hoc surveys (i.e. hospital surveillance and clinical surveillance) to monitor COVID-19 hospitalisations and in the adaption of the ICMS to monitor the available bed capacity. Many problems were encountered during the initial weeks of the crisis (e.g. changing definitions, terminology, etc.) and the data system caused a substantial registration burden for hospitals. After the initial problems these systems stabilised and improved. Yet, hospitals demand more transparency and feedback from the data they submit. In the long run these systems should evolve towards automatically extracted data systems.
- Based on online voluntary surveys we get an idea about the impact of the COVID-19 pandemic on the healthcare workforce. Yet, it should be noted that results are potentially biased due to the voluntary nature of the surveys and the lack of representativeness checks.
    - It was observed that, compared to the pre-COVID period, acute stress reactions increased in April (decreased in May and June but remained at a higher level), and long-term pressure (fatigue sleeping difficulties, unhappy & dejected, concentration difficulties) increased and remained high (April, May, June). Also negative factors related to professional functioning and experience (feeling on their own, doubting knowledge and skills, uncomfortable within the team, and risk avoiding) clearly increased in April and remained high. Having the intention to leave the profession increased in each period and amounted to 18% in June. The feeling of being part of a team, be able to make a difference and having the possibility to ask for support and guidance remained largely unchanged for all periods. The impact was clearly higher for staff who reported to be in contact with COVID 19 patients.
    - A survey of nurses conducted at the end of April 2020 showed high levels for risk of burnout (70% of respondents showed an increased risk of at least one out of three dimensions of the Maslach Burnout Inventory). In addition, the risk of burnout appeared to be associated with COVID-19 related factors such as increased workload, lack of sufficient PPE, and working with COVID 19 patients. Young nurses with few work experience, in particular, showed to be vulnerable.

- **Several studies analysed the impact of the measure to stop non-essential care.**
  - **Stopping non-essential medical activities had an impact on the number of hospitalisations during the first wave. On almost all hospital services a decrease of in the number of stays was observed. Maternity services showed for obvious reasons almost no drop in the number of stays. A remarkable pattern was observed on both intensive and non-intensive neonatal care services where a decrease was observed during the first wave. Compared to other services the decrease was less abrupt but also a slower recovery largely amplified when non-essential care restarted. Also the restart of hospital admissions on paediatric services was slower compared to other hospital services.**
  - **Hospital care for which there was hardly no discussion to categorise it as non-essential (e.g. sleep laboratory, sterilisation) dropped substantially in March, was almost not executed in April, slowly restarted in May and reached almost the level of the year before in June. For hospital care for which there is no clear consensus on the essential character not only a drop in activity was observed but also more variability between hospitals.**
  - **Also hospital care that can be considered as essential decreased substantially during the first wave. Stroke admissions, for instance, showed a decrease of 19% and 16% in March and April respectively. In May there was still a decrease of 2% while in June an increase of 3% was observed.**
  - **For oncological care it could be observed that the number of multidisciplinary team meetings decreased during the first wave. Based on an analysis of the Cancer Registry a decrease of 44% compared to April 2019 in new cancer diagnoses could be observed in April 2020. The chemotherapy treatment remained relatively stable in April but decreased by 11% in May. The decrease in the number of multidisciplinary team meetings and in chemptherapy treatment is potentially related to less newly diagnosed cancers. Possible explanations for this reduction are a reduction in the number of investigations, a temporary stop of population screening programmes or patients who postpone care on their own initiative.**
  - **Also ambulatory care for chronic conditions provided at the hospital was postponed (by the hospital and/or patient) during the first wave. It was therefore suggested to inform patients of the importance of continuation of this care, that this can be done in a safe environment and that alternatives (e.g. video-consultation) are used where possible.**
- **The burden of the COVID-19 pandemic during the first wave was not equally spread across hospitals and also the creation of additional hospital and ICU beds differed across hospitals. Hospitals in areas with higher infection rates had relatively more non-ICU COVID admissions. This association was not found for ICU COVID admission rates.**
- **Smaller hospitals have created relatively more additional ICU capacity but their capacity was less efficiently used. It is possible that in smaller hospitals, due to the admission of COVID-patients on ICU, the other beds on the (small) ICU unit could no longer be used. Therefore they had to extend capacity more quickly via the opening of additional units (e.g. turning recovery rooms into ICU). In larger and university hospitals they have more flexibility, for example because these hospitals have more ICUs. In this group of hospitals less additional ICU capacity was created but utilisation rates were higher. In addition, non-COVID ICU care could restart faster.**

6.1 Aim

In this chapter we describe the results of evaluations made by other organisations. We have identified these evaluations during the interviews (Chapter 4) and via our professional network. We have not the intention to be exhaustive but rather tried to select evaluations (or sub-parts of it) that are relevant in the context of the current study on hospital and transport surge capacity. In this chapter we present the main results per study identified. An integration of these main findings with our own study findings is done in the short report by a transversal analysis topic by topic.

6.2 Survey about strengths and weaknesses of the hospital emergency plan (HTSC committee initiative)

The HTSC committee invited hospitals on 22 June to participate in a survey to provide input for an initial evaluation of the form, structure and operation of the hospital emergency plan (HEP). One of the aims of the survey was "*to optimise the operation and communication of the committee*", but the answers to the questions were also meant *"to serve as a first step of a broader evaluation of the risk cycle"*.

Hospitals were asked to discuss a list of questions within the hospital coordination cell and to provide a concise, structured summary of up to 2 000 characters per question by completing an online form. The deadline for the survey was 13 July 2020.

Two experts of the Federal Public Service (FPS) Public Health (Service: emergency medical care), processed the answers following the structure of the questions and subquestions. This resulted in a document of 19 pages in Dutch, with a detailed list of answers, mainly presented in the form of (sub)bullet points. The selection of answers or the way they were described (or translated for the French-speaking hospitals) was based on the insights of the two experts. This document is not publicly available, but was made available to the KCE team for this study. Here, we only discuss the main findings, and give some examples to illustrate them.

6.2.1 Preparation phase of the hospital emergency plan

Hospitals were asked which measures they had taken before the activation of the HEP, related to the organisation, logistics, purchase, and update of the plan.

From the HTSC-survey it appears that hospitals already put in operation their HEP, either in the "information phase" or in the "action phase" (see Chapter 1), before this was imposed by the HTSC committee. According to the hospitals, the HEP was very helpful:

- to define the respective roles within the HEP
- for the internal and external (e.g. with other healthcare settings or with the municipality) consultation or communication
- for the organisation of specific groups related to the hospital coordination cell (e.g. outbreak control cell)
- to take measures concerning human resources (e.g. extra recruitment, flexible working hours, emotional support)
- to take measures concerning stocks (e.g. inventory or purchase of PPE or material)
- to take measures concerning separate patient and visitor flows
- to refine and write new procedures
- to provide training (e.g. on the use of PPE)
- to make architectural adjustments (e.g. extra walls).

Several hospitals reported that they had stopped the elective medical activities already before the directive of the HTSC committee was communicated (see Chapter 3).

Hospitals reported that the process of revising the HEPs and the experience of the hospital coordination cells (by experience or exercises) contributed to the successful response during the first wave.

6.2.2 *The benefits of the hospital emergency plan during the first wave of COVID-19*

Most hospitals reported that a clear benefit of the HEP is the activation of the hospital coordination cell. This process created a sense of urgency within the entire organisation and has several advantages:

- focus on the problem and take the necessary measures (e.g. translate influenza- and Ebola-plans into COVID-19 plan)
- a governance structure for crisis situations with a multidisciplinary composition and clear definitions, roles, task distribution and unity of command
- a frame to deal with processes in a structured manner
- the opportunity to act fast and take the necessary operational decisions at short notice
- the possibility to take decisions with a compulsory character (e.g. stop elective care, change rosters of staff)
- a model to communicate (internal and external).

6.2.3 *Required adjustments to the hospital emergency plan in the context of a pandemic*

Several suggestions were made to improve the current HEP. This included:

- Adding a generic pandemic section. Some hospitals stated that the current HEP was too generic, only targeting short-term crisis situations and insufficient to deal with the challenges caused by the COVID-19 pandemic. They advocated for adding a generic pandemic section to the HEP including: a roadmap with phased up- and down-scaling of the pandemic plan, phasing of outbreak plan, checklists, monitoring and dashboard system, use of prediction modelling, task distribution in case of a long-lasting crisis, architectonic guidance for cohort units, collaboration with other actors (e.g. primary care, schools, other hospitals of the loco-regional network), information gathering (e.g. about the virus, guidelines), etc.
- Strategic stock monitoring. The severe logistic problems (e.g. shortage of medication and PPE) stressed the importance of a performant monitoring system of a strategic stock.
- Improve the financing of the HEP coordinator role. Since the coordinator of the HEP is judged to be insufficiently financed via the hospital budget, insufficient time was allocated to this role prior to the crisis.
- Increase training of the HEP processes (e.g. training sessions about HEP processes, simulations) and communication about its content (e.g. role and tasks of the coordination cell).
- Include psychological support for staff but also psychological expertise to maintain human aspects of patient care.

6.2.4 *Functioning of the HTSC committee*

Measures

The hospitals made several comments about the measures taken by the HTSC committee. These concerned:

- The nature of the measures (e.g. make them more compulsory: enforcement by law; procedures to check compliance, unity of command and one clear point of contact for hospitals; more practical instead of theoretical measures).
- Measures regarding upscaling ICU were judged unrealistic because staff with this expertise was not available.
- Stopping elective care was a clear measure but the restart was too much left to the initiative of each hospital.
- No guidance about staffing issues was provided.
- The field should be more involved in drafting up the measures (e.g. representation of the networks, CNOs, a platform of HEP coordinators).
- The measures could be linked with other initiatives such as intermediate care and primary care.

- Different communication channels (mail, letters, WhatsApp) should be used and the information should be addressed to other actors besides directors (such as the HEP coordinators).
- More practical support should be provided (e.g. PPE shortage, logistic support, payment system for crisis situations).
- The distribution key to transfer patients in case of local outbreaks should be provided.
- Manual registration systems should be limited and feedback about submitted data should be provided.
- There were no measures regarding psychosocial support of staff.
- Collaboration between hospitals (network) should be made compulsory.

Communication about the data

General remarks on the communication included: the use of unclear or inconsistent terminology, lack of one central point of contact, no direct feedback on questions, high registration burden, lack of transparency about data and no feedback to hospitals, and too many ad hoc surveys.

The way ICMS and Sciensano-registration guidelines were perceived differs across hospitals. Some hospitals were positive (e.g. very clear after a difficult start with many changes, examples were helpful for the understanding, online sessions were very supportive) while others were negative (e.g. unclear and ambiguous instructions, lack of definitions for key concepts, too frequent changes which were not always communicated).

ICMS was perceived as: having a user unfriendly interface (e.g. hospitals with different sites have to submit site by site) and should evolve to a system with automatic extraction of data, being used for purposes other than for what it was designed (e.g. static tool while bed management is dynamic), cannot be used for internal purposes of bed management.

Hospitals commented on the frequent changes to the Sciensano data requirements (e.g. variables, definitions at the start of the pandemic). In addition, an informed consent was not requested from patients and therefore some hospitals indicated that these data cannot be used for research.

Communication from the HTSC committee

Communication by the public authorities and content of the measures. Hospitals indicated several issues regarding the guidelines from the HTSC committee: inappropriate timing of communication (late evening before weekend), insufficient time between communication of measures to hospitals and media (no time to inform hospital staff), rapidly changing nature of the measures, insufficient consultation of the field, measures insufficiently tailored to the local level and the long duration of HEP active phase (no formal end communicated by the authorities), need to adapt the HEPs to the particular context of psychiatric hospitals.

The responses were on several issues contradicting as they included positive (e.g. clear and well communicated content of the measures, communication via one channel, guidelines that combined efforts from federated and federal authorities, schematic figures explaining the measures) and negative comments (e.g. policy to upscale ICU was unclear in early period, rapidly changing instructions, bad timing of communication, communication perceived as lack of trust in hospitals, insufficient transparency about occupancy rates within the hospital network and beyond, disproportional measures: too much surge ICU capacity had to be provided in small hospitals) or pointed out that the composition and role of the HTSC committee was not clear.

6.2.5 *Good practices & points for improvement*

Hospital level

Several good practices were named by the hospitals. These included in the first place the flexibility, motivation and professionalism of healthcare staff. Several hospitals took initiatives to support staff (e.g. psychological support team, relaxation rooms, etc.), patients and family (e.g. skype connections, social media, practical support), the collaboration with primary care (e.g. support of nursing homes with training and expertise, GPs working together with emergency departments on site).

Hospitals stated that work needs to be done to better support staff (e.g. psychosocial burden of a crisis with a long duration), patients (e.g. information that supports patients to continue to consult medical care, contact centres for patients and families). In addition several other points for improvement were listed such as clarification of the legal responsibility of the coordination cell, collaboration with other actors and internal communication flow.

Macro-level

Hospitals stated that the role of the federal health inspectors was crucial to support hospitals that faced problems that transcended the level of their hospital. In addition, the involvement of umbrella organisations in the HTSC committee was praised as a good point.

Several points of improvement were suggested such as an increased involvement of clinicians in the HTSC committee, the creation of clear guidelines to up- and downscale medical care and more (online) education about data registration requirements. Other suggestions concerned the measures (e.g. more tailored to local incidence rates, better tuning of measures with other actors, take into account the consequences such as loneliness and collateral damage on non-COVID pathologies). The HEPs should have a generic part and specific parts including pandemics, terrorist attacks, CBRNe, ICT.

6.3 RIZIV – INAMI: monitoring of billing data

The National Institute for Health and Disability Insurance (RIZIV – INAMI) monitors health insurance expenditure within the context of the COVID-19 pandemic. A last update was published in October 2020 with data about the period March – July 2020. In this report we focus on data about hospital expenditure (hospitalised and ambulatory patients) only. The STATMD data are used (monthly collected billing data from hospitals not including the co-payment of patients, supplements or monthly hospital budget payments). RIZIV – INAMI made a comparison per month (January – July) between 2019 and 2020 (see Table 11). Despite having incomplete data for the period May – July 2020 (billing data are submitted with a certain delay) the following observations were made:[25]

- For all hospital services a decrease in expenditure was observed during the COVID-19 pandemic. Yet, there is one exception: the expenditure for ICU increased. In April, for instance, the expenditure on performed activities increased for ICU with 40% compared to 2019, while a decrease of 31% was observed for other hospital services.[26]
- The expenditure for physician fees (in hospitals) decreased in March, April and May, with 19%, 47% and 26% respectively. We refer the reader to the RIZIV – INAMI report for details about pharmaceutical expenditure.
- Based on a selection of nomenclature codes several urgent (e.g. heart attack, stroke, prostatectomy) and non-urgent medical activities (e.g. sleep laboratory, sterilisation) were studied. It could be observed that non-urgent medical activities decreased as expected based on the measures taken by the HTSC committee:
    - Sleep laboratory (billing codes 477374 – 477385: polysomnography) decreased in March (-51%), April (-99%), May (-62%), and June (-9%).
    - Sterilisation of males (billing codes 260794 – 260805: ductus deferens intervention) and females (billing codes 432692 – 432703: intervention on tubae, including

pneumoperitoneum) decreased in March (-39%), April (-99%), May (-65%) and June (-20%).

- But there was also a substantial decrease in urgent medical activities (especially in April) which was not expected and raises concerns. We give some examples (see for more examples the RIZIV – INAMI report):
  - For stroke admissions (billing codes related to stroke admission: intake by neurologist 477724 & 477746), for instance, a decrease of 19% and 16% could be observed in March and April respectively. In May there was still a decrease of 2% while in June an increase of 3% was observed.
  - To study the evolution of heart attacks a proxy was used (billing codes 589013 – 589024: percutaneous endovascular dilatation also including preventive dilation of an identified stenosis during investigation; 589153 – 589164: percutaneous insertion of endovascular catheter under medical imaging to resolve blood clots which are probably the result of a heart attack). A decrease was observed for March (-9%), April (-34%) and May (-16%) while an increase of 40% was observed in June 2020 compared to 2019.
  - Prostatectomies (billing codes: 260632 – 260643) decreased by 30% (March), 66% (April), 55% (May); for June an increase of 40% compared to the same month last year was observed.
- For the lump-sum payments for one-day hospitalisations for oncology an increase of 8% could be observed in April 2020 (potential shift from inpatient to day care). For the other lump sums for one-day hospitalisations a decrease of 70% could be observed compared to April 2019.

Table 11 – Physician fees and lump sum payments for low-variable care in hospitals (in 000 euro), data submitted until 31 July 2020

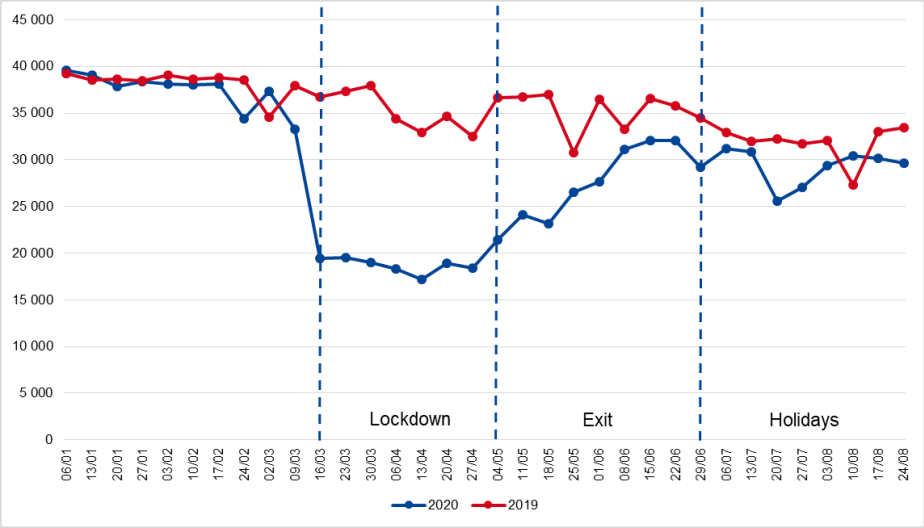
	January	February	March	April	May	June	Total
2019	491 747	453 757	464 422	438 938	412290	210 722	2 471 875
2020	559 126	503 465	373 879	231 115	303 559	223 506	2 194 650
Evolution	13.7%	11.0%	-19.5%	-47.3%	-26.4%	/	-11.2%

Source: RIZIV – INAMI. The system of low-variable care is a prospective lump-sum payment system for medical activities with low variability across hospitals, up to now including physician fees only.

6.4 Intermutualistic Agency: suspending and resuming regular activities

The Intermutualistic Agency (IMA – AIM)[ll] analysed the impact of the COVID-19 crisis on the number of hospital admissions.[27] IMA – AIM compared all inpatient hospital admissions in general hospitals in the period 6 January – 30 August 2020 (weeks 2 to 35) with the same period in 2019.[mm] The data did not allow to make a distinction between COVID-19 and non-COVID-19 patients.

Figure 26 – Number of hospital admissions in Belgian acute hospitals, comparison between 2019 and 2020, by week



Source: Versailles et al. (2020)[27]

A discrepancy between 2019 and 2020 is observed from week 11 (9 March) (see Figure 26). On 14 March, the lockdown in Belgium was announced and the HTSC committee imposed hospitals to suspend all elective activities (see the letter of 13 March in Chapter 3). In its letter of 30 April, the committee set out the conditions and timing for resuming these activities. For inpatient admissions, elective activities could resume on 11 May (week 20), but consultations and day-care activities were allowed to resume from 4 May onwards (week 19).

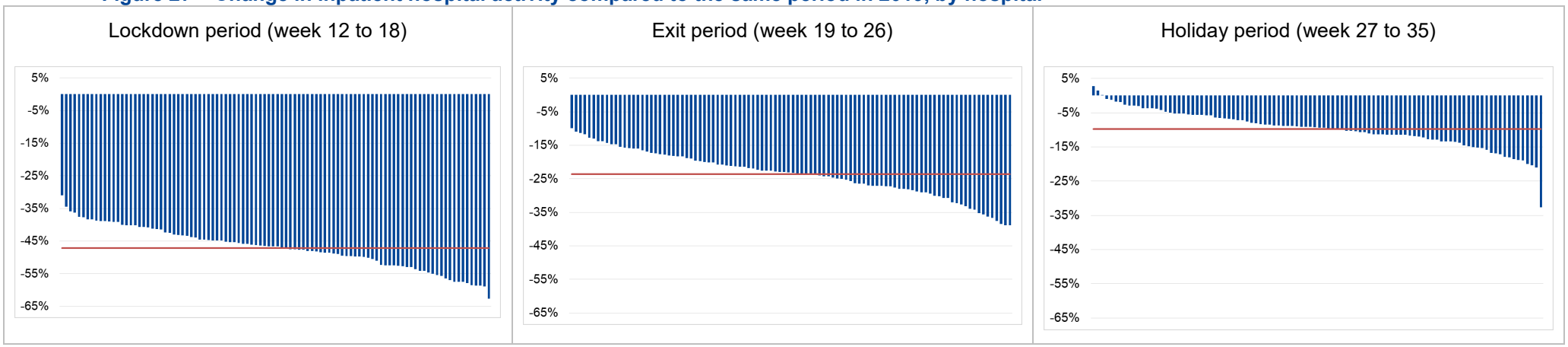
In the lockdown period, total inpatient hospital activity was 47% lower in 2020 compared with the same weeks in 2019. For instance, during the week of 13 April (week 16), 17 148 hospital admissions were registered, compared to 32 919 during the same week in 2019. In the exit period (week 19-27) the difference was 23%, in the period July-August the difference reduced to 9%.

The global picture hides large differences between hospitals (see Figure 27). While on average hospitals experienced a reduction of 47% of inpatient activity during the lockdown period compared to the same period in 2019, the reduction ranged from 31% to 63%. In the exit period the reduction of hospital admissions ranged from 10% to 39% with an average of 27%. During the holiday period, a few hospitals saw a small increase in the number of admissions compared to the same period the year before, while the large majority still experienced a decrease. During that period, differences between 2019 and 2020 ranged from +3% to -33%, with an average of -10%.

ll The IMA – AIM gathers patient data from all seven Belgian sickness funds and prepares them for analysis. The IMA – AIM databases contain billing data for healthcare reimbursed by compulsory health insurance in Belgium.

mm Since then the analysis has been extended to the period 6 January – 27 September 2020 (weeks 2 to 39).[27]

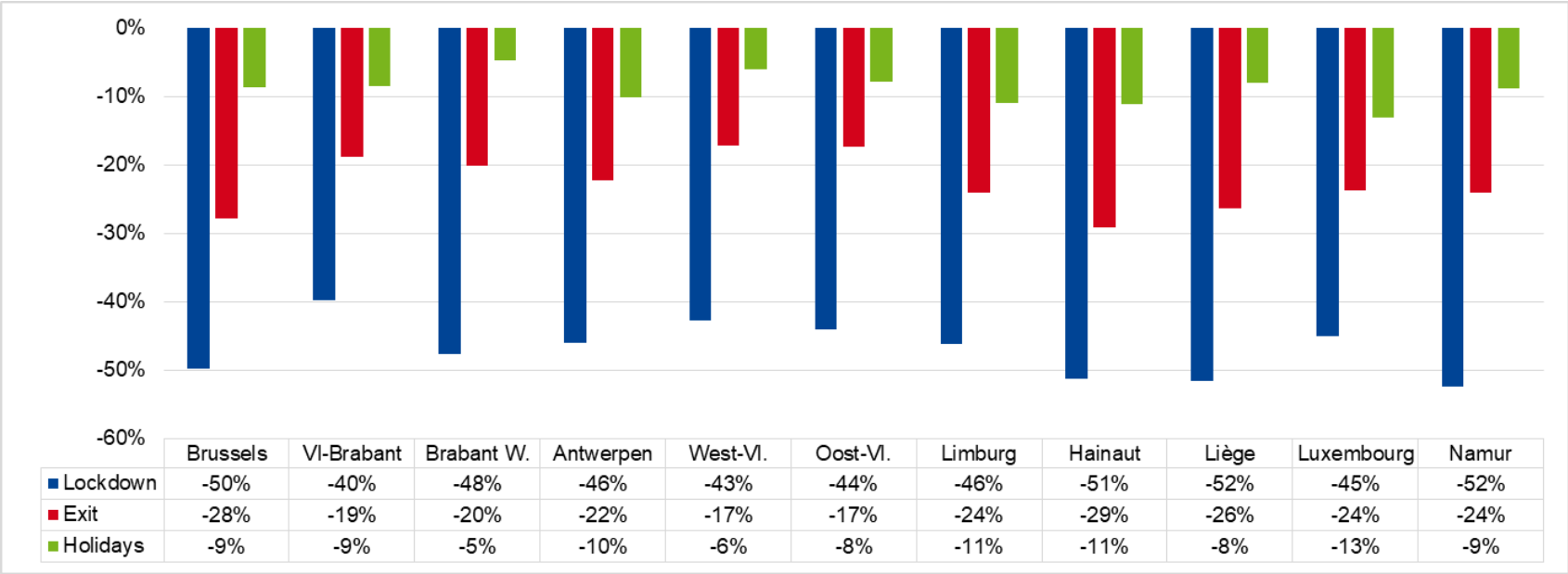
Figure 27 – Change in inpatient hospital activity compared to the same period in 2019, by hospital



Source: IMA – AIM. Each vertical bar represents a hospital. Averages of the percentage change for all hospitals (respectively -47%, -24% and -10%) are shown in red.

Figure 28 shows the changes in the number of admissions between 2019 and 2020 for the three considered periods (lockdown – week 12 to 18; exit – week 19 to 26; and holidays – week 27 to 35) per province (of the hospital). During the lockdown period, all provinces experienced a large decrease in activity compared to the same period in 2019, the decrease in the number of admissions ranging from 43% in West-Vlaanderen to 52% in Liège. During the exit period, the decrease compared to the previous year ranged from 17% in West- and Oost-Vlaanderen to 29% in Hainaut. During the holidays, this decrease was between 5% in Brabant Wallon and 13% in Luxembourg.

Figure 28 – Change in the number of hospital admissions between 2019 and 2020, per province



	Brussels	Vl-Brabant	Brabant W.	Antwerpen	West-Vl.	Oost-Vl.	Limburg	Hainaut	Liège	Luxembourg	Namur
Lockdown	-50%	-40%	-48%	-46%	-43%	-44%	-46%	-51%	-52%	-45%	-52%
Exit	-28%	-19%	-20%	-22%	-17%	-17%	-24%	-29%	-26%	-24%	-24%
Holidays	-9%	-9%	-5%	-10%	-6%	-8%	-11%	-11%	-8%	-13%	-9%

Source: IMA – AIM. Lockdown period is defined as week 12 to 18, exit period as week 19 to 26 and holidays as week 27 to 35. Province refers to the province where the hospital is located.

As illustrated by Figure 29, for most hospital services[nn] a substantial difference is observed between admission during the lockdown period and the same period a year before. In particular, a decrease of 66% was observed in surgery ('210') and 57% in paediatrics ('230').[oo] In internal medicine ('210') and geriatrics ('300'), the decrease was respectively of 38% and 36%. At the end of the exit period the number of hospital admissions for surgery, internal medicine and geriatrics was almost at the level of 2019 (difference between admissions during the exit period and the same period in 2019 are respectively -22%, -23% and -17%). For paediatrics however, the decrease lasted longer: the number of admissions was 44% lower during the exit period than during the same period in 2019. The differences diminished again during the holidays with a slower restart in paediatrics (differences with previous year are -3% in surgery, -9% in geriatrics, -10% in internal medicine and -21% in paediatrics).

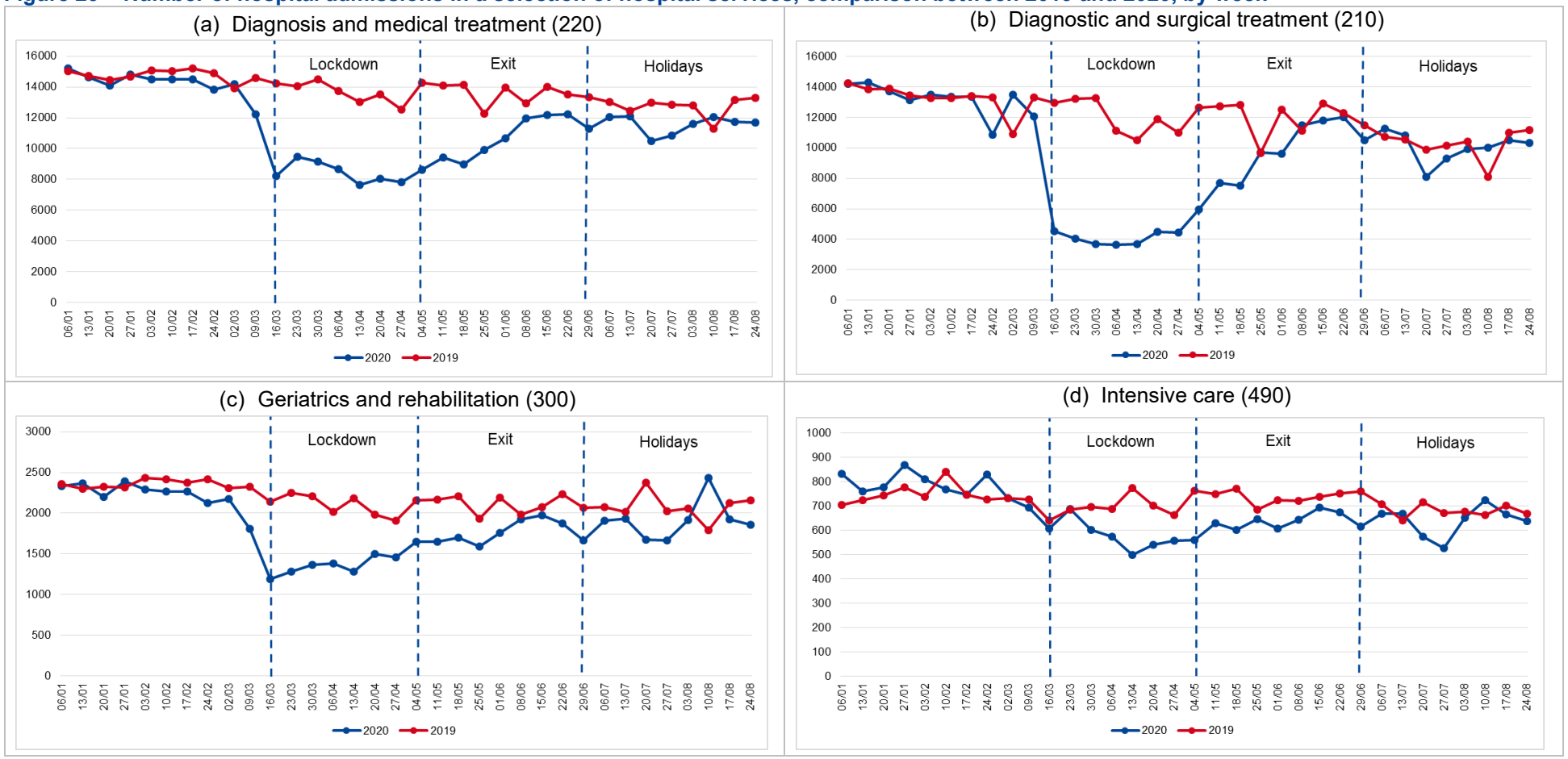
Maternity services ('260') were very little affected, as it could be expected. In these services, the difference in the number of admissions with respect to 2019 was -10% during the lockdown period and -8% during the exit as well as the holiday period. More surprisingly, an important decrease in activity was observed in neonatology services (both intensive ('270') and non-intensive ('190')) starting during the lockdown period and getting larger during the exit as well as the holiday period. The number of admissions in non-intensive neonatology services was 71% lower during the exit period than during the same period in 2019, and was 80% lower during the 2020 holidays than in 2019. For intensive neonatology services, these percentages are 75% and 83% respectively.

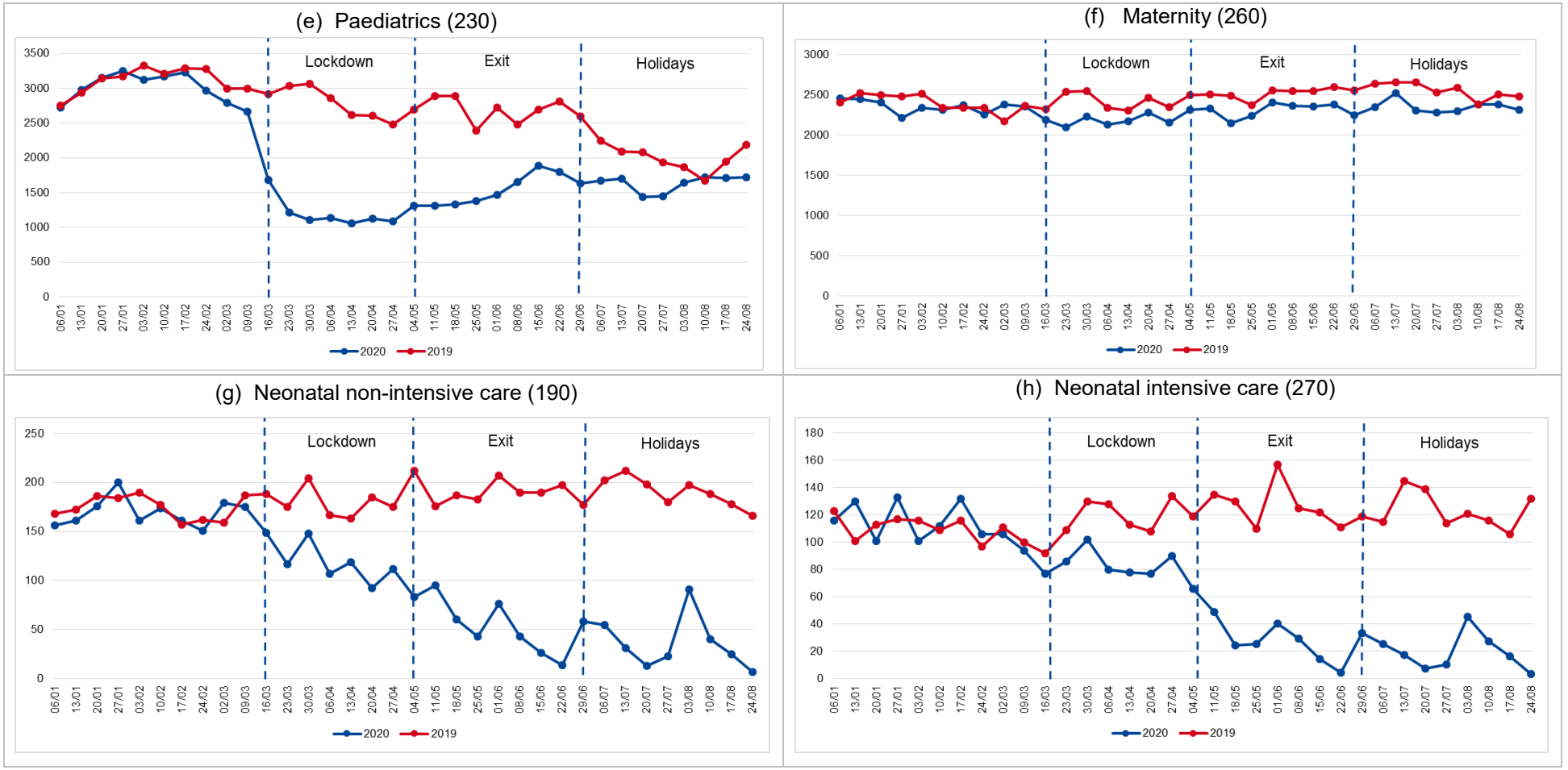
Finally, ICU services ('490') showed a moderate decrease in admissions with respect to 2019 (-16% during the lockdown period, -14% during the exit period and -8% during the holydays). However, as it is not possible to distinguish non-COVID from COVID-patients in the data, we cannot calculate the decrease in regular ICU activity.

[nn] Services considered are the services of admission, so that if a patient is transferred from one service to another, his admission is not counted in the latter.

[oo] Services are identified by a code which corresponds with a type of bed (for example, a C-bed refers to surgery).

Figure 29 – Number of hospital admissions in a selection of hospital services, comparison between 2019 and 2020, by week





Source: IMA – AIM.

6.5 Federal inter-administration hospital audit cell: impact on hospital activity in the first wave of the COVID-19 pandemic

6.5.1 Objective, data and methods

Study objective: evaluate impact on hospital capacity use and medical activities

The inter-administration hospital audit cell from the federal public authorities (FOD – SPF[pp], FAGG – AFMPS[qq] and RIZIV – INAMI) performed an analysis on several data sources to study:

- The impact of the COVID-19 pandemic during the first wave (March – June 2020) on hospital capacity and use, with ICU capacity and use in particular. The impact was further evaluated in terms of local incidence of COVID-19 infections, hospital size, hospital type (university versus non-university) and region.
- The impact of the national directive to stop non-essential care on medical interventions. In particular, the evolution of hospital admissions, the potential difference between essential, non-essential and mixed medical care, and the differences in downscaling of medical activities across hospitals were assessed.

Data sources

The audit cell used several data sources to perform this study.

In first instance the billing data from IMA – AMI were used. This concerns data on inpatient hospital admissions as well as the billing data for medical activities.

- The hospital admission data can be considered as complete as there is almost no delay in data submission. For each hospital the number of new admissions per type of service is registered per day without further details (for example, additional information about billing codes and caregivers is not available; no distinction is made between COVID and non-COVID admissions).
- The billing data include the sickness fund id, hospital id, type of hospital service, date when activity was performed, date when activity was billed, billing code, number of billed activities and reimbursed amount. Billing month and month when the activity was performed might differ. In addition, there is in general a delay in billing. Therefore the data are incomplete. The inter-administration audit cell dealt with this incompleteness by using the following strategy for all procedures: all billed activities of the billing month with the modal number of cases is used, as well as billed activities from the consecutive month. A potential limitation is that, in comparison with previous years, a delay in data submission might have occurred due to the COVID crisis. In this study, the assumption was made that there was no delay in data submission.

  Since at the time of the study only general instructions were given about stopping regular activities without a list of what was considered as essential and non-essential care, the audit team took the initiative to compile their own list. For the surgical interventions (top 10 billing codes for hospitalised and ambulatory patients) a selection of activities was categorised as “(predominantly) essential”, “(predominantly) non-essential” and “mixed”. For non-surgical interventions a selection of activities was based on medical care that was regularly cited in the international literature as “essential care during the COVID-19 crisis” (e.g. stroke, AMI, acute renal failure, oncological care, neonatal care). Also endoscopic minor interventions (e.g. biopsy) were analysed. Care was considered as essential when it was urgent (e.g. most fractures), when it concerned vital chronic care (e.g. dialysis) or when postponement could be an important negative factor in the prognosis

[pp] Federal Public Service Public Health

[qq] Federal Agency for Medicines and Health Products

(e.g. mastectomy). The selection was mainly based on an assessment of a team of six physicians.

A second source are the aggregated data per hospital per day from Sciensano about the number of hospitalised COVID-19 cases (ICU and non-ICU); new COVID-19 hospital admissions (ICU and non-ICU); the number of ventilated patients, ECMO patients and deceased patients. Since hospitals had to distinguish confirmed from suspected cases (the proportion of the latter was higher in smaller hospitals) a grey zone exists when estimating non-COVID related hospital admissions.

A third source is the number of licensed ICU beds (available via the FPS Public Health). As an alternative the occupancy of ICU beds was deduced via the billing data (billing codes related to ICU) available at RIZIV – INAMI (Doc P, 2019). This approach was used to estimate the number of operational beds (in this case used beds) which can be different from the number of licensed beds. In addition, also the available and newly created ICU beds (via ICMS) were used.

Model

Generalised linear regression models were used to compare the number of hospital admissions and medical activities during the COVID-19 with the pre-COVID 19 period.

6.5.2 Capacity

Admissions of COVID-19 patients on ICU and non-ICU COVID-19 units

In April 2020 there were, on average, 4 953 COVID-19 patients admitted in hospitals and 1 099 on intensive care. Yet, it could be observed that this burden was not evenly distributed across hospitals. 63% of COVID-19 ICU admissions, for instance, took place in hospitals that together represent 50% of the licensed ICU beds. A similar picture was observed for COVID-19 admissions in non-ICU beds: 64% of admissions in hospitals that represent 50% of licensed beds. In the study no association was found between the COVID ICU burden and hospital size, local COVID-19 incidence, region or type of hospital. A potential explanation is that ICU patients were transferred faster than non-ICU patients but more research is needed. For non-ICU COVID admissions a higher burden for hospitals was associated with the (cumulative) incidence rates in the local area. The study also illustrated that in some loco-regional networks the distribution of the COVID burden (both on ICU and non-ICU) was more equal than in other loco-regional networks.

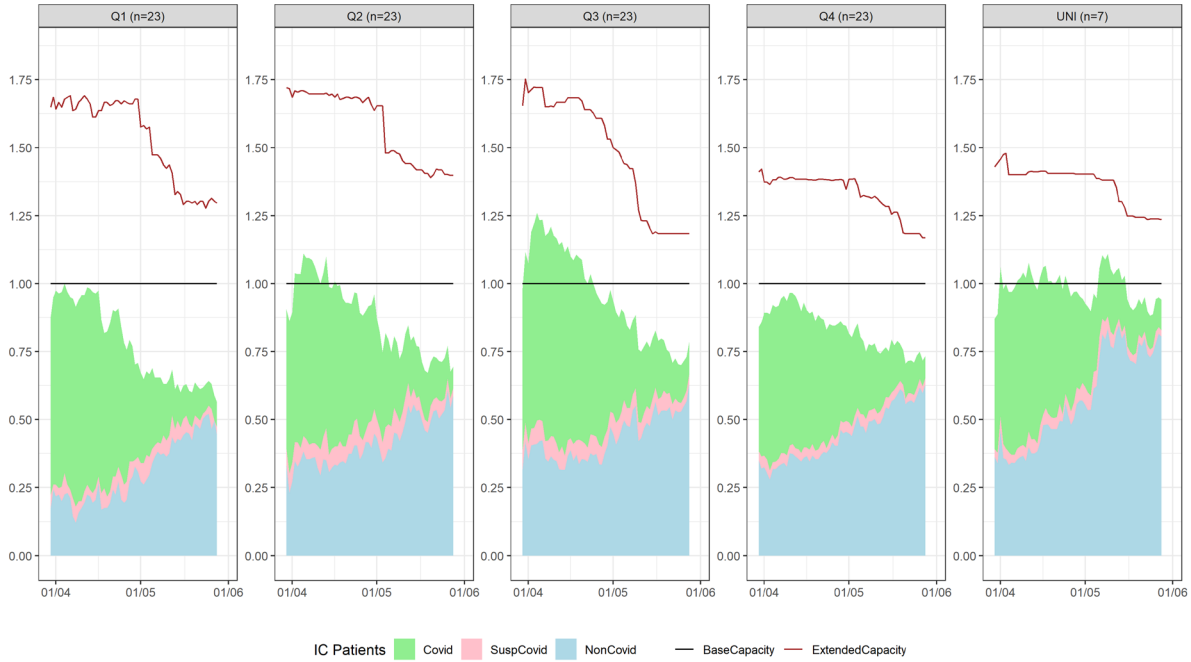
Surge ICU capacity

In Figure 30 the evolution of hospital ICU capacity (black line: licensed; red line: extended ICU capacity) and use (blue zone: non-COVID; pink zone: suspected cases; green zone: COVID-19) is depicted. General hospitals are grouped according to their number of licensed ICU beds in quartiles, a fifth group are the university hospitals.

In Figure 30 it is shown that the additionally created ICU capacity in April was relatively higher in hospitals of the first three quartiles (on average +66%) in comparison with hospitals situated in quartile 4 (Q4) and the university hospitals (+40%). On the other hand, it can also be observed that from May onward the drop in extended ICU is sharper in the first three quartiles compared to Q4 hospitals and university hospitals.

In addition, it can be observed that the proportion of non-COVID ICU patients as well as the occupancy rates are not the same in all hospital categories. The Q3 hospitals have relative higher utilisation rates of the licensed ICU beds (up to an average of 1.25 of the licensed beds in Q3 during early April). More in-depth analysis showed that, in April, a number of non-university hospitals had several days with more than 150% of their licensed ICU beds used. In the Q1 category there are 4 out of 23 hospitals surpassing this threshold for at least 5 days; in Q2 category this concerned 3 out of 23 hospitals; in the Q3 category this concerned 4 out of 23 hospitals while in the Q4 category this concerned only 1 out of 23 hospitals. In the university hospitals this threshold was not surpassed. When a threshold of 125% is used a similar picture is observed. The average number of days in which the threshold was surpassed per category is: Q1: 20%; Q2: 21%; Q3: 28%; Q4: 10%; university: 15%.

Figure 30 – Evolution between March 29 and May 28: extended ICU capacity and occupancy rates, by hospital group



Source: Inter-administration hospital audit cell. Hospital groups are the university hospitals and four groups of non-university hospitals, with quartiles based on hospital size.

Smaller hospitals did the largest relative effort to extend ICU capacity (+67% for Q1; 69% for Q2; 64% for Q3; versus +39% and +46% for Q4 and university hospitals, respectively). In addition, it appears that this additional capacity was less used in smaller hospitals. The occupancy rate of all ICU beds (extended + licensed ICU beds) increased with hospital size: 54% in Q1; 58% in Q2; 65% in Q3; 65% in Q4 and 70% in university hospitals. An important limitation is that these occupancy rates were calculated per hospital and not per unit. It is possible that smaller hospitals had to extend their capacity quickly (e.g. turning recovery rooms into ICU) because the admission of COVID-patients on ICU made that the other beds on the (small) ICU unit could no longer be used. This could be one of the explanations of lower utilisation of total ICU capacity on the hospital level.

6.5.3 *Regular activities*

Evolution of hospital admissions per type of service

For most types of hospital services a substantial decrease in the number of inpatient hospital admissions (COVID and non-COVID admissions) could be observed starting from mid-March 2020 and especially on surgical ('210'), internal medicine ('220') and paediatric services ('230'). This strong reduction in hospital admissions lasted until May when they started to increase again. Surgical and internal medicine services reached (almost) the normal level (expected level based on admissions in previous year) from June onwards. The restart on paediatric services was slower and reached its normal level from August onwards. Also on rehabilitation wards ('600') the restart was slower.

Three types of services showed a particular pattern. First, the hospital admissions on maternity services were hardly affected. Nevertheless, also on these services a drop of about 5% was observed potentially due to less hospital admissions other than delivery and pregnancy-related on maternity units or due to an increase of deliveries outside the hospital environment. However, no increase in home deliveries was observed (but the data are not complete yet). Second, the neonatal care services ('190': non-ICU and '270': ICU) are the two other exceptions. The decrease is less sudden on neonatal services. Moreover, the restart of activities could not be observed in May.

Since the data about COVID-patients is not available per service type, the evolution of hospital admissions per type of service for non-COVID admissions could not be calculated. Yet, an estimation was made at the hospital level based on the expected number of hospital admissions based on 2019, the observed hospital admissions and the observed COVID and COVID-suspected admissions. Based on this calculation it is estimated that the number of non-COVID related hospital admissions decreased by 27% in March compared to what was expected based on 2019 data. In April it was estimated that non-COVID hospital admissions dropped with 62% decrease (i.e. 38% of regular activity). In August it was estimated that there was still a reduction of 11% in the number of hospital admissions (see Table 12). In April and May large differences between hospitals were reported.

Table 12 – Change in non-COVID hospital admissions in the period March to August 2020

	Change in non-COVID hospital admissions
March	-27%
April	-62%
May	-40%
June	-10%
July	-13%
August	-11%

Source: Inter-administration hospital audit cell.

Evolution essential, non-essential and mixed activities

To study the decrease in medical activities three groups of billing codes were used (see Table 13):

- Essential surgical interventions (70 clusters)
- Non-essential surgical interventions (53 clusters)
- Mixed surgical interventions; essential or not depending on the context (21 clusters).

In addition 10 clusters of non-surgical interventions were analysed.

Table 13 – Median percentages downscaling per month and per type of intervention, March to May 2020

	March 2020	April 2020	May 2020
Surgical essential	-21%	-47%	-37%
Surgical mixed	-39%	-83%	-47%
Surgical non-essential	-46%	-95%	-60%
10 non-surgical interventions			
Deliveries (incl. caesarean)	+2%	-2%	-10%
Haemodialysis	-2%	-3%	-9%
Chemotherapy	+7%	-4%	-11%
Emergency admission (referral)	-10%	-20%	-22%
Neonatology (NICU)	-11%	-23%	-25%
Cerebrovascular accident (CVA)	-30%	-34%	-23%
Multidisciplinary team meetings	+7%	-37%	-45%
Percutaneous coronary intervention (PCI)	-18%	-43%	-36%
Emergency admission (without referral)	-28%	-55%	-46%
Endoscopy (minor procedures)	-41%	-81%	-54%

Source: Inter-administration hospital audit cell.

The drop in non-essential surgical interventions is large (median reduction of 95% in April) and stable across interventions within this category. All hospitals cancelled (almost) all interventions like circumcision, amygdalectomy, fertility treatments etc. For the mixed category a median drop of 83% was observed in April. But also for all essential surgical interventions a reduction in activities could be observed. The median reduction for this group of interventions is 47% in April, yet large differences between interventions were observed.

For the other interventions a relative strong reduction could be observed for PCI, endoscopy, and emergency care without referral. For deliveries and haemodialysis there was almost no reduction in activity. For oncological care it can be observed that the number of multidisciplinary team meetings decreased in April 2020 with 35% and in May with 45% which is potentially related to a reduction of newly diagnosed cases. The chemotherapy treatments remained relatively stable in April but dropped with 11% in May potentially related to less therapies due to less newly diagnosed cancers. The large drop (-81% in April, -54% in May) of endoscopies with biopsies (important in cancer diagnostics) support this assumption. The drop in CVA (-34% in April, -23% in May) is difficult to explain but can be related to the fact that the general population avoided to consult medical care because of anxiety to be contaminated in the hospital. The observed drop in PCI (-43% in April) can be partly explained because a part of these procedures can be temporarily postponed (as the billing codes also include non-primary PCI).

It can be concluded that the guideline to stop non-essential care was followed by the hospitals when it concerns non-essential care. In general, there is only little variation between hospitals. Nevertheless, the picture for mixed activities is more diffuse (variation between hospitals ranging from -97% to -27%) and a drop in activities for what can be considered as essential care was also observed with a variation from -80% to -25% between hospitals. Hospitals in Flanders reduced their activities (in all three categories) less than hospitals in Brussels and Wallonia. Interventions with a large variation between hospitals (e.g. CVA care, multidisciplinary team meetings) warrant further study.

6.6 Belgian Cancer Registry: decrease in newly diagnosed cancer cases

The Belgian Cancer Registry is an exhaustive national register of cancer cases. During the first wave of the COVID-19 pandemic the submission of data (from the anatomic pathology laboratories) was accelerated. This allowed the Belgian Cancer Registry to assess changes in the newly diagnosed cancers during the COVID-19 pandemic compared to what was expected based on the previous year.[28] A second report updated the figures until 18 September 2020.[29]

Each month 5 725 new cancer cases are expected in Belgium (all cancers except non-melanoma skin cancer). On 14 March 2020 all non-essential consultations, examinations and procedures were cancelled. Almost simultaneously, also the screening programmes for breast, cervical and colon cancer were stopped. After the sharp decrease in the number of new cancer diagnoses in March 2020, also in April 2020 there was a decrease of 44% compared to April 2019. From mid-April the number of new cancer cases started to increase to reach almost the level of the year before in June 2020.[28]

The decrease was present among all age groups except for children and adolescents upon the age of 19 years where after an initial decrease (-12%)[28] the number of diagnoses in the period March-September 2020 are similar as the same period in 2019.[29] The most prominent decrease was observed in the oldest age group (>80 years: -51% in April). For the period March-September 2020 there was still a decrease of 18% in this age group compared to the year before.

The incidence of cancer diagnoses (period March-September 2020) when compared to the same period in 2019 is about 20% lower for skin-, bladder, renal- and head & neck cancers. For prostate cancer and haematological malignancies (except for acute leucaemia with a limited decrease of 2%) the decrease is around 15% while for aggressive cancer types (lung-, oesophageal- and pancreas cancer) a decrease of around 10% was observed.

The temporary cancelation of population screening contributed to the decrease. For each of the three cancer types for which population screening is organised a decrease was observed in April 2020: colon cancer (-49% for men; -58% for women in the age categories targeted by screening). A similar decrease was observed for breast cancer (-51% in the target group). For cervix cancer the decrease was 20% in the target group.[28] In the meantime the catching up of diagnoses during the exit period started but only for cervix cancer the same level as the year before was obtained.[29]

6.7 Flemish Patient Platform: surveys on postponed care

The Flemish Patient Platform, which is the umbrella organisation for Dutch-speaking patient organisations in Belgium, organised three surveys on postponing care among chronic patients during the COVID-19 crisis. We focus on postponed hospital care.

A **first survey** targeted patients who postponed care during the first wave of the COVID-19 crisis (from 6 March to 13 April). Via an online survey (from 3 April to 13 April) responses from 592 respondents (of which 542 or 92% have one or more chronic conditions) were received.[30] We discuss in this report only the results of the respondents with one or more chronic conditions. During this period 348 respondents had a scheduled appointment in the hospital of which 282 (81%) reported that care was postponed (70% on initiative of the hospital, 6% own initiative, 5% not possible to make appointment, 19% appointment took place). The postponed care included follow-up appointments with medical specialists (40%), investigation (20%), a first consult with a medical specialist (11%), a consultation after surgery (6%) and other (23%). Fourty percent of the respondents with postponed hospital care indicated that this had a moderate to severe impact on their health (e.g. worsening of chronic pain). Only 45% of the patients with postponed care stated that they received sufficient information from the hospital about the care that was postponed. For appointments that took place (19%) an alternative method (mostly consultation via telephone: see Box 4) was reported in 39% of the cases.

Other types of care that were scheduled or had to take place under normal conditions were also postponed: general practitioner (34%), physiotherapist (84%), family support (77%), psychologist (61%), and dentist (92%).

Based on the results of this first survey the Flemish Patient Platform advised patients (e.g. not to postpone necessary care) and healthcare professionals (e.g. to restart necessary care; pro-actively contact chronic patients for whom care was postponed and organise care in a safe way which could imply the use of alternative methods such as video-consultation; inform patients about what care is possible in a safe way) and policymakers (e.g. design a plan to deal with the consequences of postponed care, inform the general public about what type of care can and must continue; support collaboration between hospitals; support alternative methods such as video-consultation).

Box 4 – An evaluation of teleconsultations during the first wave of the COVID-19 pandemic

IMA – AMI performed an evaluation of teleconsultations during the first wave of COVID 19. About two million members of the sickness funds had a teleconsultation between 14 March and 31 May 2020, mostly with the general practitioner (84%). 100 000 members received an invitation to participate in a survey to evaluate teleconsultations. A final response rate of 5.1% (n=5 091) was reached.

Most completed surveys concerned consultations with a GP: (78%, n=4 199) followed by consultations with medical specialists (11%), psychiatrists (4%) and psychologists (3%). In general, 53% of the cases the tele-consultation was based on the initiative of the healthcare-professional but this percentage was much higher for medical specialists (73%), psychiatrists (85% and psychologists (78%). For GP consultations only 27% of the teleconsultations replaced an originally booked physical consultation, while this was much more the case for consultations with medical specialists (76%), psychiatrists (83%) and psychologists (75%). The reason of the consultation with medical specialists was mostly (67%) to follow-up chronic conditions. Most of these consultations with medical specialists (96%) were held via telephone (GPs: 98%; psychiatrists: 67%; psychologists: 38%).

About 76% of the respondents was (very) satisfied with the teleconsultations (GPs: 77%; medical specialists: 73%; psychiatrists: 75%; psychologists: 85%). Respondents were the least satisfied with the course of the consultations: 68% were (very) satisfied (GPs: 69%; medical specialists: 60%; psychiatrists: 65%; psychologists: 72%). Despite the positive results, the percentage of respondents that stated to consider also in the future a teleconsultation with the discipline for which they received a teleconsultation during the first wave is low: GPs: 77%; medical specialists: 32%; psychiatrists: 57%; psychologists: 65%. Respondents reported that the benefits of teleconsultations are mainly for administrative issues (renewal medication prescription) and follow-up of chronic conditions.[31]

A **second online survey**, conducted between 5 June and 14 June, targeted persons that received care. Questions were posed about care that was given between 16 March and 3 May (further called: care during the lockdown) and care from 4 May onwards (called restart of care). A total of 349 respondents (of which 316 with one or more chronic conditions) completed the survey.

When we focus on the 151 respondents with postponed hospital care during the lockdown, only 38% of them reported that these postponed appointments had taken place since the restart. Most respondents indicated that they felt safe (95%) and well-informed (88%) with the protective measures taken during hospital care. Only 82 respondents with postponed hospital care filled out the question about the impact of postponing care on their health: 29% indicated to experience a moderate to severe impact of the postponement of their hospital care.[32] The average number of days between the original (but postponed) and new appointment in the hospital was 77 days (ranging from 8 to 224 days). The majority of postponed appointments were scheduled as appointments within the hospital setting (69%) while 27% were remote appointments (e.g. telephone; mail; video) or took place on another location (3%).

The restart of care that was postponed during the lockdown in other care settings is variable. The number of respondents who reported to have a new appointment for postponed care is 67% for general practitioners, 24% for physiotherapists, 57% for psychological consultations, and 30% for dentists.

From these results, the Flemish Patient Platform formulated several advices for patients (e.g. do not postpone necessary care; ask for more information if you experience not to be sufficiently informed about protective measures), for healthcare professionals (e.g. reschedule postponed care; pro-actively contact patients to monitor their health status and care needs; be innovative and provide alternatives such as other settings outside the hospital, tele-consultations), and policymakers (e.g. inform the general public; support innovative care as an alternative to hospital care, provide PPE for people with chronic conditions).

A **third survey** evaluated if care was still postponed after 10 July. Only 129 respondents completed the survey. In addition to this lower number of respondents, the report is also less detailed about the care setting. We therefore only include the main finding: 39 respondents (30%) were still postponing care on their own initiative of which the majority reported that they fear an infection.[33]

6.8 The ZorgSamen surveys: well-being of healthcare staff

"De ZorgSamen" is an initiative of Zorgnet-Icuro, the Flemish umbrella organisation of hospitals and other healthcare organisations (e.g. nursing homes, psychiatric hospitals, care councils of primary care zones). Within the task force "COVID-19 Care" the initiative developed towards an online platform for the entire Flemish healthcare and welfare sector including many partners (e.g. universities, public authorities, non-profit organisations). One of the partners (LIGB – KU Leuven) took the lead in an online survey that aims to monitor the well-being of staff within the domain of healthcare and welfare at regular time intervals. The surveys are cross-sectional, it is not possible to study a cohort of healthcare professionals over time).[34] The survey is publicly announced via social media and the communication channels of the umbrella organisation. Participation is on a voluntary basis and anonymous. The results of the survey are reported online but no distinction is made between the different sectors. In the current report we only describe the results of respondents who indicated that they work in the hospital sector (data were obtained via the research team of LIGB – KU Leuven). The survey was open for four days per period. In total 8 350 staff participated: 2 918 in April, 3 298 in May and 2 134 in June.[35] We obtained data for these three periods for hospital staff only and a distinction could be made between staff who cared for COVID-patients and other (also including non-medical or non-caring staff).

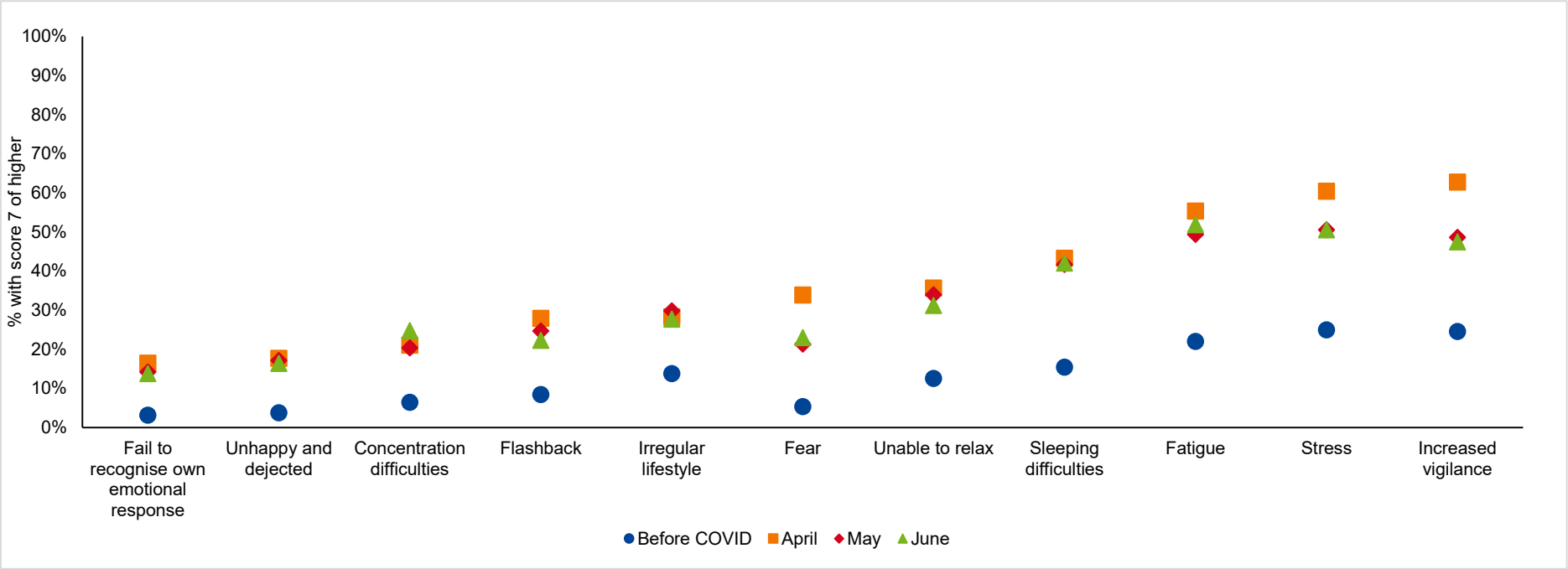
Total: n = 2 018 (COVID unit: 265; non-COVID: 1 753)

- April: n = 903 (COVID unit: 134; non-COVID: 769)
- May: n = 506 (COVID unit: 85; non-COVID: 421)
- June: n = 609 (COVID unit: 46; non-COVID: 563)

Psychological impact

To study the psychological impact of COVID-19 on hospital staff a list of 11 personal reactions was questioned (fear, fatigue, flashbacks, hypervigilance, etc. – see Figure 31). In addition, five negative professional reactions (feeling on their own, doubting knowledge and skills, etc. – see Figure 32) and three positive professional questions (being part of the team, making a difference, sufficient support and guidance) were asked. Each respondent gave a score from 0 (never present) to 10 (always present) for the past week as well as under normal circumstances (before the COVID-19 period).

Figure 31 – Percentage of hospital staff with a score of 7 or above out of 10 for 11 personal psychological reactions



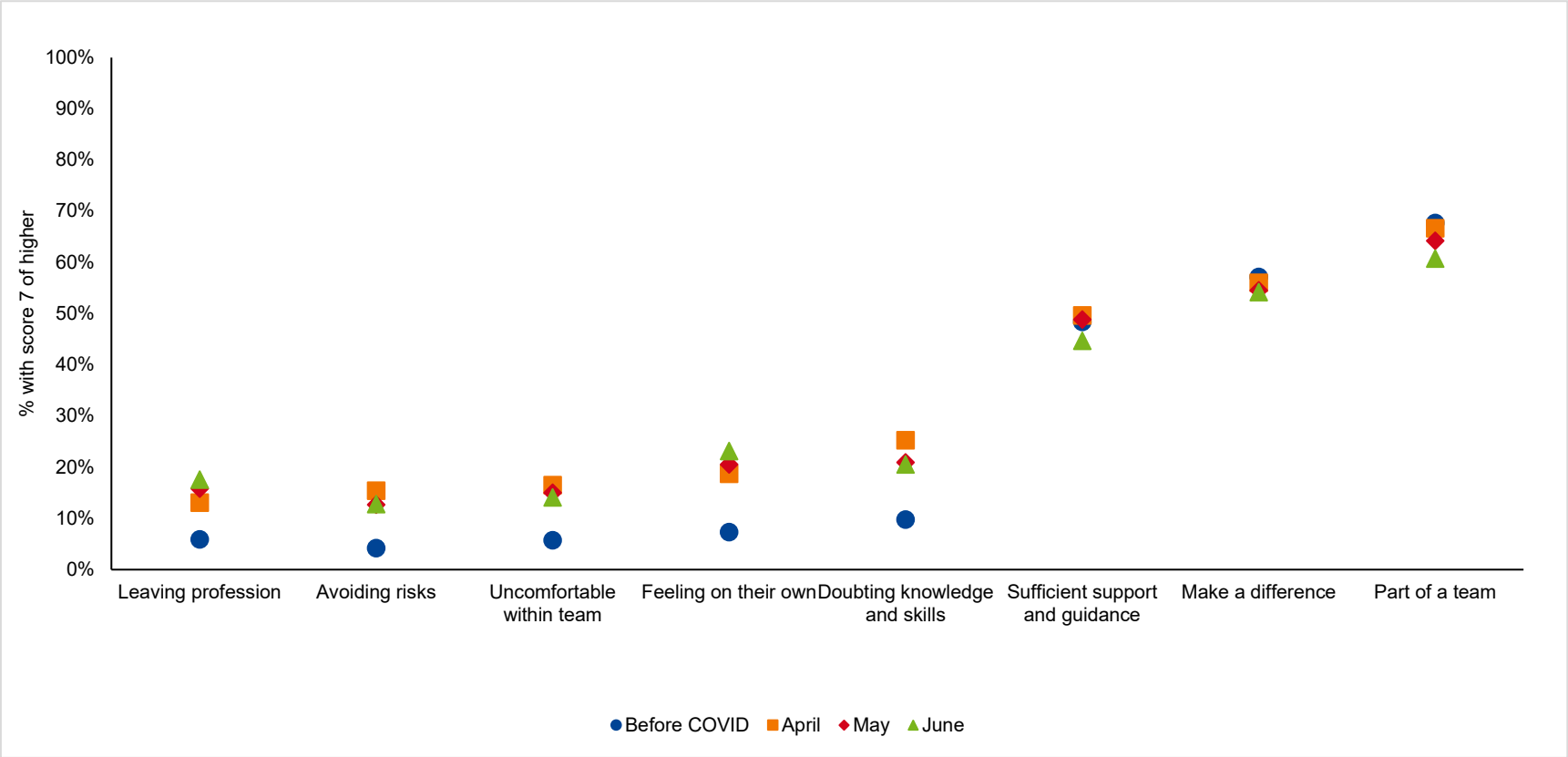
Source: Vanhaecht (2020)[35]

In April 2020 an increase for all personal psychological reactions could be observed compared to a normal situation (pre-COVID-19). Three acute stress reactions (fear, stress, increased vigilance) showed a clear increase in April but decreased again in May and June to a level that is still much above the pre-COVID-19 level. When data from staff who worked with COVID-19 patients was compared to other staff it was clear that the psychological impact was higher for the former groups on all dimensions. A remarkable result was observed for nurses. While 5% of hospital nurses experience fear in normal circumstances, this increased to 57% in April (34% in May; 24% in June). Also for other hospital staff an increase in fear was reported (from 6% pre-COVID-19 to 38% in April, 25% in May and 25% in June) but this was less pronounced. The factors that are related to long-term pressure (fatigue, sleeping difficulties, unhappy & dejected, concentration difficulties) all increased in April and stayed more or less at the same level in May and June.

Impact on professional functioning and experience

Factors related to professional functioning and experience (see Figure 32) (feeling on their own, doubting knowledge and skills, uncomfortable within the team, and risk avoiding) clearly increased in April compared to a normal situation and stayed high in May and June. Having the intention to leave the profession increased (but only slightly) in each period: 6% before COVID-19, 13% in April, 16% in May and 18% in June. Also for all these items the reported values were higher for staff working with COVID-19 patients compared to other staff. The feeling of being part of a team, be able to make a difference and having the possibility to ask for support and guidance remained largely unchanged for all periods.

Figure 32 – Percentage of hospital staff with a score of 7 or above out of 10 on professional functioning and experience



Source: Vanhaecht (2020)[35]

6.9 French-speaking association of intensive care nurses: survey on working conditions and well-being of nurses

On 21 April, in the middle of the first wave, the French-speaking association of intensive care nurses launched a survey (further called SIZ study) on the well-being of nurses. In their publication (May 11, 2020) the authors report to have received a response from 4 552 French-speaking nurses (29% Brussels-Capital Region; 71% Walloon Region).[36]

SIZ study and KCE Report 325: similar sample size but different design

The authors of the SIZ study compare their result with the results of the KCE study on safe nurse staffing levels in acute hospitals conducted in 2019. Although the sample size is comparable, a different design was used.[37] The KCE study sampled hospitals and nursing units for which all nurses were invited to participate. Only general internal medicine and surgical units were included in the study design for reasons of comparison with 2009 data. This resulted in a sample of 84 hospitals, 436 nursing units and 5 203 nurses. The response rate was 82%. As the number of invited respondents was known, the response rate could be closely monitored. In contrast, the SIZ study launched the survey online and in an open way, which did not allow to monitor response rates. This also implies that the respondents may be biased (e.g. proportionally more nurses with negative feelings). In addition, not only nurses working on general internal medicine and surgical units were included in the SIZ study: most respondents worked on ICU (about 28%), general internal medicine and surgical units (about 23%) and home nursing (14%). Other places of work included COVID units, nursing homes, psychiatric units, emergency services, rehabilitation centres, operating rooms, medico-technical services and ambulatory care.

Because of these differences between both studies, we only report the results of the SIZ study without making the direct comparison with results from the KCE study.

High reported risk of burnout

The authors used the Maslach Burnout Inventory to measure the risk of burnout. This scale measures the risk of burnout on three dimensions: 45% of the respondents had an increased risk of loss of personal accomplishment, 46% an increased risk of depersonalisation and 57% an increased risk of emotional exhaustion.[36] The authors report that 71% of the respondents showed an increased risk of at least one of the three dimensions. In addition, the risk is higher among the group of young nurses and nurses with few experience.

Risk of burnout and COVID-related working conditions

All of the reported associations are the result of univariate analysis.

Seventy percent of the nurses reported a higher workload since the start of the COVID-19 pandemic. The reported percentage differed across settings (e.g. 91% in nursing homes, 89% in intensive care, 82% in specialised rehabilitation centres, 77% in COVID-19 units). It can be deduced that in settings that were most affected by COVID-19, the experienced increase in workload was the highest. Moreover, the authors showed that the experienced increase in workload was significantly associated with the risk of burnout. A recent study from the same authors confirmed in a sample of 3 hospitals (5 ICU) based on measuring the required nursing activities that ICU patients with COVID demand more staffing resources compared to non-COVID ICU patients.[38]

In addition, it was observed that working in units with COVID-19 patients and having experienced deaths of COVID-19 patients were associated with an increased risk of burnout.

Eighteen percent of the nurses reported to work more than full-time and 60% of the nurses reported that they had no opportunity to choose their working time (shifts were imposed). Both factors were associated with an increased risk of burnout.

Sixty-one percent (higher in out-of-hospital settings: 81% in home care, 67% in nursing homes, 73% in rehabilitation settings, 77% in psychiatric hospitals) of staff reported to have insufficient PPE which was also found to be a factor associated with risk of burnout.

6.10 Hospital umbrella organisation Zorgnet-Icuro: self-evaluations made by their member organisations

After the first wave (summer 2020) the Flemish hospital umbrella organisation Zorgnet-Icuro organised a survey for their member organisations to identify lessons from the first wave of the pandemic. All their member hospitals (acute university and non-university, and categorical) were invited to complete a self-evaluation grid including 16 topics: crisis management, data collection and monitoring, surge capacity, education, communication, continuity of care, essential support services, human resources, infection prevention and control, case management, logistic processes and stock-management, laboratory activities, collaboration, leadership, patient experiences, innovation. For each topic several questions were asked:

- What worked well?
- What went wrong and was adjusted?
- What went wrong and was abandoned?
- Which are the lessons learned that you would like to share with other actors?
- Which data do support the statements you make about the topic?

From the 65 invited member hospitals, self-evaluation forms were received from 23 acute and 4 categorical hospitals. Based on a content analyses ten improvement suggestions were identified. This document was at the time of writing this report not yet publicly available, but was made available to the KCE team for this study. In this section we only retained the improvement suggestions that are relevant to the scope of the current study.

Hospital emergency plan

Despite the thorough preparation (e.g. updating procedures, acquiring crisis management skills) of the hospital emergency plans during recent years hospitals identified several obstacles and points for improvement. The evaluation indicated that there is a clear need to test the HEPs (dry runs) outside crisis times. Furthermore, the evaluation made clear that a HEP should not be limited to a generic plan only. It was stated that in future it is important to build in factors such as the intensity/impact, the duration, the type of crisis and the key actors and sectors involved to refine the HEPs.

Data

The burden of data registration was an important problem during the first wave. Therefore it was advised to set up a data system that is user-friendly (unique platform, support, time of the day when data need to be submitted) with a clear and uniform content (clear definitions, registration guidelines) and respecting the only-once principle. In return for the registration burden hospitals expect feedback that can be used for prediction models, but also to visualise occupancy rates, infection rates etc. in particular geographical areas.

Staffing

The healthcare workforce was already under pressure (e.g. working conditions, shortages, poor staffing norms) before the crisis. Once more, the societal value of the healthcare workforce was demonstrated during the crisis. Healthcare workers (physicians, nurses, care assistants, supporting staff) showed a lot of commitment, flexibility and expertise in the management of the crisis. The duration and severity of the crisis require that initiatives (e.g. by hospitals and umbrella organisations, with support of public authorities) are developed to support the psychosocial well-being of healthcare professionals.

A second element related to staffing concerns education of healthcare professionals. This includes several aspects: more basic (e.g. infection prevention and control, use of PPE) and advanced topics (e.g. care for critically ill patients). In addition, besides task-oriented training, attention

should also be paid to generic skills such as leadership, crisis management, etc. During the first wave many local initiatives were taken. It is worthwhile to join forces and combine some of the initiatives to develop even better, more efficient and harmonised educational support and training tools for the future. This requires action from public authorities, universities, schools of higher education and the hospitals.

Regular care and intermediate care structures

The regular medical activities need to be protected as much as possible when surge capacity is required leading to the advice to the public authorities to develop an organisational model with fast down- and upscaling. This will require an intensified collaboration (network, regions, nationwide) between hospitals with clear refer and transfer agreements and down- and upscaling plans.

The intermediate care structures that were set up required a lot of energy and resources but did not work in practice and are not recommended for the future. It is unclear what the benefits are in terms of hospital surge capacity (e.g. required resources, unclear for which patient profiles).

Leadership

Although the general perception is that the hospital coordination cell performed well during the crisis in most hospitals, a point to improve in the future is the legal power that is attributed to the CMOs. The CMO is responsible for the quality of care in the hospital but lacks legal power. It is advised to review the legal framework in which CMOs (and by extension head physicians of medical disciplines) operate. Yet, moral power is also of utmost importance. An important element to acquire and maintain moral power is to be visible on the field and avoid to be depicted as “ivory tower” managers. Infection prevention and control was important during this crisis. The composition and resources that are allocated to these departments should be carefully evaluated.

Patients

During the first wave all efforts went to crisis management. Non-essential care was stopped, visitors were banned, etc. This resulted in distressing situations (e.g. patients who died alone, patients who had no support from their relatives when receiving bad news, etc.). Many hospitals and healthcare professionals noticed these problems very soon and relaxed the rules or paid extra attention to deal with these patient needs.

When care is prioritised when down- or upscaling it is insufficient to evaluate this at the level of the process or condition. Also the individual patient context needs to be taken into account. Hospitals and healthcare professionals need to have in a particular context (number of infections in the region, availability of PPE, available staff, etc.) the flexibility to make balanced and justified choices.

Other topics

Other topics included in the document are out of scope of the current report but nevertheless have an impact on surge capacity. A wide-scale testing strategy with low turnaround time and efficient data sharing was recommended which is, for instance, important for healthcare staffing (e.g. availability of staff who was tested). Another example is the role of public authorities in the provision of PPE (e.g. strategic stock and a central system to check the reliability of PPE suppliers). The surge capacity is focussing on the acute phase, but the COVID-19 pandemic made clear that integrated care is required for acute conditions. Therefore it is important to look beyond the creation of the surge capacity and include collaboration between several actors (e.g. triage, post-acute care external liaison, palliative support teams) within the wider evaluation process. Another topic is clear and uniform communication that is easily accessible. This includes a central platform where guidelines and instructions can be easily accessed which is also relevant in light of the HTSC committee communication.

7 DEVELOPMENT OF HOSPITAL SURGE CAPACITY IN SELECTED COUNTRIES

Key Findings

- The chosen countries (England, Germany, Italy and the Netherlands) have a government that during the COVID-19 crisis was advised by several committees and scientific boards, as is the case in Belgium.
- In each country, surge capacity plans were issued by national and/or regional governments containing recommendations to hospitals concerning surge in staff, space, stuff and system. However, it is unknown to what extent those recommendations were considered feasible and actually followed up by the hospitals.
- Finding enough healthcare professionals to staff the needed surge in beds was one of the most difficult issues in each country.
- All countries stopped the elective hospital procedures in the beginning of the COVID-19 crisis in order to free up space and staff necessary to take care of the large number of COVID-19 patients.
- Regarding staff surge, common strategies were training of non-ICU staff in such a way that they could work on ICU, looking for personnel that formerly worked on ICU, to staff ICU with mixed teams of experienced ICU staff with less experienced, adaptation of working conditions, easing licensure requirements and financial incentives. Italy also looked for personnel abroad and made use of transferring personnel from less affected areas to the more affected regions.
- Regarding space surge, common strategies were redesigning hospital areas into intensive care areas. Italy and England also organised large scale emergency field hospitals. The Netherlands and Italy made use of infrastructure abroad.
- Regarding stuff/equipment surge, there was a large problem in each country to find enough personal protective equipment. Shortages in ventilator equipment were also mentioned.
- Regarding system, each country encountered problems related to adequate actual data about hospital (ICU) bed capacity and occupancy. In each country, new monitoring systems had to be developed. Evaluations done so far, all plea for more sophisticated monitoring systems based on real time data on number of (ICU) admissions, (ICU) bed availability, length of stay, use of life support devices.
- Triage protocols were developed in each country to support healthcare professionals in case difficult choices had to be made regarding hospital or ICU admission.

7.1 Introduction

The COVID-19 pandemic caused enormous challenges for healthcare systems to adequately care for the large amount of patients requiring hospitalisation and intensive care. Most countries around the world were required to enlarge their hospital capacity, by limiting elective procedures, reserving hospital beds to COVID-19 patients and by increasing the number of hospital beds and especially the number of ICU beds. It is interesting to see how different countries handled this process of "surge capacity"[rr], what factors they took into account to calculate needed size of (ICU) care capacity, what tools and instruments they used, how decisions were made, what barriers they encountered, etc. Therefore, we performed an international comparison with the aim to obtain insight in surge capacity strategies that were followed in other countries and what pitfalls they encountered in order to formulate recommendations in the Belgian healthcare context.

We explored the choice of potential countries, based on similarities and contrasts to Belgium or to each other on the dimensions high/low healthcare capacity, high/low impact of COVID-19, central/regional organisation of healthcare, and high/low pandemic preparedness. As such, we selected England, Germany, Italy and the Netherlands as countries for the comparison. Relevant information for each country was sought in several ways. General information on surge capacity approaches was sought by Pubmed searches and searches by Google advanced. Next to this, country specific information was sought by consulting websites of governments, the assigned epidemiological surveillance institutes, scientific organisations and hospital healthcare professionals' organisations. Also we contacted for each country the first author of the Health System Response Monitor[39-42] with the request to send relevant sources and documents related to their country surge capacity approach. Appendix 3.1 contains the full description of the methodology followed regarding country selection, information gathering and analysis. Full description of findings per country can be found in Appendix 3.2 to Appendix 3.5. Here, we present only the cross-country comparisons along the four dimensions of surge capacity (staff, space, stuff or supplies and systems) as described by the WHO[7] and explained in Chapter 1.

7.2 Starting points

In Table 14 baseline characteristics of the selected countries are presented regarding healthcare organisation, healthcare capacity, COVID-19 impact and pandemic preparedness.

Germany and Italy are countries in which regional governments have the most power to organise healthcare with limited central steering while England and the Netherlands are countries with a rather central power for healthcare and limited regional competences.

Germany has a higher number of hospital (ICU) beds compared to the other countries and Italy and England have much less nurses. Italy and England (UK) were much harder hit by the first wave of COVID-19 compared to Germany. The Netherlands, Italy and England (UK) showed lower pandemic preparedness.

[rr] Surge capacity is '*A health care system's ability to rapidly mobilize to meet an increased demand, to rapidly expand beyond normal services levels to meet the increased demand in the event of large-scale disasters or public health emergencies*' (https://www.ncbi.nlm.nih.gov/mesh/?term=surge+capacity).

Table 14 – Country baseline characteristics

		England[a]	Germany	Italy	The Netherlands
Organisation of healthcare		Rather central	Rather regional	Rather regional	Rather central
Healthcare capacity (2019 or most recent year)	N acute hospital beds per 10^5 population[b]	246	602	259	269
	N ICU beds per 10^5 population[c]	6.6	38.7	8.6	12.5
	N physicians FTE per 10^5 population[d]	295	431	402	367
	N nurses FTE per 10^5 population[e]	778	1 322	564	1 113
COVID-19 impact	First COVID case[f]	01/02/20	28/01/20	31/01/20	27/02/20
	Cancellation elective procedures	17/03/20	29/03/20	29/02/20	12/03/20
	COVID-19 cumulative cases on 01/07/20 (N per 10^6 population)[g]	4 247.4	2 348.4	3 992.9	2 904.0
	COVID-19 cumulative deaths on 01/07/20 (N per 10^6 population)[g]	606.2	108.2	579.5	352.8
Pandemic preparedness	Country preparedness for epidemics and pandemics (max score = 100) in 2019[43]	77.9	66.0	56.2	75.6
	COVID-19 Healthcare Readiness (max score = 100) in 2019[44]	54.0	78.8	54.0	65.9
	Quality of countries COVID-19 response (May 2020)[45]	Poor	Very good	Poor	Fair

[a] *Since England was not used as a separate country identity in the sources, we present figures from the UK in the table.*
[b] *Source: OECD (2020) (https://data.oecd.org/healthcqt/hospital-beds.htm)*
[c] *Source: https://en.wikipedia.org/wiki/List_of_countries_by_hospital_beds*
[d] *Source: OECD (2020) (https://stats.oecd.org/Index.aspx?ThemeTreeId=9#)*
[e] *Source: OECD (2020) (https://stats.oecd.org/Index.aspx?ThemeTreeId=9#)*
[f] *Source: https://who.maps.arcgis.com/apps/opsdashboard/index.html#/ead3c6475654481ca51c248d52ab9c61*
[g] *Source: https://ig.ft.com/coronavirus-chart/?areas=gbr&areas=deu&areas=ita&areas=nld&areasRegional=usny&areasRegional=usca&areasRegional=usfl&areasRegional=ustx&byDate=1&cumulative=1&logScale=1&perMillion=1&values=deaths*

7.3 System surge strategies

Cancellation of elective procedures

All governments issued measures to cancel non-urgent elective hospital procedures in the beginning of the COVID-19 crisis, in order to free up space, staff and stuff and reconvert these for the care of the large amount of COVID-19 patients. Urgent and life-necessary treatments for non-COVID patients could be continued. In each country, professional associations developed guidelines with criteria about what types of care needed to be continued. However, it remained the responsibility of each treating medical doctor to determine if a procedure was urgent and necessary. When the peak of the first wave of COVID-19 was passed (mid-April – begin May), regular care was started up step-wise, based on professional guidelines.

Financial injection to ensure continuity of hospital care

Due to the huge impact of the COVID-19 crisis on the hospital functioning, each government freed up substantive amounts of money to ensure continuity of hospital care and to compensate hospitals for losses due to cancellation of elective procedures. For example, in Italy the decrees of 9 March and 17 March implemented a series of measures to increase the availability of health workers for a total of 660 million euro; the UK government established on 11 March an initial emergency fund at £5bn to ease pressures in the national health system.

Launch of (hospital) emergency plans

The COVID-19 crisis caused that emergency/crisis plans (and going beyond healthcare) were activated in each country to be able to adequately develop and coordinate necessary measures to control the epidemic. Some of the emergency/crisis procedures are situated at the national level, while others are at the regional or municipality level. For example, the Italian Ministry of Health[ss] considered it necessary that the regions prepared an emergency plan for the management of critically ill patients affected by COVID-19, which allowed for guaranteed adequate levels of treatment through an adequate number of intensive care beds; further each region had to identify one or more structures/establishments for the management of COVID-19 patients only ("COVID Hospital"). Germany obliged hospitals to have a hospital emergency plan that needs to be activated in case of a mass crisis event such as COVID-19; but we did not identify information on (activation of) hospital emergency plans in the other countries.

Setting up scientific advisory structures

In each country governments called for advice from existing scientific advisory boards and/or established new ones in order to develop adequate strategies to tackle the COVID-19 crisis. The main advisory boards were the Scientific Advisory Group for Emergencies (SAGE) in England, the Robert Koch Institute in Germany, Istituto Superiore di Sanità in Italy and the National Institute for Public Health and the Environment (RIVM) in the Netherlands. Several other scientific and healthcare professional organisations also provided advice to the national and regional governments.

Involvement of the army

In all four countries the army provided help, mostly in ensuring sufficient physical infrastructure (e.g. set up of military field hospitals), sufficient equipment (such as ventilators and ICU beds), assisting in patient transport (e.g. by military helicopters and ambulances) and deploying extra workforce capacity (by sending military physicians and nurses to civil hospitals).

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ss https://www.trovanorme.salute.gov.it/norme/renderNormsanPdf?anno=2020&codLeg=73530&parte=1%20&serie=null

Monitoring systems

Each country also immediately requested a scientific organisation to initiate a system to monitor daily the epidemiological impact from COVID-19 regarding the number of new COVID-19 cases and mortality. In addition, systems were set up to monitor hospital (ICU) admissions of COVID-19 patients and often in parallel another system to monitor availability of hospital (ICU) beds (normal plus extra created capacity). These monitoring systems were sometimes based on already existing surveillance systems (e.g. regarding flu-epidemics or ICU beds use) or they were completely new developed. Sometimes the **monitor systems were set up at a national level, sometimes at a regional level, sometimes both.** Some monitor systems related only to COVID-19 patients and other to all patients; some systems registered all hospital admissions and other only ICU.

The main monitoring systems per country are shown in Table 15.

Each country reported **problems in the way the monitoring systems functioned and everywhere adaptations were needed along the way**. Problems in having adequate overviews of availability and occupancy of hospital (ICU) beds were faced in each country. Most of the hospital availability and occupancy systems asked hospitals to fill out daily aggregated numbers of patients admitted/discharged or beds available/occupied. In each country part of the surveillance systems were made mandatory.

Next to surveys with aggregated data, several other non-mandatory surveys were initiated in which individual patient data were gathered regarding disease course and severity.

Table 15 – Main monitoring systems of hospital (ICU) beds availability and occupancy concerning COVID-19 patients

	England	Germany	Italy	The Netherlands
Hospital admissions	COVID-19 Hospitalisation in England Surveillance System (CHESS)	?	Civil protection survey	Stichting Nationale Intensive Care Evaluatie
Hospital ICU admissions	COVID-19 Hospitalisation in England Surveillance System (CHESS)	DIVI-Intensivregister	Civil protection survey	Stichting Nationale Intensive Care Evaluatie
Hospital bed availability	?	?	?	Landelijk Platform zorgcoördinatie
Hospital ICU bed availability	Monthly Situation Report (MSitRep)	DIVI-Intensivregister	?	Landelijk Platform zorgcoördinatie
Hospital bed occupancy	?	?	?	Landelijk Platform zorgcoördinatie
Hospital ICU bed occupancy	Monthly Situation Report (MSitRep)	DIVI-Intensivregister	?	Landelijk Platform zorgcoördinatie

7.4 Staff surge strategies

Looking for the second best alternative: areas that were affected the most had to employ more staff with non-ICU expertise

A plethora of interventions have been recommended and used in the different countries to increase staff capacity in hospitals. Common strategies were training of non-ICU staff in such a way that they could work on ICU, recruiting personnel that formerly worked on ICU, staffing ICU with mixed teams of experienced ICU staff with less experienced, adaptation of working conditions, easing licensure requirements and financial incentives. Italy also looked for personnel abroad and made use of transferring personnel from less affected areas to the more affected regions. Table 16 shows the type of interventions we identified. However, it was not always clear who should do the interventions or to what extent interventions were used by governmental bodies, or by (all) hospitals, or overarching networks, and to what extent the interventions were successful to obtain more staff. Most of the interventions related to (ICU) nursing staff, since these were found to be the most critical profession, but also extended to medical and supporting staff.

The impact of the different strategies on the number of staff working on COVID-units is unclear

Regarding effectiveness of staff surge interventions, there are only some indications available for the total of interventions, but not for each specific intervention. For example, from an evaluation in England,[46] it appeared among others that by the end of April, an extra 18 200 NHS staff were deployed in clinical and support roles, including 7 000 nursing and midwifery students and 8 000 returning retired and former staff. Or from Italy it was reported[40] that several regions increased their workforce capacity, e.g. Lombardia hired 589 additional doctors (+ 3.8%) and 1 016 nurses (+ 2.6%) by 8 May, whereas Emilia Romagna hired 421 doctors (+ 4.7%) and 1 032 nurses (+ 4.0%) and Marche increased its capacity of clinicians by 15.8% and of nurses by 7.3%.

Table 16 – Staff surge strategies

	England	Germany	Italy	The Netherlands
Note: In the table there are crosses X when we identified documents on it; when there is no mark, it does not mean that that strategy has not been advised or used, but only that we did not identify information on it. Also it was not always clear if interventions were advised to / used by hospitals only or concerned also other healthcare settings.				
Combine experienced staff with less experienced under careful supervision and after appropriate training	x	x	x	x
Deploy staff from non-ICU wards in ICU	x	x	x	
Increase/adapt patient-to-nurse ratio	x	x		
Extended shifts or request to work full time instead of part time	x	x	x	x

	England	Germany	Italy	The Netherlands
Suspension of holidays			x	
Flexibility in shifting rotas	x	x	x	
Incorporate staff on leave	x	x		
Consider the role that staff who are unable to have patient contact could play in supporting staff remotely	x			
Acquire retired/former healthcare providers		x	x	x
Make use of medical or nursing students	x	x		
Developing list of interested people to join healthcare workforce			x	x
Deployment of military (medical) workforce		x		x
Engagement of volunteers		x		x
Transfer healthcare professionals from less impacted regions to the more impacted ones			x	
Use of staff from private hospitals			x	
Acquire workforce from abroad			x	
Use of NGOs (Red Cross, Médecins sans frontières, etc.)			x	x
Facilitating licensing procedures of healthcare professionals	x	x		x
Ease visa requirements to keep foreign professionals at work	x	x		
Financial incentives for staff		x	x	x
Attractive working conditions				x
Set up training for less experienced staff	x		x	x
Support of the staff (e.g. psychological support, domestic support services, child care)	x		x	x
Increase influx in nursing ICU trainings (long term measure)				x

7.5 Space surge strategies

Also here, we identified a range of interventions advised and/or applied in the selected countries. They could be categorised in hospital-internal space surge, e.g. deployment of operation rooms into ICU space, and hospital-external space surge strategies, e.g. establishment of emergency field hospitals.

Some of the interventions were initiated by national or regional governments, other by hospital networks or individual hospitals.

Regarding the use of hospital infrastructure in other regions or abroad and transferring patients, as was done in Italy and the Netherlands, it is mentioned that this also requires an appropriate transport system for which also extra ambulances and extra personnel are needed.

Creating extra infrastructure faced everywhere the problem of necessary staffing.

Regarding effectiveness of interventions (extra created beds), there are some indications on the total of space surge interventions, but not on each specific intervention.

For example, the National Audit Office of England[46] reported that between 17 March and 12 April, the number of available beds increased from 12 600 to 53 700, and the NHS additionally increased capacity with 8 000 beds in private hospitals; also extra capacity was created by establishing temporary Nightingale hospitals, although use of these was limited up to mid-May. The report states that overall the NHS system's capacity for COVID-19 patients, in terms of beds and respiratory support, has been sufficient during the pandemic to date.

With respect to Italy, in the region Lombardia, the initial ICU capacity of 724 beds could be increased to 1 100.[40] Grasselli et al.[47] reported that the hospital network in the Milan area created 482 new ICU beds in the first 18 days of the crisis. In Bergamo a field hospital with 142 beds, out of which 72 are ICU beds was opened.[40] In Turin a temporary hospital was opened consisting of 90 beds (4 ICU beds, 30 "sub-intensive" beds and 56 ward beds).[48] However, in some Italian regions there was insufficient space to take care for all COVID-19 patients, e.g. Remuzzi[49] reported that by 3 April 4 068 patients had been admitted to ICU, of which 2 842 in the North, occupying 113% of their bed capacity. Nacoti et al.[50] reported on 21 March that most hospitals were overcrowded and patients were lying on mattresses on the floor. Also the WHO[51] reported that the demand for care soon exceeded capacity in (the North of) Italy.

Table 17 – Space surge strategies

		England	Germany	Italy	The Netherlands
Hospital internal	Re-purposing of operation and recovery rooms into ICU	x	x	x	x
	Use of empty space	x	x	x	x
	Converting clinical areas into ICU	x	x	x	x
	Converting non-clinical spaces into clinical ones	x	x	x	x
	Setting up of triage areas at the entrance of the hospital			x	
Hospital external	Creation of emergency field hospitals			x	
	Redesign of non-care buildings into care buildings (e.g. hotels, convention centres, etc.)	x		x	
	Use of private hospitals			x	
	Establishment of intermediate care structures			x	x
	Cooperation within a hospital network to create extra space			x	x
	Dispersion of patients across hospitals in the country and transfer of patients	x		x	x
	Use of foreign care structures and patients transfer			x	x
	Creation of separate COVID-19 hospitals		x	x	
	Use of military hospitals			x	x
	Triage guideline for hospital (ICU) admission developed		x	x	x
	Triage for hospital (ICU) admission applied			x	
	Use of digital solutions		x	x	x

7.6 Stuff surge strategies

All countries around the world struggled during the COVID-19 crisis to obtain sufficient supplies to appropriately care for the COVID-19 patients. Main shortages related to personal protective equipment (masks, gowns, gloves), but also to ventilators, ECMO equipment and medications. Governments often tried to buy centrally the needed supplies and set up distribution channels and conditions to healthcare organisations. Also national stock piles and stock loan programmes were set up. Other strategies are listed in Table 18.

Effectiveness of the surge strategies is difficult to demonstrate, but it appeared that at the end of the first COVID-19 wave most shortages had disappeared.

Table 18 – Stuff surge strategies

	England	Germany	Italy	The Netherlands
Registration and monitoring of hospital stock	x			
Establishment of a regional and national stock loan programme	x			x
Central procurement of PPE	x	x	x	x
Prohibition of PPE export		x		
Guideline development concerning use of PPE (who, what, when)			x	x
Re-use of PPE		x		x
Deployment of military (medical) equipment		x	x	x
Use of equipment from private hospitals				x
Development of simplified ventilators				x
Shared ventilation guideline developed				x
Shared ventilation applied				

7.7 Discussion and conclusions

A pandemic in the format and size of the COVID-19 crisis is an enormous challenge for healthcare systems and healthcare organisations. It requires interventions and measures at national, regional, and organisational level and concerns the intertwined domains of staff, space, stuff and systems.

Main problem each country faced was to find sufficient PPE, sufficient trained personnel and the lack of up-to-date actual data of hospital (ICU) bed availability and occupancy.

The surge strategies we identified in our analysis are in line with earlier international comparisons[52-56] that also found the large range of surge interventions used around the world.

From this international comparison we learned that the selected countries used much creativity and applied a plethora of surge interventions (creating new resources, using resources more intensively and more flexibly). However, it was not always clear who should do the interventions or to what extent interventions were used by governmental bodies, or by (all) hospitals, or overarching networks, and to what extent the interventions were successful. Unfortunately, it was impossible to find out the intensity and frequency of the interventions: was it rather an advice than a policy measure?, was the advice feasible? were the interventions de facto implemented /used? how effective were they? Despite the many interventions, it appeared that it was not enough in the case of Italy, where the care demand exceeded care availability. One could question if Italy failed and the other countries succeeded. Or was it bad luck for Italy because it was the first European country were an outbreak took place and was it simply much harder hit by the COVID-19 virus? Were other countries better prepared for a pandemic than Italy or did they learn from the Italian experience? Or was it due to the high level of regional competencies and policies in Italy?

Balzhan et al.[57] concluded, based on a worldwide country comparison, that "*Health system capacity measures represented by the numbers of hospital beds and doctors have statistically significant effects. The higher the number of both doctors (per 10 000 people) and beds (per 10 000 people) is, the more likely the country is to have a lower case fatality rate due to COVID-19.*" Stribling et al.[58] on the other hand compared 36 countries and found that "*The extent of a countries pandemic preparedness, expenditure on healthcare and magnitude of the nursing workforce does not appear to impact mortality rates".*

Regarding centralised/decentralised (regional) management a report of the OECD[59] remarks that "*COVID-19 is revealing that the centralisation versus decentralisation debate currently taking place in many countries is a deceptive one. There are advantages and disadvantages to both. For instance, a centralised approach to managing aspects of the public health emergency can support a rapid and uniform response across a country, overriding potential inequalities, be they in resource capacity or in the treatment of individuals. [...] On the other hand, a decentralised system can support greater flexibility and experimentation in the face of uncertainty, making room for "bottom-up", innovative approaches that can be applied elsewhere, if successful and appropriately adapted. [...] Additionally, decentralised approaches create space for regional and local governments to react and respond quickly*. [...] *As the OECD*[tt] *has argued with respect to COVID-19 – and decentralisation in general – it is not the degree of centralisation or decentralisation that matters for an effective crisis response. Rather, what matters is inter-governmental coordination and the interaction of proactive measures undertaken at and by all levels of government. The crisis is revealing that extreme centralisation and extreme decentralisation both exhibit significant weaknesses.*"

[tt] https://www.oecd-ilibrary.org/urban-rural-and-regional-development/making-decentralisation-work_g2g9faa7-en

From the evaluations that were done so far in the countries, it appears that each country encountered rather similar problems and shortcomings in their surge capacity approach, e.g. monitoring systems for hospital (ICU) bed availability and occupancy showed imperfections and required many adaptations along the road in every country. Everywhere it was difficult to find enough appropriate staff; everywhere there were supplies shortages and everywhere there were threats to sufficient appropriate space (hospital (ICU) beds). Commonly, evaluations plea for better data registration and monitoring systems, for increasing the number of ICU beds and ICU nurses, for a national supplies stock pile, etc.

Some of the applied surge strategies can only work conditionally; e.g. dispersion and transfer of patients from one region to another or from one country to another can only work when the pandemic impact is lower in one area than in other areas. Increasing the number of ICU beds or establishing field hospitals can only work if there is sufficient personnel to staff them. It means that even surge has its limits and that in case of overwhelming amount of patients, difficult choices are unavoidable.

The COVID-19 crisis also led in the selected countries to cancellation/postponing regular care and in the evaluations of the first wave this was found to be a great problem that caused a great amount of “collateral damage”, that should be avoided as much as possible in case of a second wave. Also here difficult choices will be unavoidable and clear (ethical) guidelines will be needed.

8 GUIDELINES AND TOOLS FOR HOSPITAL SURGE RESPONSE STRATEGIES

Key Findings

- **Planning hospital surge capacity is situated on four different dimensions: space, stuff, staff, and systems. These four dimensions should be taken into account during the planning process of hospital surge responses.**
- **The dimension space is mainly focusing on available beds to meet the patient flow. First, the guidelines recommend to increase the space capacity by suspending elective, nonessential services, repurposing of beds and departments, and the creation of additional temporary capacity. Furthermore, actions should be taken to improve functional programming, accessibility and flow management.**
- **Adequate levels of stuff were a major bottleneck during the first wave of the COVID-19 crisis in Belgium (mainly PPE). When referring to stuff, guidelines mainly refer to the availability of ventilators and PPE. Major strategies for this dimension recommended by the guidelines entail optimising the utilisation of stuff, increasing the supply of stuff, and improving the stock management.**
- **The availability of sufficient numbers of fully trained staff may become a significant constraint during an increased surge. The options to mitigate this constraint can be categorised in three major strategies: increase the supply of staff (e.g. by redeploying staff and mobilising additional staff), minimise the loss of staff (e.g. by providing sufficient support), and optimise the utilisation of staff (e.g. by changing the staffing model).**

- **It is recommended in the systems dimension to clearly define hierarchy of command at the national, regional, and hospital level. In addition, arrangements to purchase supplies and resources should be activated, healthcare providers should be supported in priority setting, and care continuity should be ensured.**
- **Most consulted guidelines are rather "common sense" instead of embedded in a strong evidence base. These common sense recommendations are very time- and context-specific (e.g. global PPE shortage was limited in time and place), making it not always easy to translate them to the Belgian context.**
- **Monitoring is a recurring topic in all dimensions of surge capacity. Several planning tools and models that are developed to project or forecast beds, stuff, and/or staff needed to respond to the COVID-19 pandemic, already exist. These tools and models incorporate a wide variety of different parameters (sometimes very context-specific), use different statistics and operationalisations, and have different purposes.**

8.1 Introduction

The goal of the current chapter is to provide an overview of the tools and guidelines written to meet a pandemic- or crisis-induced surge, as identified in the literature. The identified strategies and recommendations will be structured throughout this chapter using the 4S's framework (see Chapter 1). This framework of Barbisch and Koenig[60] (slightly adapted by the World Health Organization[7]) proposes a multicomponent approach taking into account the interactions and dependencies necessarily entailed by an effective health systems' response to a disaster- or pandemic-induced surge.

8.2 Methods

During the screening of the literature for the international comparison (see Methods described in Chapter 7), we observed that some of the included publications were general guidelines or tools (not necessarily focused on one particular country). These general guidelines and tools were, therefore, not included Chapter 7, but analysed in a separate one. Additional relevant guidelines and tools were identified through for- and backward snowballing. Relevant guidelines were included up until 30 September 2020.

All recommendations cited in the consulted guidelines were divided into the four categories of the 4S's framework. After that, all recommendations in each category were analysed using thematic clustering.

8.2.1 Characteristics of the included guidelines and tools

In total, 28 guidelines or tools were included in this analysis, of which 23 publications were specifically targeted to surge capacity for current COVID-19 pandemic (published between February and October 2020). Five publications focused more on recommendations for surge capacity during a general pandemic or crisis. These five general guidelines or tools were published between 2009 and 2014.

8.3 Space

Recommendations to meet space requirements during a pandemic or crisis can be categorised in two main strategies:

1. Increase space capacity: by suspending elective, nonessential services, repurposing beds and departments, and creating additional temporary capacity (see 8.3.1).
2. Improve functional programming, access, and flow management (see 8.3.2).

Before going into depth in the options to implement these two strategies, we want to highlight an important prerequisite. In order to keep track of the availability of space, a system to monitor bed occupancy (including the number of patients in isolation), the number of rooms used for isolation, and

the number of rooms that can be potentially used for isolation should be in place both at hospital and country level.[61] This system can, once the number reaches a certain threshold, trigger the progressive conversion of normal rooms to isolation rooms, create cohorting departments, or set other strategies in motion. We elaborate on planning tools and models to monitor bed occupancy later in this chapter (see 8.7).

8.3.1 Increase space capacity

8.3.1.1 Suspend nonessential elective services

In order to increase the space capacity, several guidelines recommend to suspend all elective medical/surgical procedures and activities.[62-68] This should especially be done once community transmission of COVID-19 has been documented within a province or country.[63] The suspension of these nonessential services will rapidly increase the availability of staff (which can then be redeployed to assist in critical care provision, see 8.5.3.1) and repurposing of spaces to acute care delivery.[69, 70] Despite its short term merit, nonessential services cannot be suspended indefinitely, because this will enhance the stress on the healthcare system in the long term. Cancelling nonessential services can increase the capacity substantially in the beginning of the pandemic or crisis, but if it is prolonged, this strategy may have to be re-evaluated.[69] In this respect, the National Academies of Sciences – Engineering and Medicine (2020)[70] recommend to determine prioritisation for procedures (for instance, by embedding a ranking system) or collaborations between hospitals in networks or coalitions. This could lead to the continuation of elective procedures in some hospitals, while others curtail them. However, the authors do not refer to existing ranking systems or tools to prioritise procedures in light of pandemics.

The role of healthcare coalitions and public authorities is important to maintain a coordinated approach in absorbing the surge. Healthcare coalitions (or networks) are, therefore, required to be consulted during the decision making on suspending nonessential elective services. But the actual decision is best taken by the public authorities to ensure coordination.

Table 19 – Options to suspend nonessential elective services

Recommendations	References
Suspend all elective nonessential services (e.g. medical and surgical procedures and activities)	Anesi et al. (2020)[62], Aziz et al. (2020)[63], Christen et al. (2020)[64], Hick et al. (2009)[65], Hick et al. (2020)[69], Thomas et al. (2020)[67], World Health Organization (2020a)[68]
Utilise a ranking system for procedures to determine prioritisation Collaborate in networks or coalitions to continue elective procedures	National Academies of Sciences – Engineering and Medicine (2020)[70]

8.3.1.2 Repurpose beds and departments

When beds at the ICU are saturated, guidelines usually recommend a stepdown approach to convert or repurpose beds/departments. First, post-anaesthesia care units (PACU) beds or operating rooms are converted to deliver critical care.[64, 71, 72] The necessary resources to deliver critical care (such as oxygen connection, ventilators, monitoring) are already available in these monitored procedural areas. Afterwards, beds in other hospital locations are repurposed for critical care in the following order: (i) use of step-down units and large procedure suites (e.g. gastroenterology labs), (ii) use of telemetry units (i.e. non-ICU rooms with vital sign monitoring), and (iii) use of hospital floor beds.[62, 64, 71] If this repurposing is not yet sufficient to meet the care demand for COVID-19, non-clinical areas can be transformed in delivering (critical) care.[72] Nevertheless, the overall objective should be to concentrate care for the most critically ill patients in the conventional critical care areas (such as an ICU) and move those patients that are more stable or with lower resource requirements to other areas of care.[66]

Furthermore, hospitals should have a tiered plan in which initial cases are accommodated in Airborne Infection Isolation Rooms (AIIR).[69] This is mainly attributable for current COVID-19 pandemic (e.g. reverse isolation rooms will be necessary in case of nuclear disasters) and will especially be useful

in the beginning of the pandemic. The number and location of potential beds to be re-assigned as AIIR rooms and a plan to re-allocate the non-isolated patients to other rooms is established.[61] In first instance, all hospitals should maximise the number of single rooms in which a positive COVID-19 patient can be hospitalised (that can be transformed into double rooms in case of hyper flow of patients).[73] When there are no single AIIR rooms available, hospitals can progress to cohorting[uu] multiple patients in one isolation room[vv] (e.g. doubling up patients in ICU rooms) and subsequently to cohorting on specific designated departments.[69, 71]

Table 20 – Options to repurpose beds and departments

Recommendations	References
Convert beds and departments using a stepdown approach: • post-anaesthesia care unit (PACU) beds or operating rooms to ICU beds • other monitored procedural areas (such as gastroenterology labs, intermediate care) and monitored/step-down units • telemetry units • hospital floor beds • transform non-clinical areas for care	Abir et al. (2020)[71], Anesi et al. (2020)[62], Bader et al. (2020)[72], Christen et al. (2020)[64], Hick et al. (2020)[69]
Cohorting of patients (tiered plan): • hospitalisation of initial cases in AIIR isolation rooms • cohorting of multiple patients in isolation rooms • cohorting on specific designated departments	Abir et al. (2020)[71], Anesi et al. (2020)[62], Hick et al. (2020)[69]
When designing new hospitals or refurbishing of existing ones, maximise the number of single rooms (that can be transformed into double rooms in case of hyper flow of patients).	Capolongo et al. (2020)[73]
The number and location of potential beds to be re-assigned as isolation rooms and a plan to re-allocate the non-isolated patients to other rooms must be established.	European Centre for Disease Prevention and Control (2020)[61]

8.3.1.3 Create additional temporary capacity

When existing space capacity is insufficient, hospitals can opt to create/open new units or beds (additional, on top of the licensed number of beds) to handle patient flow.[65] In addition, deployable critical care services can be considered as a temporary alternative for critical care provision.[64, 68, 71, 74, 75] "Temporary" because sophisticated critical care is most effectively provided in the regular hospital setting.[74] These deployable services could entail opening mobile/field hospitals, reopening closed hospitals, outsource care of non-critical patients to appropriate alternative treatment sites (e.g. home for mild illness, long-term care), or convert additional sites to patient care units (e.g. convalescent homes, hotels, schools, university dorms, community centres, gymnasiums). This has traditionally been used by the military but has only recently been integrated into the civilian setting in response to pandemics and crisis situations.[74] Contrary to military field hospitals, which primarily focus on trauma, mobile hospitals, when deployed in the civilian setting, should prepare to manage a dynamic and diverse case mix (including both surgical and nonsurgical patients). Because staff has to work more intensively compared to a regular civilian hospital setting (e.g. longer working hours), nursing staff requirements may have to be higher than those required within a conventional hospital setting.[76] However, this creation of deployable care services also entails some important threats

[uu] Cohorting means grouping residents based on their risk of infection or whether they have tested positive for COVID-19 during an outbreak.

[vv] If the hospital has rooms with negative pressure, the maximal number of patients that can be hosted in each room according to the manufacturer should be determined.[61]

(e.g. in terms of patient safety) and should therefore only be implemented in real crisis-situations. Measures need to be taken to ensure safe and high-quality care delivery in these deployable facilities.

Table 21 – Options to create additional temporary capacity

Recommendations	References
Create/open new units/beds (on top of the licensed number of beds)	Hick et al. (2009)[65]
Create deployable critical care services, such as: • mobile/field hospitals with ICU beds • reopen closed hospitals • outsource care of non-critical patients to appropriate alternative treatment sites (e.g. home for mild illness, long-term care) • convert additional sites to patient care units (e.g. convalescent homes, hotels, schools, university dorms, community centres, gymnasiums)	Abir et al. (2020)[71], Christen et al. (2020)[64], Einav et al. (2014)[74], Meyer et al. (2020)[75], World Health Organization (2020a)[68]

8.3.2 *Improve functional programming, access and flow management*

In order to manage the admission of incoming patients during a pandemic or crisis, hospitals can trigger mechanisms to transfer patients.[65, 70] Admission and discharge criteria for patients should be developed in terms of available treatment capacity and demand.[68] When pressure on the healthcare system is increasing, ICU nurses and managers should be notified to start transferring stable patients with less resource demand (and cleared for release) to non-ICU departments. In addition, a list of potential patients that could be admitted to stepdown departments, should be developed.[65] If appropriate, patients can also be transferred to other health centres or home care (see 8.3.1.3). For instance, treatment of the hospitalised elderly can be continued in care homes. However, the triggers for referring patients to other health centres or home care should be established.[61] The clearance of rooms can be accelerated by placing cots to pre-designated discharge holding area/waiting areas to hold patients pending transfers.[69] As a last resort, transfer and diffusion of patients can be speeded-up by reallocating patients to bordering countries.[64]

When healthcare systems are overwhelmed during health emergencies and resources are scarce, some of the guidelines refer to resource allocation by the triage of patients[ww].[63, 68, 77] Triage algorithms for pandemics usually include the prospect of a time-limited trial (TLT)[xx] period of therapy by recommending a re-assessment period between 48h and 120h. At this time, it is decided whether to continue critical care or to divert those scarce resources to another patient which is determined to benefit more.[79-81] There is currently no robust, long-term data on patient outcomes for COVID-19. However, Aziz et al.[63] recommend a TLT period of 10-12 days. The TLT can be ended sooner when the condition is worsening and there are clear signs for unlikely survival. However, important to note is that early reports of COVID-19 patients suggest recovery is possible after prolonged periods of ventilation, so the time given to a TLT period of ventilation must be carefully considered. Nevertheless, when resource allocation by triage of patients is implemented, healthcare professionals should be protected by an adequate legal framework (see 8.6.3).

Related to the triage of patients is the decision regarding in-hospital placement of critically ill patients. For example, older persons already living in a nursing home can be quarantined and treated in the care home, rather than in a hospital.[64] This can be beneficial for the continuity of care and

[ww] Triage of lifesaving resources is the re-allocation or discontinuation of services (such as ECMO or mechanical ventilation) due to its extreme resource commitment in times of shortage or saturation of the health system.[69]

[xx] A TLT is an agreement between clinicians and a patient/family to use certain medical therapies over a defined period to see if the patient improves or deteriorates according to agreed-on clinical outcomes.[78]

diffuses some of the impact on the hospitals. But the criteria for these decisions need to be embedded in legislation and the decision should be performed by an experienced clinician (who makes similar triage decisions on a daily basis).[74]

Last, some of the guidelines recommend some architectural conditions[yy] for hospitals to enhance access and flow management.[61, 69, 73, 82] This is especially the case for the emergency department (ED), which is usually the entrance for suspected infected patients. When patients arrive at the ED, a "parking lot triage" can be implemented, separating suspected infected patients from non-infectious patients.[69] Actually, the entire pathway through the ED should be separated for these patients.[82] Furthermore, it is recommended to place ED and infections ward at the same level promoting short and horizontal connections and minimising the transmission of the virus to other people.[73]

Table 22 – Options to improve functional planning, access, and flow management

Recommendations	References
Adapt admission and discharge criteria according to available treatment capacity and demand	World Health Organization (2020a)[68]
Transfer patients to diffuse impact • Transfer stable patients to stepdown departments • Develop list of additional patients that might be admitted to stepdown department • Create pre-designated discharge holding areas or waiting areas for patients pending transfers • Relocate patients to bordering countries	Christen et al. (2020)[64], Hick et al. (2009)[65], National Academies of Sciences – Engineering and Medicine (2020)[70]
Resource allocation by triage of patients	Aziz et al. (2020)[63], Maves et al. (2020)[77], World Health Organization (2020a)[68]
Decisions regarding in-hospital placement of critically ill patients	Christen et al. (2020)[64], Einav et al. (2014)[74]
Architectural conditions • Separate entrance and pathway in the ED for suspected infected patients and non-infectious patients • ED and infections ward should be placed at the same level promoting short and horizontal connections	Capolongo et al. (2020)[73], European Centre for Disease Prevention and Control (2020)[61], Hick et al. (2020)[69], Paganini et al. (2020)[82]

[yy] Other conditions to be considered when planning the building of new hospitals: strategic site location, typology configuration for enabling disease containment, create spaces with nature (real and on screen), recharge rooms for healthcare professionals to recover from a physically and mentally taxing shift, ventilation and air conditioning (HVAC) and indoor air quality (ensure adequate air exchange in all environments through mechanical, and where possible, mixed ventilation; heating, HVAC must be flexible and operation should be able to be modified).[73] Also, an additional place should be established that could be used as a morgue, if required, and where the custody of the bodies will be ensured.[61]

8.4 Stuff

The recent COVID-19 pandemic revealed the vulnerability of healthcare systems and how they can rapidly be overloaded in terms of available material capacity. In the setting of a pandemic surge, many forms of supplies are essential to provide lifesaving care to critically ill patients. According to the consulted guidelines, key equipment and supplies in light of the COVID-19 pandemic include mainly – but are not limited to – mechanical ventilators and personal protective equipment (PPE). We will, therefore, mainly focus on these two supplies, but will also highlight some general options to, for example, improve stock management. This section is structured using the following strategies:

1. Optimise the utilisation of stuff (see 8.4.1)
2. Increase the supply of stuff (see 8.4.2)
3. Improve the stock management (see 8.4.3)

8.4.1 Optimise the utilisation of stuff

8.4.1.1 Ventilators

The large surge of COVID-19 patients with respiratory failure has led to shortages of mechanical ventilators in some countries. Without access to appropriate mechanical ventilation, many of the infected patients suffering from acute hypoxemic respiratory failure will not survive.[63]

The first option to optimise the utilisation of stuff, is to avoid intubation and mechanical ventilation when medically appropriate alternatives exist. For instance, there are good results of treating patients with acute hypoxemic respiratory failure due to COVID-19 by high-flow nasal oxygen (HFNO), non-invasive ventilation (NIV), or continuous positive airway pressure (CPAP).[zz83-85] Protocols for intubation should, therefore, be developed and implemented, as well as the use of HFNO and NIV.[63] In addition, when standard full-featured ventilators are limited, repurposed devices and alternative techniques could be considered. This could entail the use of long-term ventilators, emergency transport ventilators, anaesthesia gas machines, MRI compatible ventilators, or even prolonged manual ventilation, NIV for invasive ventilation, or veterinary ventilations.[63]

Another option to optimise the utilisation of ventilators could be to incorporate a TLT period.[63] However, as discussed above in 8.3.2, this option is subjected to ethical considerations and the conditions have to be clearly stipulated in a legal framework.

Some guidelines and publications suggest the use of a single mechanical ventilator to support multiple patients during surge of patients with hypoxemic respiratory failure (i.e. “ventilator splitting”).[71, 86, 87] However, lung compliance and resistance are likely to vary among patients (and even in the same patient over time), which could lead to large variations in tidal volumes. The Columbia University College of Physicians and Surgeons proposed a ventilator sharing protocol (requiring careful patient selection with similar mechanical support need, use of neuromuscular blockades, and especially the transfer of patients to a single ventilator for weaning).[88] Nevertheless, several professional groups, such as the Society of Critical Care Medicine (SCCM), American Association for Respiratory Care (AARC), American Society of Anestesiologists (ASA), American College of Chest Physicians (CHEST), issued a consensus statement in which ventilator splitting is not recommended, because it cannot be done safely with current equipment.[89]

Last, a mechanism for the prompt maintenance and repair of essential equipment has to be in place (and non-essential maintenance and repair should be postponed).[68] This will also require sufficient and qualified technical staff.

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zz Despite the merit of avoiding intubation, these treatments are also accompanied with some side effects. For example, NIV and HFNO are potentially associated with an increased risk of viral spread and nosocomial transmission of the infection due to aerosol generation. Also, the failure of non-invasive respiratory support and delayed intubation could be associated with worse outcomes.[63]

8.4.1.2 *Personal protective equipment (PPE)*

Many of the consulted guidelines formulate recommendations on the procurement/utilisation of PPE. This is primarily because, during the first wave of the COVID-19 pandemic, many countries were caught by the rapid spread of the virus, leading to acute deficits in PPE availability. We assume that this acute deficits will be less pronounced in latter stages of the pandemic, due to large efforts of all public authorities to procure and distribute PPE. Nevertheless, for the completeness of this chapter, we describe the cited recommended strategies targeted to PPE.

Protection of healthcare professionals from COVID-19 requires airborne precautions through adequate respiratory protection. When the supply of PPE (almost) is exhausted, several conservation and re-use techniques may be recommended. First, a plan for optimising the use of PPE in case of shortages should be in place. For instance, most protective eyewear/gowns/respiratory protection can be reserved for those performing high-risk interventions (e.g. intubations, monitoring patients on BiPAP), FFP2/3 masks can be reserved for airborne generating procedures and surgical masks can be used for other procedures. As cohorting becomes necessary and the volume of cases increases, a shift to continuous use in designated units or even through the entire hospital may be required (rather than intermittent use).[69, 72, 90, 91] The European Centre for Disease Prevention and Control[90] recommends to keep using the same FFP2/3 mask up to four hours (if not damaged), when performing the same activity or when managing care for multiple COVID-19 patients. Also, in times of pressing shortage of PPE for healthcare personnel, public authorities can decide to discourage the general population from wearing masks.[69, 91] However, this can only be recommended in times of acute shortage.

In times of shortage of PPE, single-use supplies can also be recycled or reused.[62, 69, 91] For instance, elastomeric half-face masks in high-risk environments could be used and reused after appropriate disinfection procedures. Aziz et al.[63] recommend not to use time as a decontamination method of PPE, mainly because the virus remains in the mask for more than seven days. Instead of disinfecting N95/FFP3 masks with ethylene oxide, they should rather be reprocessed with ultraviolet germicidal irradiation (UVGI) or vaporized hydrogen peroxide (VHP) to extend usage time of these masks. Also, the use of surgical masks across multiple days for patients is not recommended.[63]

Last, in order to limit the loss of PPE, healthcare professionals should be trained in putting on ("donning") and taking off ("doffing") PPE.[61, 62] This is best propagated by local "champions" or "superusers" that take ownership over PPE training and adherence in their unit.[62]

Table 23 – Options to optimise the utilisation of stuff

Recommendations	References
Ventilators	
Avoid intubation by developing and implementing clear protocols for intubation, as well as the use of HFNO and NIV	Aziz et al. (2020)[63]
In a setting with a shortage of full-featured ventilators, alternative devices that provide invasive mechanical ventilation or alternative techniques should be considered	Aziz et al. (2020)[63]
Time-limited ventilation trial period	Aziz et al. (2020)[63]
Ventilator splitting: not recommended with current equipment	Abir et al. (2020)[71], Aziz et al. (2020)[63]
Ensure a mechanism for the prompt maintenance and repair of the equipment required for the essential services. Postpone non-essential maintenance and repair.	World Health Organization (2020a)[68]
PPE	
Plan for optimising the use of PPE in case of shortages	Bader et al. (2020)[72], European Centre for Disease Prevention and Control (2020)[90], Harris et al. (2020)[91], Hick et al. (2020)[69]

Recycle/reuse single-use supplies	Anesi et al. (2020)[62], Aziz et al. (2020)[63], Harris et al. (2020)[91], Hick et al. (2020)[69]
Training in putting on ("donning") and taking off ("doffing") PPE	European Centre for Disease Prevention and Control (2020)[61]

8.4.2 *Increase the supply of stuff*

8.4.2.1 *General*

Many of the general recommendations targeted to the supply of stuff are related to sufficient and adequate policy or legislation issued by public authorities. We describe this macro-component more elaborately in section 8.6.2. Below, we focus on recommendations addressed to individual healthcare facilities. Facilities should ensure the adequate availability of supplies through facility-based storage, with vendor agreements and understanding of supply chain resources and limitations.[74] For instance, supply chain bottlenecks can be resolved through the government, which can help to ensure the continuous provision of essential supplies (e.g. institutional and central stockpiles, emergency agreements with local suppliers, donations).[7, 68]

Einav et al.[74] provided some mass critical care target lists for the ancillary equipment for surge in positive pressure ventilation, medical equipment for critical surge and pharmaceuticals. These target lists can be used by hospitals to plan and acquire the relevant and essential resources for current pandemic response.

8.4.2.2 *Ventilators*

In addition to the recommendations to optimise the utilisation of ventilators (see 8.4.1.1), hospitals can increase the number of available ventilators by purchasing domestically available ventilators, or borrow ventilators from other hospitals in their network or region.[62, 63, 71] Hospitals can potentially also acquire additional ventilators from their stockpiles. Related to this, hospitals should partner up to safeguard the supply, flow capacity, and quality assurance of oxygen.[92]

8.4.2.3 *Personal protective equipment (PPE)*

Anesi et al.[62] recommend a mechanism in which PPE are efficiently redistributed across hospitals. Hospitals with lower stocks or more infected patients should receive more PPE compared to less affected hospitals. Alternative suppliers have to be identified if the main suppliers are running out of stock (especially for PPE).[61]

Table 24 – Options to increase the supply of stuff

Recommendations	References
General	
Facilities should ensure adequate availability of disaster supplies through facility-based caches, with vendor agreements and understanding of supply chain resources and limitations	Einav et al. (2014)[74]
Identify and resolve supply chain bottlenecks	World Health Organization (2020)[7]
Consult with authorities to ensure the continuous provision of essential medications and supplies (e.g. institutional and central stockpiles, emergency agreements with local suppliers, donations).	World Health Organization (2020a)[68]
Assess the quality of contingency items prior to purchase	World Health Organization (2020a)[68]
Use the mass critical care hospital target lists for basic equipment, supplies, and pharmaceuticals	Einav et al. (2014)[74]
Ventilators	
Acquire additional ventilators: • Purchase domestically available ventilators • Procurement and donations of ventilators	Abir et al. (2020)[71], Anesi et al. (2020)[62], Aziz et al. (2020)[63]

• Borrow ventilators from other hospitals in the network or region • Acquire ventilators from stockpiles	
Partner up to safeguard the supply, flow capacity, and quality assurance of oxygen	Adelaja et al. (2020)[92]
PPE	
Efficient redistribution of PPE across hospitals	Anesi et al. (2020)[62]
Identify alternative suppliers if main suppliers should run out of stock (especially for PPE)	European Centre for Disease Prevention and Control (2020)[61]

8.4.3 Improve stock management

Physical space for the stockpiling of additional supplies needed during a pandemic or crisis has to be designated by hospitals.[68] Essential supplies and pharmaceuticals should be stockpiled according to recommended guidelines. A comprehensive list has been developed in the context of the influenza pandemics. However, it is likely that this list can also be applied to the COVID-19 population.[74, 93] Hospitals have to develop an inventory of supplies and equipment necessary to provide care to critically ill patients during a pandemic and identify potential shortages based upon projected ICU need in the most likely outbreak scenario.[61, 63, 68] In addition, methods to monitor, maintain, and accurately report equipment and stock levels are recommended to be in place.[61, 63, 92] For example, a list of available sizes and expiry dates of the stockpiled PPE must be compiled and be up to date and escalation procedures for supply shortages within the organisation should be clearly communicated.[61, 92] Also, hospitals can anticipate these critical shortages by creating a strategic buffer of key supplies (e.g. for hand and respiratory hygiene, PPE, isolation, ICU supplies, mechanical respirators, etc.).[61]

A plan should be in place to keep track and custody of key supplies (e.g. PPE, ventilators, cleaning and disinfection material, alcohol solution, etc.) to avoid misuse, overuse or theft.[61, 92] We refer the reader for planning tools and models targeted to supplies in Section 8.7.

Table 25 – Options to improve stock management

Recommendations	References
Identify physical space within the hospital for the storage and stockpiling of additional supplies	World Health Organization (2020a)[68]
Stockpile essential supplies and pharmaceuticals according to recommended guidelines	World Health Organization (2020a)[68]
Methods should be in place to monitor, maintain, and accurately report equipment and stock levels in each clinical area	Adelaja et al. (2020)[92], Aziz et al. (2020)[63], European Centre for Disease Prevention and Control (2020)[61]
Buffer stock of key supplies (e.g. for hand and respiratory hygiene, PPE, isolation, ICU supplies, mechanical respirators) should be acquired	European Centre for Disease Prevention and Control (2020)[61]
Estimate the consumption of essential equipment, supplies, and pharmaceuticals (e.g., amount used per week) based on most likely outbreak scenario	World Health Organization (2020a)[68]
Keep track and custody of key supplies (e.g. PPE, ventilators, cleaning and disinfection material, alcohol solution, etc.) to avoid misuse, overuse or theft	Adelaja et al. (2020)[92], European Centre for Disease Prevention and Control (2020)[61]

8.5 Staff

The availability of sufficient numbers of fully trained staff may be become a significant constraint during an increased surge. The options to mitigate this constraint can be categorised in three major strategies (ranked by recommended order).[63]

1. Optimise the utilisation of staff: for example by changing the staffing model (see 8.5.1)
2. Minimise the loss: by providing sufficient support to the workforce (see 8.5.2)
3. Increase the supply: by redeploying already employed staff and/or mobilising additional (temporarily) staff (see 8.5.3).

8.5.1 Optimise the utilisation of staff

In order to optimise the utilisation of the employed staff, standard team structures and workflow should be reorganised. This can be done by changing the staffing model. Multiple variations for this new staffing model have been suggested. In many cases the model integrated nursing care is not sustained, critical care nurses and physicians move to a consulting role supervising an increasing ratio of patients while non-ICU nurses (such as general hospital nurses and physicians) manage the bedside, orders, and medications.[70] According to the international retrieved guidelines, hospitals maintain in the normal/regular situation, a critical care staffing ratio of 1 nurse per 2 patients. Adjusting this ratio to 1:3 or even 1:4 is an advised strategy during pandemic crises by some guidelines.[69-72, 74, 94] These critical care nurse-to-patient ratios can by determined by provider experience, available support, and clinical demands.[74] However, not all guidelines support this increase in nurse-patient ratios. Al Mutair et al. (2020)[95] recommends to keep using the same nurse-patient ratios as outside crises time (i.e. 1:1 or 1:2) to ensure the provision of safe and high-quality care to patients. Lower nurse-patient ratios are associated with improved patient safety, less complications, and lower mortality rates.[77, 95, 96] If low nurse-patients ratios cannot be provided, these authors advise to find additional staff (see 8.5.3).

Hospitals can also opt to utilise team-based staffing models. In this respect, the tiered staffing model, developed by the SCCM, is a commonly described model (Figure 33).[97] In this model, a physician trained or experienced in critical care and who regularly manages ICU patients oversees the care of four groups of 24 patients. A non-ICU physician (e.g. anaesthesiologist, pulmonologist, etc.), who ideally has some ICU training but does not regularly perform ICU care, is inserted at the top of each triangle. This non-ICU physician extends the trained or experienced critical care physician's knowledge, while working alongside advanced practice providers (APPs) who regularly care for ICU patients. Similarly, to augment the ability to mechanically ventilate more patients, the model recommends experienced ICU respiratory therapists and APP are amplified by adding clinicians such as physicians (either MD or DO), nurse anaesthetists, certified anaesthesiologist assistants, and pharmacists who are experienced in managing patients' ventilation needs. However, ICU respiratory therapists and APP do not have a legal statute in Belgium. Another possible team-based approach is, for example, the adult critical care novel COVID-19 staffing framework developed by the NHS.[94] These team-based approaches have similar concepts and applications. They focus on the utilisation of less-experienced healthcare professionals to work in collaboration with experienced staff to increase the capacity of care for critically ill patients.[95]

The numbers in the mentioned tiered team-based staffing models are not standardised, each hospital can determine the best combination of staff based on their resources and particular context.[95, 97] If these alternative staffing models are implemented, it is recommended to maintain effective communication between all team members.[95] An example to achieve this, is by organising team huddles[aaa] at the start of each shift (and at regular

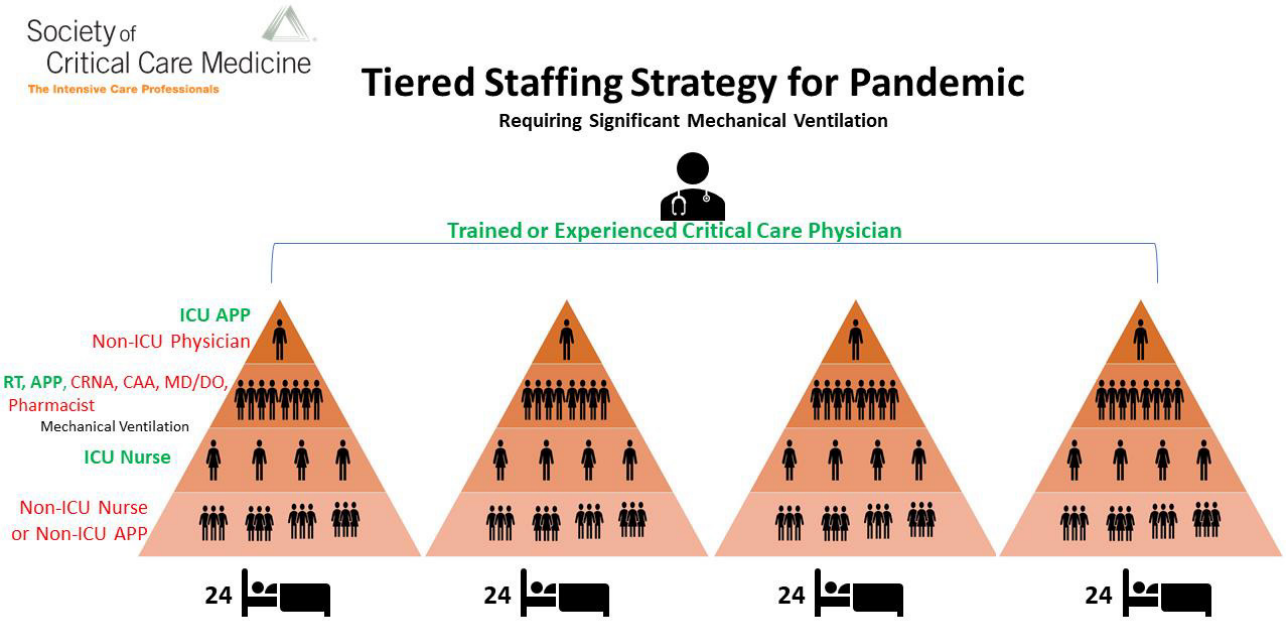
[aaa] A huddle is a short, stand-up meeting – 10 minutes or less – that is typically used once at the start of each workday in a clinical setting.

intervals during the shift) to discuss team assignments, patient care goals, etc.[98] If face-to-face huddles are impossible, virtual huddles can be a valid alternative.

Oversight is recommended to be direct, however, if this is unavailable means of remote consultation should be used. Telemedicine or other technology could be a beneficial tool that allows skilled critical care physicians and nurses to work in areas from which they are geographically remote.[63, 74]

Furthermore, adaptive measures to compensate for a reduced number of staff can be considered. These adaptive measures could entail additional shifts, changes in shift structure and/or time, cancelling leaves of absence, etc.[61, 62, 67, 74] However, these measures should be planned with the staff representatives and a plan to avoid burn-outs among personnel should be in place (e.g. maximum number of working hours, equal distribution of workload, minimum rest times between shifts, etc.).[61, 74]

Figure 33 – Tiered Staffing Strategy for Pandemic



Source: Halpern & Tan (2020)[97]

Table 26 – Options to optimise the utilisation of staff

Recommendations	References
Change staffing model	Abir et al. (2020)[71], Al Mutair et al. (2020)[95], Bader et al. (2020)[72], Einav et al. (2014)[74], Hick et al. (2020)[69], National Academies of Sciences – Engineering and Medicine (2020)[70], NHS England (2020)[94]
Install possibility of remote consultation (when direct oversight is unavailable)	Aziz et al. (2020)[63], Einav et al. (2014)[74]
Compensate reduced staff by adaptive measures (e.g. additional shifts, changes in shift structure and/or time, cancelling leaves of absence, etc.)	Anesi et al. (2020)[62], Einav et al. (2014)[74], European Centre for Disease Prevention and Control (2020)[61], Thomas et al. (2020)[67]

8.5.2 Minimise the loss of staff

The healthcare workforce experiences multiple sources of stress during a surge. They must cope with an increased volume and acuity of patients, moral distress, due to resource scarcity and reallocation, concerns for personal health and the risk of transmission to their family, and dealing with private responsibilities (such as child care).[62] Therefore, maximal support should be provided to the staff in order to deal will the stress and feel safe for themselves and their family.

Provide additional domestic support services (such as access to transport, child care, care of ill or disabled family members) can be considered to enhance staff flexibility to work in shifts and longer working hours. Also, off work time for recuperation should be clearly defined.[68, 74] Next to domestic support, dedicated psychological support (e.g. recognition, peer support and professional support) can be considered to build resilience among staff in coping with the psychological stressors and avoid burn-outs or post-traumatic stress.[7, 61-63, 67, 68, 70, 92] A hazard pay can also be implemented to increase motivation among staff to continue working in a stressful and potentially hazardous environment.[70]

Furthermore, hospitals can also focus on creating and maintaining a safe working environment with the necessary education to familiarise staff with the new working environment.[61, 63, 67-69, 92] For instance, hospitals can organise simulation sessions to better prepare staff for their new roles. Staff must be trained in proper donning and doffing of PPE.[61, 63] Also, all documents and procedures should be easily and centrally accessible and staff should be informed where to find them.

Al Mutair et al. (2020)[95] presented a long-term educational model to train non-ICU nurses in the ICU setting prior to the pandemic (Figure 34). In this educational model, a team is composed of two ICU nurses of which each ICU nurse trains one non-ICU nurse and together they provide care for two critically ill patients. The authors further recommend to have a predefined and delegated group of non-ICU nurses to be stationed in the ICU and be assigned for training to an ICU nurse in order to form a controlled baseline training prior to the actual pandemic. This will establish roles and responsibilities and forms the foundation to build an expanding team when a surge becomes evident. This long-term educational model has almost the same configuration as the tiered staffing strategy (Figure 33), with the exception that this educational model is applied before pandemics or crisis-situations.

Figure 34 – Baseline educational model for tiered staffing strategy prior COVID-19 pandemic preparation

Source: Al Mutair et al. (2020)[95]

Hospitals should develop procedures to monitor staff sickness and absenteeism (also in advance).[61, 68, 92] Back-up teams must be rostered if staff members are absent.[61] In addition, and important in light of cross infections, the WHO[68] and ECDC[61] recommend to establish a clear policy (specifying levels of exposure) to monitor and manage staff suspected or confirmed of having COVID-19 or who have had exposure to a confirmed, probable or suspected COVID-19 patient. For instance, the CDC[99] prefers a symptom-based strategy when staff is suspected to be infected, rather than a test-based strategy. In the test-based strategy, healthcare personnel suspected to be infected are immediately tested. However, in the majority of the cases, the testing results in excluding from work (because individuals will have prolonged viral shedding, limiting the utility of this approach).

Box 5 – Symptom-based versus test-based strategy[99]

Symptom-based strategy:

- In case of mild to moderate illness (not severely immunocompromised staff): at least 10 days have passed since symptoms first appeared and at least 24 hours have passed since last fever (without the use of fever-reducing medication) and symptoms have improved.[bbb]
- In case of severe to critical illness (or staff which is severely immunocompromised): at least 10 days and up to 20 days have passed since symptoms first appeared and at least 24 hours have passed since last fever (without the use of fever-reducing medication) and symptoms have improved. Consultation with infection control experts is recommended.[ccc]

Nevertheless, in some instances, a **test-based strategy** could be considered to allow healthcare staff to return to work earlier (compared to the symptom-based strategy)[99]:

- Symptomatic staff: resolution of fever (without the use of fever-reducing medications) **and** improvement in symptoms **and** results are negative from at least two consecutive tests (collected ≥ 24 hours apart).
- Asymptomatic staff: results are negative from at least two consecutive tests (collected ≥ 24 hours apart).

After returning to work, staff are obliged to self-monitor symptoms and seek re-evaluation if symptoms recur or worsen.[99] Last, staff vulnerable at high-risk for complications of COVID-19 acute respiratory infection (e.g. severely immunocompromised staff) should be considered to be reassigned to “safer” departments.[68, 92]

[bbb] Staff who is not severely immunocompromised and was asymptomatic throughout their infection may return to work when at least 10 days have passed since the date of their first positive viral diagnostic test.

[ccc] Staff who is severely immunocompromised but who was asymptomatic throughout their infection may return to work when at least 10 days and up to 20 days have passed since the date of their first positive viral diagnostic test.

Table 27 – Options to ensure staff support

Recommendations	References
Monitor staff sickness and absenteeism (also in advance)	Adelaja et al. (2020)[92], European Centre for Disease Prevention and Control (2020)[61], World Health Organization (2020a)[68]
Establish clear policy to monitor and manage staff suspected or confirmed of having COVID-19	European Centre for Disease Prevention and Control (2020)[61], World Health Organization (2020a)[68]
Consider reassigning staff at high risk for complications of COVID-19 acute respiratory infection	Adelaja et al. (2020)[92], World Health Organization (2020a)[68]
Provide domestic support services	Einav et al. (2014)[74], World Health Organization (2020a)[68]
Provide psychological support	Adelaja et al. (2020)[92], Anesi et al. (2020)[62], Aziz et al. (2020)[63], European Centre for Disease Prevention and Control (2020)[61], National Academies of Sciences – Engineering and Medicine (2020)[70], Thomas et al. (2020)[67], World Health Organization (2020)[7]
Provide hazard pay as a motivation to continue to work in a stressful and potentially hazardous environment	National Academies of Sciences – Engineering and Medicine (2020)[70]
Prioritise induction, training and familiarity in the new high-demand area	Adelaja et al. (2020)[92], Al Mutair et al. (2020)[95], Aziz et al. (2020)[63], European Centre for Disease Prevention and Control (2020)[61], Hick et al. (2020)[69], Thomas et al. (2020)[67], World Health Organization (2020a)[68]

8.5.3 Increase the supply of staff

8.5.3.1 Redeploy already employed staff and adjust job responsibilities

It should be possible to shift staff among facilities and departments.[70] For example, a significant amount of outpatient staff can be made available as nonessential procedures and appointments are suspended (see 8.3.1.1). This staff can be redeployed to support inpatient response. In addition, educational and administrative staff with a clinical background (such as clinical educators, nursing managers, etc.) should be returned to practice and also relieved from other duties (to the extent that they are not related to COVID-19 or other critical operational roles).[7, 61, 64, 69, 70]

The existing workforce may be asked to adjust their job responsibilities by "stepping-up", "stepping-over", or "stepping-down" the level of provided care.[70] When staff is asked to *"step-up"* the level of care, they are asked to extend their usual provision of care to patients with more acute or different conditions.[7, 62, 64, 69-71, 92, 95] However, these "step-ups" should have the least difference possible between regular and surge responsibilities. For example, a medium care nurse starts working in the ICU, a cardiac rehabilitation nurse staffs the medium care unit, a regular department nurse provides care in the cardiac rehabilitation, etc. Certain staff members may also be asked to *"step-over"* by applying their knowledge to a different group of patients than they regularly care for.[70] For instance, (post-) anaesthesia nurses or surgery nurses can be asked to apply their critical care knowledge to the ICU department. Some staff can also be asked to *"step-down"* or generalise their practices.[70] For example, surgeons or physician assistants can take on general medicine rounding roles. Nevertheless, these "step-ups/overs/downs" should be accompanied by appropriate training and orientation in these anticipated roles and responsibilities, ideally provided before transition.[61]

The European Centre for Disease Prevention and Control[90] also recommends a division of the staff in a group designated to the care of COVID-19 patients (i.e. testing and care of infected patients) and a group caring for the other patients. Moreover, the staff should be prepared to

support critical surge response (such as standard operation procedures, role definition, use of hospital incident command system, and cross-training of additional staff).

Table 28 – Options to redeploy staff and adjust job responsibilities

Recommendations	References
Move staff among facilities and departments (outpatient to inpatient facilities)	All Mutair et al. (2020)[95], National Academies of Sciences – Engineering and Medicine (2020)[70]
"Step-up" level of care	Abir et al. (2020)[71], Adelaja et al. (2020)[92], Al Mutair et al. (2020)[95], Anesi et al. (2020)[62], Christen et al. (2020)[64], Hick et al. (2020)[69], National Academies of Sciences – Engineering and Medicine (2020)[70], World Health Organization (2020b)[7]
"Step-over" level of care	National Academies of Sciences – Engineering and Medicine (2020)[70]
"Step-down" level of care	National Academies of Sciences – Engineering and Medicine (2020)[70]
Training and information on anticipated roles and responsibilities	European Centre for Disease Prevention and Control (2020a)[61]
Appoint designated staff members to the care of COVID-19 and other patients	European Centre for Disease Prevention and Control (2020b)[90]
Hospital staff should be prepared to support critical care surge response	Einav et al. (2014)[74]

8.5.3.2 *Mobilise additional staff*

When the numbers of already employed staff are insufficient, additional staff should be recruited and put to work. The consulted guidelines refer to a range of options to mobilise temporary healthcare professionals.[7, 61-64, 67, 70, 71, 90, 92, 95] Inactive healthcare professionals (such as retired healthcare staff, educational or administrative staff) and trainees (such as medical or nursing students) should be asked to (re)turn to practice and should be relieved from their duties (unless those duties are already involved with COVID-19 or other critical operational roles). In addition, healthcare professionals of the military forces or volunteers can be mobilised and recruited. For instance, the Danish government installed a "Corona Job Bank" for volunteers across health and social sectors to apply for support in COVID-19 care.[7 ddd] Foreign healthcare professionals at the end of their conversion assessment/credentialing process can also be a substantial source to obtain additional staff, if the assessment/process is speeded up.[63] Where appropriate, pathways for accelerated training should be considered.[7, 61]

This reallocation of staff or recruitment of additional personnel should be triggered by a predefined threshold.[61, 68] The trigger should set a mechanism in motion for the recruitment, training and quick provision of all necessary administration needs as well as equipment for new staff on short notice. The budget for all of this should be available and allocated.[61] Furthermore, it is important to address liability, insurance and temporary licensing issues with respect to staff or volunteers who may be working outside their area of expertise.[7, 61, 68]

ddd The Flemish government has also launched a call for people with a clinical background to create a reserve of clinical professionals that can be called upon in terms of need. The list of volunteers was made available to residential care centers, hospitals and GP circles. They could contact the volunteers themselves to hire additional staff.

Table 29 – Options to obtain additional staff

Recommendations	References
Mobilise/hire temporary healthcare workforce (such as retired healthcare providers, medical or nursing students, foreign healthcare providers at the end of their conversion assessment, volunteers, etc.)	Abir et al. (2020)[71], Adelaja et al. (2020)[92], Al Mutair et al. (2020)[95], Anesi et al. (2020)[62], Aziz et al. (2020)[63], Christen et al. (2020)[64], European Centre for Disease Prevention and Control (2020)[61], European Centre for Disease Prevention and Control (2020)[90], National Academies of Sciences – Engineering and Medicine (2020)[70], Thomas et al. (2020)[67], World Health Organization (2020)[7]
Establish pathways of accelerated training for temporary staff (if appropriate)	European Centre for Disease Prevention and Control (2020)[61], World Health Organization (2020)[7]
Formulate an legal framework to recruit and employ temporary staff	European Centre for Disease Prevention and Control (2020)[61], World Health Organization (2020)[7], World Health Organization (2020a)[68]
Establish thresholds for reallocation of staff or the recruitment of new additional staff	European Centre for Disease Prevention and Control (2020)[61], World Health Organization (2020a)[68]
For each unit or service, identify the minimum number of healthcare workers and other hospital staff needed to ensure the sufficient operation of the unit or service	World Health Organization (2020a)[68]
Create mechanisms for the recruitment, training, administration. Financial means for these mechanisms should be available and allocated	European Centre for Disease Prevention and Control (2020)[61]

8.6 Systems

8.6.1 Define hierarchy of command at national, regional and hospital level

There should be a clear hierarchy in leadership at the macro level, embedded in a pre-existing legal mandate.[7, 67, 75, 100] Leadership has to be effective and participatory (including representation of each level of the health system).[67] Policy guidance to the hospital sector must be centralised and consistent at all times. Effective collaboration across sectors, different levels of public authorities, and between government and non-government stakeholders can be ensured by establishing or intensifying cooperation channels.

Furthermore, synergy between territorial services and hospital organisations is recommended.[73] For instance, hospitals can identify potential gaps in the provision of healthcare (with an emphasis on critical care) and address these gaps in coordination with the authorities and neighbouring hospitals.[68] Meyer et al. (2020)[75] stresses the importance for coordination plans between facilities. Plans are developed on how to coordinate with other facilities (including public and private) in the event that it is needed to transfer patients or share supplies.

A clear hierarchy and level in command also requires clear and consistent communication both at hospital and country level.[61, 67, 92] However, most of the consulted guidelines formulate mainly recommendations for communication at the hospital level. Communication has to be timely and filtered to be as concise and relevant as possible (to avoid information overlap for the staff).[92] An internal and external communication plan is established with clear communication lines to allow rapid communication to all staff and patients or visitors.[61] Key communication people are appointed, these are responsible for disseminating information, providing training and receiving feedback and questions. All staff members have been informed of their names, contact details and roles. In addition, staff should be equipped to address queries and concerns raised by patients (to avoid misinformation). Also, despite actions, systems must be in place to facilitate communication between relatives, patients and staff (e.g. through

telecommunication technologies).[92] Last, hospitals should ensure that external communication messaging is consistent with public health and national messaging.

In the consulted guidelines, recommendations for communications strategies targeted to public authorities are limited to "infection control policies should be clearly communicated to all patients" and "communicate to the public transparently in order to create trust and building support".[61, 67] These limited recommendations can probably be attributed to the scope of the included guidelines in this chapter.

Table 30 – Options to define hierarchy of command at national, regional, and hospital level

Recommendations	References
Clear hierarchy in leadership, defined by a pre-existing legal mandate	Frank et al. (2020)[100], Meyer et al. (2020)[75], Thomas et al. (2020)[67], World Health Organization (2020)[7]
Ensure effective collaboration across sectors, different levels of government, and between government and non-government stakeholders Establish or intensify cooperation channels with other governments and international institutions	Thomas et al. (2020)[67]
Establish synergy between territorial services and hospital organisations	Capolongo et al. (2020)[73], Meyer et al. (2020)[75], World Health Organization (2020a)[68]
Provide clear and consistent communication both at hospital and country level	Adelaja et al. (2020)[92], European Centre for Disease Prevention and Control (2020)[61], Thomas et al. (2020)[67]

8.6.2 Activate arrangements to purchase supplies and resources

As mentioned above, hospitals are recommended to align their stock management to keep track on availability of supplies and resources (see 8.4.3). However, this monitor system should also be in place on the country-level. Public authorities are required to have a general overview of the availability of supplies and resources at all times across all hospitals.[73]

When activating additional arrangements to purchase supplies and resources, public authorities must ensure sufficient financing to hospitals.[62, 67, 75] Thomas et al. (2020)[67] recommends public authorities to anticipate and ensure sufficient monetary resources in the system and flexibility to reallocate and inject extra funds. For example, in some countries this is facilitated by accumulating national reserves, whereas others may have rules in place that allow for money to be reprogrammed towards the health system when needed. Stability of the health systems funding should, however, be safeguarded through countercyclical health financing mechanisms and reserves (by creating a health financing system that is impervious to any effects of shocks and automatic stabilizers in the presence of a shock).

Table 31 – Options to activate arrangements to purchase supplies and resources

Recommendations	References
Constant monitoring of medical equipment	Capolongo et al. (2020)[73]
Ensure sufficient financing	Anesi et al. (2020)[62], Meyer et al. (2020)[75], Thomas et al. (2020)[67]

8.6.3 *Support providers in priority setting*

Several strategies referred to priority setting of infected patients by triaging[eee] or implementing a TLT (see 8.3.2). However, as mentioned earlier, this priority setting should be embedded in a clear legal framework, legally protecting both healthcare professionals and patients.[7, 62-64, 69, 77] Maves et al. (2020)[77] describe clearly the operational steps to take by the public authorities when implementing a triage system.

Box 6 – Operational steps to implement a triage system[77]

1. **Inventory of potential ICU resources for a surge in demand**: physical ventilators and beds (e.g. OR, PACU), human resources (staff with ICU training), and supply and space to deliver care
2. **Establish identification triggers for and initiation of triage:** as clinical demand reaches crisis stage, crisis standards of care, including triage, should be initiated
   a. The decision to initiate triage should be made by an identified regional authority with situational awareness of regional health-care demands
   b. Triage must be consistently applied across the region, with documented rationale and oversight by the relevant regional authority
3. **Preparation of a triage system**
   a. Create central triage committee for the region, tasked with coordination and standardisation. This should include representation of key stakeholders (medical, nursing, ethics, law, patient and community representatives)
   b. Identify members of institutional tertiary triage teams and support structures
   c. Prepare and distribute training materials to local officials for standardisation of implementation
4. **Agreement on a triage protocol** to target resources to those with the greatest incremental benefit
5. **Consideration of changes to allow limits to the delivery of life-sustaining measures in times of crisis care, and indemnity against litigation for decisions made in accordance with the triage policy**
6. **Standards of care:**
   a. Modify end-of-life care policies to indicate that the standard of care in a pandemic is to triage patients according to an accepted plan, and that consent is not required to implement treatment decisions taken according to that plan
   b. Ensure that patients unable to receive invasive life-sustaining therapies (e.g. mechanical ventilation) are provided the best available care under the circumstances (e.g. supplemental oxygen through another route, palliative care, family support)
   c. Clear clinical guidelines for medical management of people with respiratory failure, including palliative measures
   d. Standardised communication tools (e.g. sensitive information sheets) to inform members of the public about triage decisions and the rationale behind them
7. **Family and societal support**:
   a. Transparency with the public about triage processes

[eee] Triage refers to re-allocation or discontinuation of services due to its extreme resource commitment.[69]

b. Communication plans with the public (telephone hotlines, online resources) to ensure that information is readily available

c. Work to preserve the integrity of family units, especially in cases of young children and during end-of-life

d. Ensure support for grieving families

8. **Health-care worker support**:

a. A systematic communication plan with the reasons for triage system activation, training on its use, and companion decision support tools to ensure consistent implementation is essential

b. Triage decisions must be made collaboratively, using a team-based approach that includes the designated triage officer, providers directly assigned to care for individual patients, with support from hospital ethics and palliative care experts when necessary

9. **Paediatric considerations**:

a. Concentrate care for children at paediatric centres to preserve necessary paediatric systems, including accepting any paediatric transfers, even ones for whom they may not typically care

b. Increasing paediatric age thresholds to 21, 25, or 30 years iteratively as surge requires (as long as no adult comorbidities exist that are not consistent with paediatric critical care practice)

8.6.4 Ensure care continuity

Several of the guidelines stress the importance of ensuring care continuity during the COVID-19 pandemic.[63, 67, 70, 73, 75, 101] Alternative and flexible approaches for healthcare delivery should be considered.[67] Some elective procedures may be postponed to differ extents (see 8.3.1.1) or alternative service delivery paths may be expanded. In this respect, digital healthcare innovation (e.g. teleconsultation or remote monitoring) is described as one of the major strategies to pursue care continuity.[63, 70, 73] For example, smartphone and wearable devices can reduce ED and inpatient loading and guarantee a continuous monitoring of patients who not necessarily require hospitalisation. However, public authorities should develop a legal base of this remote monitoring and decide within whose competence it falls (i.e. who should interpret the results and make therapy decisions). Furthermore, Capolongo et al. (2020)[73] recommend to create additional community health centres on the territory in order to guarantee primary care delivery and facilitate triage activities.

Effective information systems and flows are also important in light of care continuity. Systems of sharing critical information between stakeholders are vital and may well be part of the planning needed when policy response is needed.[67] Furthermore, patient suitable for transfer should have their information entered into a central, secure database for tracking, triage, and placement.[101]

Table 32 – Options to ensure care continuity

Recommendation	References
Consider alternative and flexible approaches to deliver care	Thomas et al. (2020)[67]
Expand digital healthcare innovation	Aziz et al. (2020)[63], Capolongo et al. (2020)[73], National Academies of Sciences – Engineering and Medicine (2020)[70]
Creation of community health centres in the territory for guaranteeing primary care delivery and triage activities	Capolongo et al. (2020)[73]
Ensure effective information systems and flows	Thomas et al. (2020)[67], Centers for Disease Control and Prevention (2020)[101]

8.7 Hospital surge capacity planning models and tools

A returning topic in the space, stuff, and staff dimension is the need for monitoring (both by individual hospitals and public authorities). Therefore, monitoring is a longitudinal recommendation. However, it should actually be categorised in the systems dimension. Because several relevant hospital surge capacity planning models and tools were found during this study, it is of significance to describe them more elaborately in a separate section.

Planning for needed resources to respond to the COVID-19 pandemic is based on projecting the number and timing of cases requiring various types of treatment. Several tools were designed to assist policy makers, hospital management, and healthcare professionals in forecasting demand for hospital resources to understand hospital capacity constraints and to determine when peak demand will occur. Important to note is that these models and tools have been all rapidly developed to fit its purpose and be user-friendly. However, they continue to evolve due to new insights.

8.7.1 Methods

For the next section of this chapter, we analysed ten relevant planning tools or models to estimate hospital capacity requirements in light of the current COVID-19 pandemic. These planning tools or models were also identified through the search of the literature for Chapter 7 and from two recent reviews listing relevant planning models and tools which can be used during the COVID-19 pandemic.[102, 103]

A brief overview of these planning models and tools is presented in Table 33, while Table 34 provides a summary of their content (in terms of version, planning horizon, input parameters, and output).

Table 33 – Overview of the analysed planning models and tools

Tool	Description
ICU-COVID-sim	ICU-COVIC-sim describes the maximum rate of COVID-19 patients that can be handled for a given number of ICU beds dedicated to COVID-19 patients.[104] The model uses queueing theory and patient flow simulations. https://andres-alban.shinyapps.io/icu-covid-sim/
Hospital Bed Projections	This model has been developed by researchers of Stanford University for the USA. The model uses an exponential growth structure of COVID-19 patients requiring hospital beds, ICU beds, and ventilators.[105] This demand is compared with the hospital capacity parameters and estimates when this capacity will be saturated. https://surf.stanford.edu/covid-19-tools/covid-19/
COVID19Surge	COVID19Surge is a spreadsheet-based tool that is developed by the Centers for Disease Control and Prevention (CDC).[102, 106] This tool estimates the likely increase in number of hospital admissions, persons requiring ICU care, and the number of persons requiring ventilator support, with several different social distancing scenarios with varying degrees of intensity/stringency. https://www.cdc.gov/coronavirus/2019-ncov/hcp/COVIDSurge.html

COVID-19 Hospital Impact Model for Epidemics (CHIME)	The COVID-19 Hospital Impact Model for Epidemics (CHIME) offers users the ability to visualise forecasts for several outcomes of the COVID-19 outbreak (e.g. cumulative number of hospitalisations, number of new daily hospitalisations, and cumulative number of susceptible individuals in a population).[107] It uses a discrete-time susceptible, infected, recovered (SIR) model. Parameters are estimated from other locations based on logical reasoning and best estimations from the American Hospital Association (AHA). https://penn-chime.phl.io/
Cornell COVID Caseload Calculator with Capacity and Ventilators (C5V)	The C5V is an interactive tool that estimates the number of COVID-19 caseloads and project the critical resources needed to treat cases for any user designed scenario.[102] Hospital system projections are broken down into medical-surgical and ICU beds and ventilators while considering a variety of outbreak characteristics (such as population and time period). The calculator combine mathematical calculation and deterministic simulation to provide estimates for (i) the rate at which COVID-19 patients in a designated catchment area may present for hospitalisation, and (ii) the simulated hospital load caused by COVID-19 patients to both medical/surgical and ICUs, with specific attention paid to identifying the magnitude and timing of the peak daily hospital census for non-ICU and ICU beds throughout the catchment area.[108] https://covid19.sjsu.edu/C5V/default/user/login?_next=/C5V/default/index
COVID-19 Acute and Intensive Care Resource Tool (CAIC-RT)	This online tool provides an estimate of the maximum manageable daily number of incident COVID-19 cases a healthcare system could serve based on age-stratified case distribution and severity, as well as available medical resources (such as number of available acute and critical care beds).[109] https://caic-rt.shinyapps.io/CAIC-RT/
RAND Interactive Critical Care Surge Response Tool	The RAND Interactive Critical Care Surge Response tool is built to inform decision makers at all levels — hospitals, healthcare systems, states, regions — to estimate current critical care capacity and rapidly explore strategies to increase it.[71, 110] The model allows users to set baseline numbers of ICU doctors, ICU nurses, and respiratory therapists per shift and ratios of these providers to patients. Further, it allows users to input information related to how critical care physicians, critical care nurses, and respiratory therapists might act as supervisors for "extender" care providers—including ICU doctors supervising hospitalists, ICU nurses supervising floor nurses, and respiratory therapists supervising nurse anaesthetists; users set the ratios of supervisor-to-extender and extender-to-patients. Users can also specify additional spaces that can be created and used as ICU space (e.g. through doubling patients in ICU rooms or using PACU space) and additional ventilators (e.g., through purchasing or sharing with other facilities) that can be added to create critical care surge capacity. The model then estimates the number of patients who can be cared for. The model also identifies which among the three staff (critical care doctors, critical care nurses, and respiratory therapists), space (beds), and stuff (ventilators) resources is the limiting factor in increasing capacity. https://www.rand.org/pubs/tools/TLA164-1/tool.html#drQ2=10&drQ3=0&drQ4=0&drQ5=0&drQ6=0&drQ7=4&drQ9=0&drQ1=8&drQ8=6&nurseQ2=50&nurseQ3=0&nurseQ4=0&nurseQ5=0&nurseQ6=0&nurseQ7=3&nurseQ9=0&nurseQ1=1&nurseQ8=2&respQ2=20&respQ3=0&respQ4=0&respQ5=0&respQ6=0&respQ7=4&respQ9=0&respQ1=4&respQ8=3&ventQ2=150&ventQ4=0&ventQ5=0&ventQ6=0&ventQ1=1&bedQ2=130&bedQ4=0&bedQ5=0&bedQ6=0&bedQ1=1
J-IDEA Pandemic Hospital Planner	The J-IDEA pandemic planner is a hospital planning tool to calculate the capacity needs in terms of beds, staff, and ventilators by implementing healthcare provision interventions affecting the management of patient care in hospitals.[64] The planner shows the baseline capacity, and then calculates the amount of additional capacity gained by various healthcare interventions. These interventions entail: • Cancellation of elective operations

	• National guidelines for the prioritisation of critical care resources • Set up of field hospitals • Use of private healthcare resources • Conversion of operating theatre to critical care wards • Conversion of general and acute beds to critical care beds • Upskill general and acute staff to work in critical care wards • Return of former healthcare staff • Deployment of newly qualified and final year medicine and nursing students • Deployment of international doctors at the final stage of their conversion assessment • Procurement of newly manufactured ventilators https://www.imperial.ac.uk/mrc-global-infectious-disease-analysis/covid-19/report-15-hospital-capacity/
Health Workforce Estimator (HWFE)	The Health Workforce Estimator (HWFE) can be used to estimate the required number of each type of healthcare worker based on the target number of mild, moderate, severe and critical patients per day. It also provides an analysis of the throughput of mild, moderate, severe and critical patients in multiple facilities, and highlights workforce gaps for each type of healthcare worker. https://euro.sharefile.com/share/view/s1df028894aa49abb/fob92ed8-23cb-4b24-a746-524bb6a27843
COVID-19 Essential Supplies Forecasting Tool (ESFT)	The COVID-19 Essential Supplies Forecasting Tool (ESFT) is designed by WHO to help governments, partners, and other stakeholders to estimate potential requirements for essential supplies to respond to the COVID-19 pandemic. Although it gives users with an estimation of the number of cases, this calculator is not an epidemiological calculator. The focus of this tool is to forecast essential supplies: it includes estimation of PPE, diagnostic equipment, etc. The COVID-19 ESFT tool is intended to be complimentary to the HWFE (see above), however, their outputs are intentionally different due to their primary focus. https://www.who.int/publications/m/item/covid-19-essential-supplies-forecasting-tool

Table 34 – Content analysis of consulted hospital surge capacity planning models and tools

Planning model or tool	Version	Planning horizon	Input parameters	Output
COVID19Surge[106, 111]	Spreadsheet	365 days	**Part 1: hospital resources** • Population of catchment area or local jurisdiction • Total staffed, unoccupied non-ICU beds • Total staffed, unoccupied ICU beds • Total number of ventilators available **Part 2: hospital stays for COVID-19 patients** • Average percentage of COVID-19 cases who will be admitted for hospital care • Average LOS of non-ICU hospital stay • Average of admitted COVID-19 cases who will require ICU care • Average duration in ICU (if no ventilator) • Average percentage of COVID-19 cases in ICU that will need ventilators • Average duration in ICU (if ventilator required) • Average downtime per ventilator (i.e. decontamination or re-allocation) **Part 3: community outbreak details** • Date start analysis • Total cases to start analysis • Cases died in the 14 days before start analysis • Planned duration of interventions: stratified in low intensity, medium intensity, and high intensity • Effectiveness of interventions (percent reduction in new infections per case): stratified in low intensity, medium intensity, and high intensity **Part 4: epidemiological parameters (optional)** • Infected (non-contagious period) • Contagious period • Convalescent period (non-hospitalised) • New infections per case (lowest estimate and highest estimate) **Part 5: age-weights (optional)** • Demographic information for jurisdiction	**Primary output** Three graphs illustrating differences in bed occupancy and ventilator use for (i) no intervention and (ii) three social distancing scenarios **Secondary output** Graphs for each intervention scenario showing estimated demand for hospital resources (beds, ICU beds, and ventilators). These estimates of demand are compared to hospital capacity entered by the user in *Part 1.*

			• Percentage of population aged 0-4 years, 15-17 years, 18-49 years, 50-64 years, 65+ years • Age-specific risk for parameter of interest for each group: 0-4 years, 15-17 years, 18-49 years, 50-64 years, 65+ years	

ICU-COVID-sim[104]	Online	7 – 60 days	**Part 1: parameters for COVID-19 patients**
			• Arrival rate of COVID-19 (patients per day, assumption exponentially distributed inter-arrival times)
			• LOS distribution: median (IQR, assumes a log-logistic distribution) or mean (SD, assumes a lognormal distribution)
			• Number of ICU beds dedicated to COVID-19 patients
			Part 2: parameters for non-COVID-19 patients
			• Simplest case: one stream of non-COVID-19 patients (assumes to arrive exponentially distributed inter-arrival times)
			  ○ Assumption that elective surgeries are cancelled
			  ○ LOS distribution
			  ○ Number of beds for non-COVID-19 patients
			• Advanced case: several streams of non-COVID-19 patients
				Primary output
				• Throughput rate, for COVID-19 beds, defined as the number of patients per day that can go through the system
				• Occupancy rates, for each of COVID-19 and non-COVID-19 beds, defined to be the fraction of beds occupied on average through time
				• Referral rates, non-COVID-19 beds, defined to be the fraction of patients who need to be referred to another hospital due to capacity issues

CHIME	Online	30 days	**Part 1: fixed parameters** • Population size • Hospital market share • Currently hospitalized patient • Currently known regional infections **Part 2: varying parameters** • Doubling time • Hospitalisation • Hospitalised patients requiring ICU care • ICU patients requiring mechanical ventilation • Median hospital length of stay • Median duration of ICU stay • Percentage of ICU stay on mechanical ventilation • Median recovery time	**Primary output** • Total counts of expected demand for hospital beds, ICU beds, and ventilators over time **Secondary output** • Number of new admissions each day • Time until demand will exceed current capacity • Time until peak demand • Time spent above current capacity • Proportion of simulations in each scenario in which capacity will be exceeded
C5V	Online	180 – 360 days	**Part 1: obligatory parameters**	**Primary output**

	Spreadsheet, desktop	180 days	• Catchment area population in age strata • Market share of that catchment area • Overall population infection rate • Percent symptomatic patients • Proportion hospitalised of symptomatic patients • Proportion ICU hospitalised symptomatic patients • Time of peak of epidemic curve (mode of the chosen gamma distribution) • Shape of the overall epidemic curve, from "flat" to quite peaked. • Length of stay in both a medical/surgical and ICU bed defined by minimum and maximum days (UNIFORM distribution) • Mortality fraction • Increase (>100%) or decrease (<100%) in LOS for those who die **Part 2: optional parameters** • Total number of available med/surgical and critical care beds, as well as ventilators • Input for the overall number of patients per ventilator, to accommodate ventilator splitting • LOS by outcome and mortality fractions, for patients who do not have immediate access to a ventilator but need one	• Rate at which COVID-19 patients in a designated catchment area may present for hospitalisation • Simulated hospital load caused by COVID-19 patients to both medical/surgical and ICUs
CAIC-RT	Online	NA	**Part 1: expected resource utilisation for COVID-19 patients** • Mean days in acute care • Mean days in critical care • Mean days on a mechanical ventilator **Part 2: resource availability** • Number of acute care beds for COVID-19 patients • Number of critical care beds for COVID-19 patients • Number of mechanical ventilators for COVID-19 patients	**Primary output** • Maximum daily number of incident COVID-19 cases manageable by the healthcare system (divided in acute care beds, critical care beds, and mechanical ventilators) **Secondary output** • Age-stratified case distribution and severity
RAND Interactive Critical Care Surge Response Tool[110]	Online	NA	**Part 1: current staff levels** • Starting numbers of personnel or resources (staff, stuff, and space) • Absentee percentage (staff) **Part 2: augmentation by fully capable personnel or equipment**	**Primary output** • Total current staff after absentee (staff) • Total after augmentation by fully capable personnel or

			• Number of newly, hired, purchased, built (staff, stuff, and space) • Number of borrowed from other departments (staff, stuff, and space) • Number borrowed from outside facilities, agencies, stockpiles (staff, stuff, and space) **Part 3: augmentation by extenders needing supervision** • Extender-to-supervisor ratio (staff) • Number of extenders who could be brought in, assuming enough supervisors (staff) **Part 4: patient capacity** • Patient-to-staff or patient-to-resource ratio (staff, stuff, and space) • Patient-to-extender ratio (staff)	resources (staff, stuff, and space) • Number of supervisors needed (staff) • Enough supervisors? (staff, Y/N) • Total augmentation by extenders, given limitations of supervisors (staff) • Number of patients who can be cared for by fully capable personnel (staff) • Number of patients who can be cared for by extenders (staff) • Total number of patients who can be cared for (staff, stuff, and space)
J-IDEA Pandemic Hospital Planner	Spreadsheet	NA	**Part 1: baseline parameters on existing hospital capacity** • Total number of critical care beds • Total number of general and acute beds • Number of critical care beds occupied by non-COVID-19 patients • Number of general and acute beds occupied by non-COVID-19 patients • Percentage of non-COVID-19 patients requiring ventilator • Total number of ventilators • Total critical care nurses (FTE) • Total general and acute nurses (FTE) • Total critical care senior doctors (FTE) • Total critical care junior doctors (FTE) • Total general and acute senior doctors (FTE) • Total general and acute junior doctors (FTE) **Part 2: maximum staff ratio allowances parameters** • Beds per critical care nurse • Beds per general and acute nurse • Beds per critical care senior doctor • Beds per critical care junior doctor • Beds per general and acute senior doctor	**Primary output** • Spare capacity per 10.000 population (for each intervention) • Percent change in spare capacity compared to baseline (for each intervention) • Staff planner: staff required for total bed numbers • Staff ratio check for current patients

			• Beds per general and acute junior doctor **Part 3: COVID-19 related parameters** • Number of COVID-19 patients in critical care beds • Number of COVID-19 patients in general and acute beds • Percentage of COVID-19 critical care patients requiring ventilator • COVID-19 related sickness rate for nurses • COVID-19 related sickness rate for doctors **Part 4: additional parameters** • Headcount to FTE multiplier • Reference population size for output calculation	
Hospital Bed Projections[105]	Online	1 – 60 days	• State and county • Number of cumulative confirmed cases of COVID-19 or cumulative COVID-19 hospitalisations (cumulative hospitalisations is preferred) • Doubling time (number of days until the cumulative number of cases/hospitalisations doubles) • Symptomatic cases per confirmed case • Number of days to model ahead • Simulation of intervention with doubling times • LOS for acute patients • LOS for ICU patients • Acute beds available for COVID-19 patients • ICU beds available for COVID-19 patients	**Primary output** • Estimated daily number of people hospitalised for COVID-19 (divided into acute, ICU, and total hospitalisations) • Estimated moment of saturation of capacity (for acute and ICU beds) **Secondary output** • Heat map per state and county of expected number of hospitalisations per 100 symptomatic cases (based on the age distribution of the county population)
Health Workforce Estimator (HWFE)	Spreadsheet	NA	**Part 1: required staff** • Numbers on mild, moderate, severe, critical COVID-19 patients[fff] • Numbers on screening/triage **Part 2: policy options** • Current number of beds per facility and department	**Primary output:** • Estimate of the number of each type of health worker required per day to treat Covid-19 cases by level of severity (mild, moderate, severe and critical)

[fff] According to the severity definitions of the HWFE "mild" refers to no need for inpatients care, "moderate" to may require inpatient care (but not including oxygen therapy), "severe" to requires oxygen, and "critical" to requires critical care including mechanical ventilation

			• Severity level per facility and department • Future number of cases per facility and department • Future number of beds per facility and department • Current number of workforce per facility and department **Part 3: skill mix** • Number of workforce, stratified in different groups (e.g. GPs, newly qualified doctors or nurses, international doctors, return of doctors and nurses) **Part 4: optional parameters** • LOS per severity level • Time spend per patient per healthcare professional	• Analysis of current capacity and likely surge requirements across health facilities and work units, highlighting potential mismatches • Visualizations of the impact of the surge on workforce groups
COVID-19 Essential Supplies Forecasting Tool (ESFT)	Spreadsheet	≤ 12 weeks (but can also longer)	**Part 1: patients and case severity** • Percentages on case severity (mild, moderate, severe, and critical) • LOS by case severity (mild, moderate, severe, and critical) • Case fatality rates (severe and critical) **Part 2: healthcare workers and staff** • Number of healthcare workers in the country/region • Percentage of healthcare workers not activated for COVID-19 care • Percentage of healthcare workers treating hospitalised COVID-19 patients • Percentage of healthcare workers screening and triaging suspected COVID-19 cases • Number of healthcare workers per bed • Number of cleaners per bed • Number of ambulance personnel per bed • Number of biomedical engineers per bed • Cases screened/triaged per healthcare worker per day • Number of informal caregivers for severe/critical patients treated in hospital • Number of informal caregivers for mild/moderate patients in isolation **Part 3: hospital infrastructure** • Number of hospital beds in the country (all levels of care) • Percentage of beds nog allocated for COVID-19 patients	**Primary output:** Forecasting of essential supplies: estimation of personal protective equipment, diagnostic equipment, biomedical equipment for case management, essential drugs for supportive care, and consumable medical supplies

- Percentage of beds available for severe COVID-19 patients
- Percentage of beds available for critical COVID-19 patients
- Number of hospital beds per care unit

Part 4: labs and testing

- High-throughput conventional platforms available for COVID-19: number of Roche 6800/8800, Abbott m2000, Hologic Panter/Panter fusion platforms; shift/day (high-throughput conventional); days/week (high-throughput conventional); percentage of high-throughput capacity for COVID-19
- Near-patient PCR machines available for COVID-19: number of Cepheid GeneXpert modules, shift/day (near-patient); days/week (near-patient); percentage of near-patient capacity for COVID-19
- Manual platforms available for COVID-19: number of manual real-time PCR platforms, shifts/day (manual), days/week (manual), percentage of manual capacity for COVID-19
- Other platforms available for COVID-19
- Additional capacity per day modules
- Number of lab staff in the country
- Percentage of lab staff available for COVID-19 response
- Number of labs conducting COVID-19 testing
- Number of lab staff per lab
- Number of cleaners per lab
- Number of safety boxes per hospital care unit per week
- Number of triple packaging per hospital care unit
- Percentage of wastage of manual testing kits

Part 5: oxygen use

- Percentage of patients with invasive mechanical ventilation
- Percentage of patients with non-invasive ventilation
- O_2 flow rate per bed for severe patients, critical patients (stratified in invasive mechanical ventilation and non-invasive ventilation)

Part 6: equipment use

- Number of diagnostics, PPE, hygiene, and biomedical engineering
- Reusable (Y/N)

8.7.2 Content analysis

Content analysis of these eight hospital surge capacity planning tools reveals two major categories: (i) tools who provide a snapshot of a hospital's capacity on one particular moment and (ii) tools providing a more longitudinal perspective on hospital capacity.

Models that provide a snapshot of a hospital's capacity on one particular moment can be categorised as "static models". They have the ability to identify which dimensions (i.e. beds, ventilators, or staff, depending on the tool's finality) are potentially in danger to be saturated and highlight what hospitals should focus on in order to meet surge capacity demands. However, because the goal is only to provide a snapshot of the hospital's capacity, they cannot produce a longitudinal view on the situation. It is not possible to make a forecasting or prediction in the future, making it difficult to act proactively. These models are therefore mainly relevant for individual hospitals or networks. However, in some particular cases (e.g. a quick overview or for clearly defined domains) these models can also be suitable for public authorities.

These "static models" usually include a wide variety of input parameters. However, input is mainly dependent on the primary focused output. First, almost all tools include parameters on the **number of available beds**. These number of beds are collected by individual hospitals, but are also important for policymakers to have an overview when capacity limits are exceeded. The tools do not recommend to just collect an overall number of available beds, but stratify the collected indicators in order to identify mismatches and specific capacity limits. Fundamental indicators on available beds include the baseline number of licensed beds, stratified in non-ICU beds and ICU beds. If applicable, numbers should be available on the amount of beds earmarked for COVID-19 and non-COVID-19 patients. If no beds are earmarked, data should always be available on occupancy and availability of these beds.

Furthermore, planning surge capacity during pandemics also requires insights on the disease process of COVID-19. This insight can be provided by the collection of a range of **epidemiological parameters**. It is recommended to collect these parameters on the macro level (by the public authorities). Nevertheless, the scientific literature can provide robust default values for some of these epidemiological parameters when data collection is not possible or feasible (based on data from other countries). In the analysed planning tools, epidemiological parameters contain numbers on the **population that eventually will be infected** (stratified by asymptomatic and symptomatic cases), **infectious days** (including numbers on contagious and non-contagious days), **convalescent period**, and **symptomatic cases per confirmed COVID-19 case**. In addition, cumulative COVID-19 cases and cumulative COVID-19 hospitalisations should be recorded.

As recommended by the 4S's framework[60], surge capacity planning models and tools should include data on the capacity of "stuff" and "staff". In light of the current COVID-19 pandemic, parameters for the "stuff" dimension contain numbers on available ventilators (earmarked for COVID-19 patients) and the availability of PPE[ggg]. "Staff" contains a wide range of parameters in the analysed models and tools: from available numbers focused on general groups (i.e. nurses and doctors) to stratified availability numbers per specific healthcare professional group (e.g. senior doctors, junior doctor, surgeons, acute care nurses, physiotherapists, etc.). Important to monitor this staff availability numbers is the **absenteeism percentage** or even **COVID-19 related sickness rate**. Moreover, the **applied patient-to-staff ratio** is also usually taken into account when planning workforce during a pandemic.

The difference between the models providing a more longitudinal perspective on capacity and their "more static" counterparts are the additional COVID-19 related parameters (next to the parameters described above). **These additional parameters facilitate to model patient flow** allowing a longitudinal perspective on a hospital's capacity (in the longer

[ggg] However, PPE parameters are only taken into account in one model (i.e. ESFT).

term, not just a snapshot on a particular moment). Due to this longitudinal perspective, these models are particularly relevant for public authorities, but can also be used by individual hospitals.

These additional patient flow indicators include numbers on the **estimated proportion of patients that will need hospital and/or ICU care after being infected**. Some models (i.e. C5V and CHIME) stratify these numbers per age group in terms of estimated hospitalisation rate or estimated ICU hospitalisation fraction. Furthermore, and especially necessary to model patient flow, is the inclusion of **length of stay (LOS)** measures. All dynamic models take these measures into account. However, the degree of granularity differs. Some dynamic models only add average LOS for COVID-19 patients and non-COVID-19 patients, while others stratify the LOS according to type of care received (i.e. non-ICU care or ICU care), and in case of ICU care, stratification between ventilated patients and patients who do not require ventilation. Two models also add the **proportion of COVID-19 cases in ICU care that will need mechanical ventilation**. Additionally, **arrival rate** of COVID-19 patients and non-COVID-19 patients and **doubling time**[hhh] is included in some dynamic models.

When no data are available on these patient flow indicators, the scientific literature can provide some reference values, which can also be used as a proxy. Nevertheless, hospital- or country-specific numbers for the patient flow indicators are the preferred option. Reference values from the literature are less context-specific and can, therefore, be under- or overestimated. Most of the described models and tools in this chapter, set default values for (some of) these parameters. An overview of possible relevant reference values can be consulted in HWFE tool (tab "Journal papers"). It should be noted that there is a wide variance between these reference values, making them less robust.

[hhh] The number of days it takes for the COVID-19 infection cases, hospitalisations or deaths to double. The shorter the time frame, the steeper the curve and the faster the growth.

8.8 Discussion

The analysis of guidelines and tools for hospital surge respond strategies shows that a multicomponent approach is required. This has also been emphasized by Barbisch and Koenig (2006)[60], who described the 4S's framework to respond to a disaster- or pandemic-induced surge. This chapter describes a variety of strategies to create surge capacity, structured by the four S's: space, stuff, staff, and systems.

Recommendations

Within the "space" dimension, guidelines recommend to increase the available capacity by suspending elective nonessential services, repurposing beds and departments, and the creation of additional temporary capacity. Actions should also be taken to improve functional programming, accessibility and flow management. Furthermore, adequate levels of stuff were a major bottleneck during the first wave of the COVID-19 crisis in Belgium (mainly PPE). When referring to the "stuff" dimension, guidelines mainly refer to the availability of ventilators and PPE. Major strategies for this stuff-dimension entail optimising the utilisation, increasing the supply, and improving the stock management. Third, the availability of sufficient numbers of fully trained staff may become a significant constraint during an increased surge. The options to mitigate this constraint can be categorised in three major strategies: increase the supply of staff (e.g. by redeploying staff and mobilising additional staff), minimise the loss of staff (e.g. by providing sufficient support), and optimise the utilisation of staff (e.g. by changing the staffing model). It is recommended in the "systems" dimension to clearly define hierarchy of command at the national, regional, and hospital level. In addition, arrangements to purchase supplies and resources should be activated, healthcare providers should be supported in priority setting, and care continuity should be ensured. And last, however closely related to the "systems" dimension, guidelines emphasise the importance of

monitoring and data. Several planning tools and models are developed to project or forecast beds, stuff, and/or staff needed to respond to the COVID-19 pandemic. These tools and models incorporate a wide variety of different parameters (sometimes very context-specific), use different statics and operationalisations, and have different purposes.

Although the unity in the recommendations of the guidelines was clear, it was, however, not always evident who is responsible or should take action for which strategy (i.e. individual hospital/hospital networks or public authorities). We tried to target, throughout the chapter, who should take responsibility within the current Belgian context. However, this was not always possible. A lot of strategies are intertwined between the meso- and macro-level and require action from all levels. For example, when implementing a triage system during the COVID-19 pandemic, individual hospital networks can initiate some implementation steps, but the legal framework has to come from the public authorities. Most of the consulted guidelines are general and can be applied in multiple contexts or countries. This can probably explain this ambiguity in the guidelines. The country's specific context should be taken into account when interpreting the recommendations. Nevertheless, actions handled by authorities on multiple levels are recommended to achieve the best and fastest result. In addition, a planning framework should be based on strong ethical principles, the rule of law, the importance of provider and community engagement, and steps that permit the equitable and fair delivery of medical services to those who need them under resource-constrained conditions.[69] For each of the recommended strategies, an ethical balancing act must be carried out. This can be done, for instance, by integrating ethical experts in advisory boards of public authorities.

Limitations

The sample of analysed guidelines originates from the literature search for the chapter describing surge capacity strategies in some particular countries (Chapter 7). Additional relevant guidelines were included up until 30 September 2020. However, there is a rapid flow of publications describing potential strategies to meet surge needs during the current COVID-19 pandemic. We are aware that this convenience sample of guidelines may not be exhaustive. Nevertheless, saturation of the recommendations was experienced during analysis. Although this limitation may also apply for the described hospital surge models and tools, recent pre-published (systematic) literature reviews[102, 103] refer to the same included models and tools as in our sample.

A second limitation is that for the majority of the included guidelines, strength of evidence could not be determined. The "methods" section in these guidelines is often limited to a short summary of different data sources (such as "review of the peer-reviewed literature" or "expert opinion"), making it impossible to assess a publication's quality or strength of evidence. In addition, most guidelines are rather "common sense" instead of evidence based. These "common sense" recommendations are very time- and context-specific (e.g. global PPE shortage was limited in time and place), making it not always easy to translate them to the Belgian context.

APPENDICES

APPENDIX 1. APPENDIX TO CHAPTER 2

Appendix 1.1. Initial hospital surge capacity plan

Proposition aux entités fédérées et au RMG en ce qui concerne la mobilisation des capacités hospitalière dans le cadre du COVID-19.

Nota voorbereid door dr. Erika Vlieghe (Wetenschappelijk Comité COVID-19) met de Dienst Dringende Hulpverlening van het DG Gezondheidszorg van de FOD VVVL.

06/03/2020

Context

In het kader van de COVID-19-aanpak is, volgend op de Interministeriële Conferentie Volksgezondheid van 1 maart, door het DG Gezondheidzorg een initiatief genomen om, over de bevoegdheden met betrekking tot de ziekenhuissector, een coördinatie te voorzien tussen het federale niveau, de gefedereerde entiteiten, de ziekenhuiskoepels en vertegenwoordigers van het Wetenschappelijk Comité. Een coördinatiemeeting vond plaats op 2 en 3 maart met betrekking tot: 1) de organisatie van de staalafname, 2) het stockbeheer, 3) de behandelcapaciteit, gelinkt aan aspecten van het ziekenhuisnoodplan.

Wat het 3e punt betreft, werden instructies gegeven via een entiteitsoverschrijdende brief aan de ziekenhuizen (o.a. wat het up-to-date houden van ICMS betreft) en werden gegevens inzake behandelcapaciteit via de gefedereerde entiteiten verzameld. Er vond op 6 maart een meeting plaats met dr. Erika Vlieghe en de Dienst Dringende Hulpverlening van het DG Gezondheidszorg van de FOD VVVL. Voorliggende nota is het resultaat daarvan.

Deze nota omvat voorstellen en vereist, gezien hun bevoegdheid op vlak van normering en erkenning van ziekenhuizen en op vlak van ziekenhuisnoodplanning, afstemming met de gefedereerde entiteiten. Deze is mondeling aangevat op 6 maart in de namiddag. Bedoeling is voorliggende nota ook aan de RMG van maandag 9 maart voor te leggen.

Moeten nog in beschouwing worden genomen:

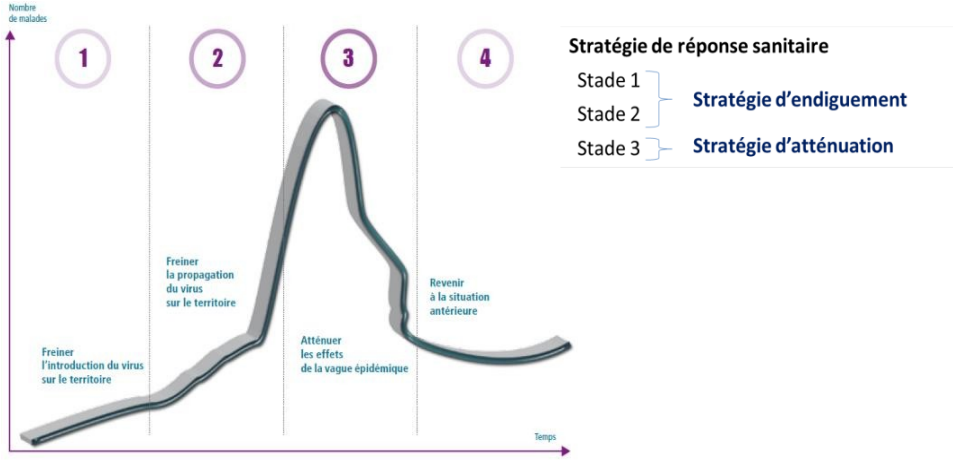
- Inzake transport wordt bekeken hoe in functie van stijging van gevallen eventueel bijzondere maatregelen moeten worden genomen, ook rekening houdend evt. met spreiding van patiënten over de ziekenhuizen in functie van capaciteit.
- Inzake outpatient care worden de gefedereerde entiteiten gevraagd om dit 5te bekijken, waarbij zonder twijfel nauwe afstemming met lokale besturen vereist is.

Organisatie van behandelcapaciteit in functie van de evolutie van de besmettingen

Dans le contexte de l'épidémie actuelle du COVID-19, la stratégie actuelle est de freiner sa propagation sur le territoire, en s'assurant de la détection rapide des patients suspects et le cas échéant, leur classement en « cas possibles ».

L'objectif vise aussi à isoler et traiter les patients classés « cas confirmés » dans des établissements de santé habilités.

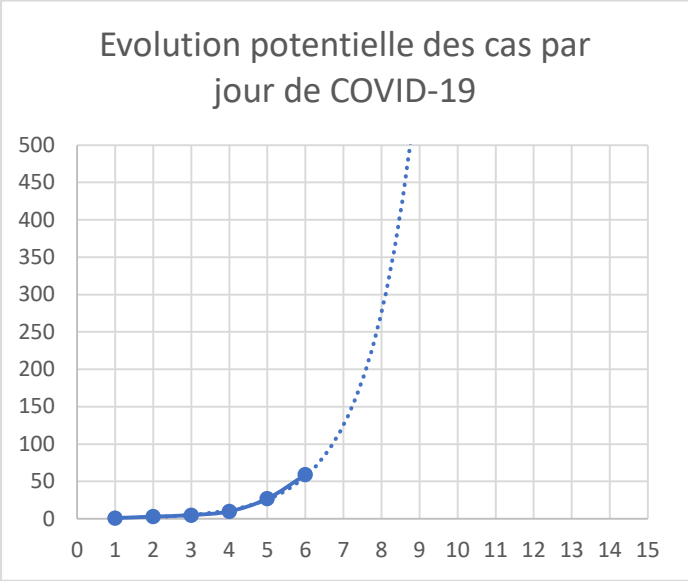
La stratégie de réponse est définie en fonction de la cinétique épidémique.



Sur base des derniers cas positifs de COVID-19 que connaît notre pays, nous savons que le nombre de cas positifs va augmenter dans les prochains jours. Une projection plus précise sera possible au fur et à mesure de l'émergence des cas.

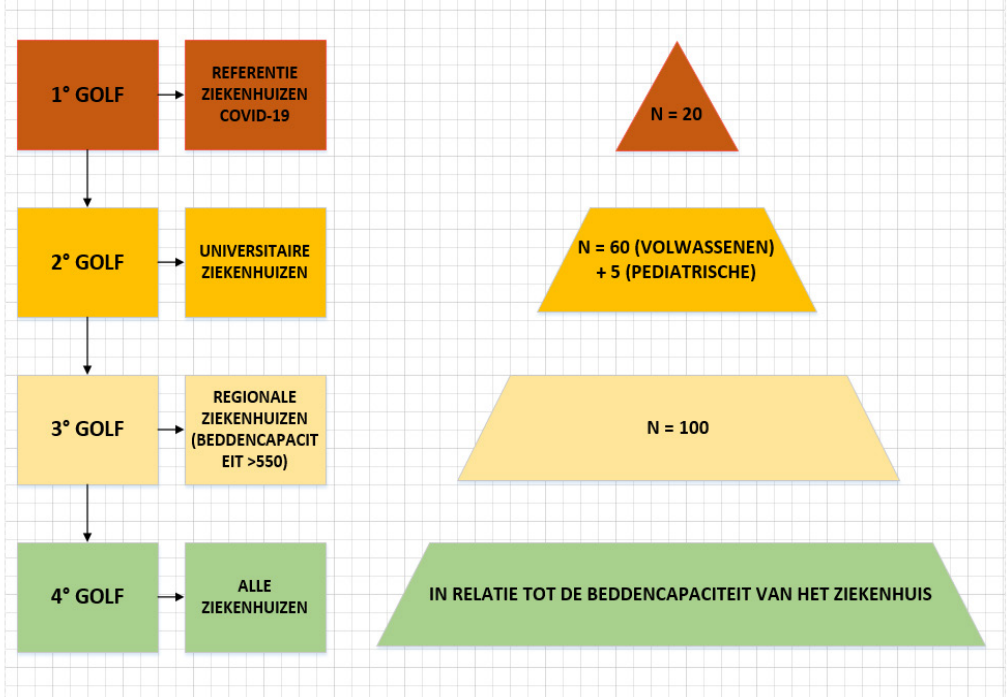
Néanmoins, afin d'avoir une première idée, nous avons procédé à une extrapolation des chiffres actuels que nous présentons ci-dessous. **Il s'agit probablement du pire scénario**. Néanmoins, nous pouvons constater qu'il est urgent d'assurer une capacité des lits hospitaliers afin de faire face à l'affluent potentiel de patients (soit 10 % de l'incidence selon une estimation basée sur la situation chinoise).

Le graphique ci-dessous reprend un scénario possible de l'évolution des nouveaux cas.



L'axe horizontale représente les jours, 1 étant le dimanche 01/03. Au jour 9, c'est-à-dire le lundi 9 mars, il est possible d'atteindre plus de 500 nouveaux cas ce jour-là, c'est-à-dire environ 1.000 cas au total en Belgique.

Met het oog op het verzekeren van voldoende behandelcapaciteit voorzien we vier golven.



Ces différentes vagues s'articulent comme suit :

<u>Binnen de fase van containment:</u>

- Vague 1 : occupation des lits des hôpitaux de référence (UZA et CHU St-Pierre) selon une distribution de 7 lits « classiques » et 3 lits de soins intensifs (10 lits par hôpital de référence), soit 20 lits ;
- Vague 2 : occupation des lits des hôpitaux universitaires, soit Gand, Louvain, UZ Brussel, UCL, Erasme, CHU Liège, Mont Godinne (10 chacun, soit 70 lits). Si on ajoute HUDERF (enfants, au cas où : + 10 lits). Ces hôpitaux sont formés pour faire face à une pathologie complexe qui nécessite l'utilisation intensive d'équipements de protection ;

- Vague 3 : les lits des hôpitaux de plus de 550 ou 600 lits afin d'obtenir une capacité supplémentaire d'une centaine de lits.

  Dans cette vague, nous sommes toujours dans la phase d'endiguement : distribution sélective des patients, impact minimal sur les hôpitaux, regroupement dans des hôpitaux spécialisés, en tenant compte de leurs capacités respectives. Parallèlement, tous les autres hôpitaux sont disposés à prendre en charge les pathologies moins graves des hôpitaux concernés pour les aider à libérer des lits.

Binnen de fase van mitigation

- Vague 4 : nous procédons à l'atténuation. Algemene uitrol in functie van situatie/ziekenhuisnoodplan.

APPENDIX 2. APPENDIX TO CHAPTER 5

Appendix 2.1. Introduction

Table A. 1 – Invitation email

French	Dutch
Au directeur médical, Bruxelles, le 2 septembre 2020. **Sujet : Invitation à prendre part à une étude KCE sur les mesures prises par le comité Hospital & Transport Surge Capacity** Docteur, Madame, Monsieur, **Invitation à participer à une étude KCE** Le Centre Fédéral d'Expertise des Soins de Santé (KCE) mène actuellement une étude sur le fonctionnement et les mesures prises par le comité Hospital & Transport Surge Capacity (HTSC) (https://kce.fgov.be/fr/etude-2020-03-hsr-evaluation-du-fonctionnement-et-des-mesures-prise-par-le-comit%C3%A9-%C2%ABhospital). Le comité HTSC est un groupe de travail qui a été mis en place début mars 2020 dans le cadre de la pandémie covid-19 pour gérer la capacité hospitalière en coordonnant les activités au niveau des hôpitaux et des services d'ambulances. Le KCE réalise cette étude à la demande du SPF Santé Publique (DG Soins de Santé). L'objectif de cette étude est de tirer des leçons et de formuler des recommandations pour l'avenir. Dans le cadre de cette étude, nous organisons une enquête concernant tous les hôpitaux belges. **L'objectif premier de cette enquête est de savoir comment les mesures ont été mise en œuvre.** Les questions portent principalement sur la capacité de traitement (lits, personnel, matériel), le plan d'urgence hospitalier ainsi que sur le rôle des réseaux.	Aan de Hoofdarts, Brussel, 2 september 2020 **Re: Uitnodiging tot deelname aan een KCE-studie over de maatregelen van het comité Hospital & Transport Surge Capacity** Geachte dokter, Geachte mevrouw, Geachte heer, **Uitnodiging tot deelname aan een KCE-studie** Het Federaal Kenniscentrum voor de Gezondheidszorg (KCE) voert momenteel een studie uit over de werking en de maatregelen van het comité "Hospital & Transport Surge Capacity (HTSC)" (https://kce.fgov.be/nl/studie-2020-03-hsr-evaluatie-van-de-werking-en-de-maatregelen-van-het-comit%C3%A9-%E2%80%9Chospital-transport). Het comité HTSC is een werkgroep die in het kader van de covid-19 pandemie begin maart 2020 werd opgericht om de ziekenhuiscapaciteit te beheren door de activiteiten van de ziekenhuizen en de ambulancediensten te coördineren. Het KCE voert deze studie uit in opdracht van de FOD Volksgezondheid (DG Gezondheidszorg). Met deze studie willen we lessen trekken en aanbevelingen formuleren naar de toekomst. Als onderdeel van deze studie wordt een bevraging georganiseerd bij alle Belgische ziekenhuizen. **Deze bevraging wil in eerste instantie nagaan op welke manier de maatregelen werden toegepast**. De vragen zijn vooral gericht op, de behandelcapaciteit (bedden, personeel, materiaal), het ziekenhuisnoodplan en de rol van de netwerken.

Pourquoi cette enquête ?

Nous sommes conscients du fait que les hôpitaux ont reçu ces dernières semaines plusieurs questionnaires, parfois très étendus, notamment de la part du SPF Santé publique et de Zorgnet-Icuro (uniquement pour les hôpitaux flamands). Nous savons que cela demande beaucoup d'efforts de votre part. Cependant, ces questionnaires ne sont pas suffisants pour répondre aux questions de l'étude KCE, soit parce que seule une partie des hôpitaux a été interrogée, soit parce que le sujet était trop spécifique. Nous espérons donc que vous avez encore le temps et l'énergie nécessaires pour participer à l'étude KCE.

Qu'entend-on par participation ?

Le questionnaire en ligne peut être complété par plusieurs personnes de votre hôpital, par exemple par le directeur médical, par chef du département infirmier, ou par le médecin chef de service des soins intensifs. Il est possible d'interrompre l'enquête et de la reprendre plus tard. Si le questionnaire est rempli par une unique personne, par exemple le directeur médical, cela n'empêche évidemment pas cette personne de recueillir des informations auprès d'autres personnes de l'hôpital. Certaines questions relèvent vraisemblablement de l'expertise ou de la responsabilité du directeur médical, d'autres de celle du directeur des soins infirmiers, du directeur général ou de quelqu'un d'autre dans l'hôpital. Toutefois, nous vous demandons de ne remplir qu'un seul questionnaire par hôpital, c'est pourquoi ce mail et celui contenant le lien vers le questionnaire (voir ci-dessous) n'ont été envoyés qu'au directeur médical. **Il faut environ 40 minutes pour remplir le questionnaire**.

Seule l'équipe KCE a accès aux questionnaires complétés. Lors de la publication du rapport de recherche, l'anonymat des hôpitaux participants sera assuré, et il ne sera pas possible de faire le lien entre un hôpital individuel et ses réponses. Les hôpitaux participants ne seront jamais nommés. Le rapport complet sera publié sur le site web du KCE (https://kce.fgov.be/) après approbation par le conseil d'administration du KCE.

Comment puis-je participer ?

Suite à cet e-mail, vous recevrez dans l'heure également un e-mail contenant un lien LimeSurvey et un code d'accès au questionnaire. Si le questionnaire est rempli par plusieurs personnes de votre hôpital, nous vous suggérons de leur faire suivre les deux e-mails. Nous vous prions de bien vouloir répondre pour le **11 septembre 2020** au plus tard.

Waarom deze bevraging?

We zijn er ons zeer van bewust dat de ziekenhuizen de voorbije weken meerdere, en soms erg uitgebreide vragenlijsten ontvangen hebben, onder andere van de FOD Volksgezondheid en van Zorgnet-Icuro (enkel voor de Vlaamse ziekenhuizen). Dit vraagt van u een grote inspanning. Deze vragenlijsten laten echter onvoldoende toe om een antwoord te geven op de onderzoeksvragen van de KCE studie, ofwel omdat enkel een deel van de ziekenhuizen bevraagd werd, ofwel omdat het onderwerp te specifiek was. We hopen daarom dat u nog de tijd en energie heeft om mee te werken aan de KCE studie.

Wat houdt een deelname in?

De online vragenlijst kan door meerdere personen in het ziekenhuis ingevuld worden, bijvoorbeeld door de hoofdarts, de algemeen of verpleegkundig directeur, of het diensthoofd intensieve zorgen. Het is mogelijk om op elk moment in de vragenlijst te stoppen en later te hervatten. Indien de vragenlijst enkel door bijvoorbeeld de hoofdarts wordt ingevuld, kan zij/hij ook informatie inwinnen bij andere personen in het ziekenhuis. Sommige vragen behoren waarschijnlijk eerder tot de expertise of verantwoordelijkheid van de hoofdarts, andere tot die van de verpleegkundig directeur, algemeen directeur of nog iemand anders in het ziekenhuis. De bedoeling is wel dat er slechts één vragenlijst wordt ingevuld. Daarom is deze e-mail en de e-mail met de link naar de vragenlijst (zie verder) enkel naar de hoofdarts gestuurd. **Het invullen van de vragenlijst duurt ongeveer 40 minuten**.

Enkel het KCE-team heeft toegang tot de ingevulde vragenlijsten. Bij de publicatie van het onderzoeksrapport zal de anonimiteit van de deelnemende ziekenhuizen worden verzekerd en zal het niet mogelijk zijn om een individueel ziekenhuis in verband te brengen met bepaalde antwoorden. Deelnemende ziekenhuizen zullen nooit bij naam worden genoemd. Het volledige rapport zal, na goedkeuring door de Raad van Bestuur van het KCE, op de website van het KCE gepubliceerd worden (https://kce.fgov.be/).

Hoe kan ik deelnemen?

Aansluitend op deze e-mail, ontvangt u binnen het uur ook een mail met een LimeSurvey link en een toegangscode voor de vragenlijst. Indien de vragenlijst door meerdere personen in het ziekenhuis wordt ingevuld, willen we u voorstellen om beide e-mails naar hen door te sturen. We vragen u om uiterlijk op **11 september 2020** te antwoorden.

Problèmes techniques et autres questions	**Technische problemen en andere vragen**
Si vous avez des questions ou rencontrez un problème technique, merci d'envoyer un email à Mélanie Lefèvre (melanie.lefevre@kce.fgov.be).	Bij technische problemen of vragen kan u een e-mail sturen naar Carine Van de Voorde (carine.vandevoorde@kce.fgov.be).
Nous vous remercions d'avance pour votre participation à cette étude.	Alvast bedankt voor uw bereidwillige medewerking aan deze studie.
Cordialement,	Hoogachtend,

Table A. 2 – Invitation letter

French	Dutch
Comme annoncé dans un précèdent e-mail, ce message vous permet d'accéder à l'enquête en ligne concernant l'étude KCE sur les mesures prises par le comité Hospital & Transport Surge Capacity.	Zoals aangekondigd in een vorige e-mail, dient dit bericht om u toegang te geven tot de online bevraging in het kader van de KCE studie over de maatregelen van het comité Hospital & Transport Surge Capacity.
Vous pouvez accéder à l'enquête en ligne et la compléter via le lien : {SURVEYURL}. Le code d'accès de votre hôpital est {TOKEN}. Nous vous prions de bien vouloir répondre pour le 11 septembre 2020 au plus tard. Il est possible d'interrompre l'enquête et de reprendre plus tard. Lorsque vous cliquez sur « suivant » ou « précédent » vos réponses sont automatiquement enregistrées, vous pouvez dès lors reprendre plus tard, ou avec un autre ordinateur (ou tablette ou smartphone), en utilisant le même lien et code d'accès. Une fois que vous avez cliqué sur « envoyer », il n'est par contre plus possible de modifier vos réponses.	U kan de bevraging openen en invullen via volgende link: {SURVEYURL}. De toegangscode van uw ziekenhuis is {TOKEN}. We zouden willen vragen om uiterlijk op 11 september 2020 te antwoorden. Het is mogelijk om de enquête te onderbreken en later te hervatten. Wanneer u op "volgende" of "vorige" klikt, worden uw antwoorden automatisch opgeslagen, zodat u later of met een andere computer (of tablet of smartphone) verder kunt gaan met dezelfde link en toegangscode. Als u eenmaal op "verzenden" heeft geklikt, is het echter niet meer mogelijk uw antwoorden te wijzigen.
Si vous avez des questions ou rencontrez un problème technique, merci d'envoyer un email à Mélanie Lefèvre (melanie.lefevre@kce.fgov.be).	Bij technische problemen of vragen kan u een e-mail sturen naar Carine Van de Voorde (carine.vandevoorde@kce.fgov.be).
Nous vous remercions d'avance pour votre participation à cette étude.	Alvast bedankt voor uw bereidwillige medewerking aan deze studie.

Table A. 3 – Survey introduction

French	Dutch
Docteur, Madame, Monsieur, L'équipe de recherche du KCE vous remercie de votre participation à cette étude. Cette enquête se com7pose d'un certain nombre de questions qui permettent d'évaluer les mesures prises par le comité Hospital & Transport Surge Capacity. Nous vous demandons de répondre à ces questions de la manière la plus complète possible, de façon à ce que nous puissions appréhender au mieux la situation spécifique de votre hôpital. Il faut environ 40 minutes pour remplir le questionnaire. Il est possible d'interrompre l'enquête et de reprendre plus tard. Lorsque vous cliquez sur « suivant » ou « précédent » vos réponses sont automatiquement enregistrées, vous pouvez dès lors reprendre plus tard, ou avec un autre ordinateur (ou tablette ou smartphone), en utilisant le même lien et code d'accès. Une fois que vous avez cliqué sur « envoyer », il n'est par contre plus possible de modifier vos réponses. L'enquête peut être complétée via un ordinateur, une tablette ou un smartphone. Pour toute question ou problème technique, vous pouvez contacter melanie.lefevre@kce.fgov.be.	Geachte dokter, geachte mevrouw, geachte heer, Het onderzoeksteam van het KCE dankt u voor uw deelname aan deze studie. Deze vragenlijst bevat een aantal vragen die peilen naar de maatregelen van het comité Hospital & Transport Surge Capacity. We willen u vragen om de vragen zo compleet mogelijk te beantwoorden, zodat wij de specifieke situatie in uw ziekenhuis zo goed mogelijk kunnen begrijpen. Het invullen van de vragenlijst duurt ongeveer 40 minuten. Het is mogelijk om op elk moment in de vragenlijst te stoppen en later te hervatten. Wanneer u op "volgende" of "vorige" klikt, worden uw antwoorden automatisch opgeslagen, zodat u later of met een andere computer (of tablet of smartphone) verder kunt gaan met dezelfde link en toegangscode. Als u eenmaal op "verzenden" heeft geklikt, is het echter niet meer mogelijk uw antwoorden te wijzigen. De vragenlijst kan zowel via computer als tablet of smartphone ingevuld worden. U kan voor vragen of technische problemen contact opnemen met carine.vandevoorde@kce.fgov.be.

Appendix 2.2. Survey questions

Table A. 4 – Capacity (1/3)

Code	Question in French	Question in Dutch	Type answer / condition
C1	Le comité Hospital & Transport Surge Capacity (HTSC), en collaboration avec le Risk Management Group, vous a, au cours de la période du 1er mars 2020 au 30 juin 2020, envoyé plusieurs lettres comprenant des mesures relatives à la capacité de traitement requise. Pour plusieurs de ces mesures, les instructions ont changé pendant la période mars-juin. Dans cette partie de l'enquête, nous vous demandons d'évaluer une sélection de ces mesures prises par le comité HTSC.	Het comité Hospital & Transport Surge Capacity (HTSC) in samenwerking met de Risk Management Group heeft u in de periode 1 maart 2020 – 30 juni 2020 verschillende brieven gestuurd met maatregelen die betrekking hebben op de benodigde behandelcapaciteit. Voor meerdere van deze maatregelen wijzigden de aanwijzingen gedurende de periode maart-juni. In dit deel van de enquête vragen we naar uw beoordeling van een selectie van die maatregelen van het comité HTSC.	
C1a	Pas du tout – Plutôt non – Plutôt oui – Tout à fait – Pas de réponse La lettre du 17/3 du comité HTSC indique : « En outre, vous devez libérer immédiatement un nombre maximal de lits	Helemaal niet – Eerder niet – Eerder wel – Helemaal – Geen antwoord	Array single choice

	d'hospitalisation, à raison de 3-4 lits d'hospitalisation par lit de soins intensifs. » Selon vous, cette mesure était Claire Faisable	In de brief van 17/03 van het comité HTSC staat: “Daarenboven moet u onverwijld maximaal hospitalisatiebedden vrijmaken, a rato van 3-4 hospitaalbedden per ICU bed.” Deze maatregel was volgens u Duidelijk Uitvoerbaar	
C1aa	Pouvez-vous décrire pourquoi cette mesure n'était pas claire ?	Kan u omschrijven waarom deze maatregel niet duidelijk was?	Open. If C1a = helemaal niet of eerder niet duidelijk
C1ab	Pouvez-vous décrire pourquoi cette mesure n'était pas faisable ?	Kan u omschrijven waarom deze maatregel niet uitvoerbaar was?	Open. If C1a = helemaal niet of eerder niet uitvoerbaar
C1b	Pas du tout – Plutôt non – Plutôt oui – Tout à fait – Pas de réponse La lettre du 17/3 du comité HTSC indique : « Les hôpitaux sont invités à prendre des dispositions proactives, au moins au niveau du réseau locorégional, concernant les orientations possibles lorsque la capacité maximale d'un hôpital est dépassée.» Selon vous, cette mesure était Claire Faisable	Helemaal niet – Eerder niet – Eerder wel – Helemaal – Geen antwoord In de brief van 17/03 van het comité HTSC staat: “Ziekenhuizen worden uitgenodigd om minstens op locoregionaal niveau proactief afspraken te maken inzake eventuele verwijzing wanneer de maximale capaciteit van een ziekenhuis overschreden wordt.” Deze maatregel was volgens u Duidelijk Uitvoerbaar	Array single choice
C1ba	Pouvez-vous décrire pourquoi cette mesure n'était pas claire ?	Kan u omschrijven waarom deze maatregel niet duidelijk was?	Open. If C1b = helemaal niet of eerder niet duidelijk
C1bb	Pouvez-vous décrire pourquoi cette mesure n'était pas faisable ?	Kan u omschrijven waarom deze maatregel niet uitvoerbaar was?	Open. If C1b = helemaal niet of eerder niet uitvoerbaar
C1c	Pas du tout – Plutôt non – Plutôt oui – Tout à fait – Pas de réponse La lettre du 25/3 du comité HTSC indique : « Chaque hôpital doit garder au moins la capacité suivante disponible pour les patients COVID-19: 60 % du nombre de lits agréés ayant un caractère de "soins intensifs" (lits intensifs). En annexe à cette lettre, vous trouverez par hôpital le nombre de lits pour adultes agréés (ou	Helemaal niet – Eerder niet – Eerder wel – Helemaal – Geen antwoord In de brief van 25/03 van het comité HTSC staat: “Elk ziekenhuis dient minstens volgende capaciteit vrij te houden voor COVID-19-patiënten: 60% van het aantal erkende bedden met een karakter “intensieve zorgen” (intensieve	Array single choice

	déclarés par les hôpitaux en tant que lits de soins intensifs) sur lequel se basent les entités. Les autres lits intensifs agréés, par exemple pour les enfants en pédiatrie, ne sont pas pris en compte dans notre régulation, mais peuvent bien sûr être considérés comme une capacité supplémentaire d'appoint et utilisés si nécessaire.» Selon vous, cette mesure était Claire Faisable	bedden). In bijlage bij deze brief vindt u per ziekenhuis het aantal erkende bedden voor volwassenen die door de overheden als basis gebruikt worden. De andere erkende intensieve bedden, bv. voor kinderen binnen E-diensten, nemen we in onze regulatie niet in rekening, maar kunnen uiteraard als bijkomende “surge” capaciteit worden beschouwd en ingezet, wanneer dat nodig zou blijken.” Deze maatregel was volgens u Duidelijk Uitvoerbaar	
C1ca	Pouvez-vous décrire pourquoi cette mesure n'était pas claire ?	Kan u omschrijven waarom deze maatregel niet duidelijk was?	Open. If C1c = helemaal niet of eerder niet duidelijk
C1cb	Pouvez-vous décrire pourquoi cette mesure n'était pas faisable ?	Kan u omschrijven waarom deze maatregel niet uitvoerbaar was?	Open. If C1c = helemaal niet of eerder niet uitvoerbaar
C1d	Pas du tout – Plutôt non – Plutôt oui – Tout à fait – Pas de réponse La lettre du 25/3 du comité HTSC indique : « Pour chaque lit ayant un "caractère intensif" (agréé), 4 lits non intensifs doivent être prévus dans les hôpitaux. Nous encourageons, en vue d’un bon flux de patients à l’hôpital, d’appliquer le même ratio pour les lits intensifs "surge".» Selon vous, cette mesure était Claire Faisable	Helemaal niet – Eerder niet – Eerder wel – Helemaal – Geen antwoord In de brief van 25/03 van het comité HTSC staat: “Voor elk bed met een “intensief karakter” (erkend) dienen 4 niet-intensieve bedden voorzien te worden in de ziekenhuizen. Wij moedigen, omwille van de doorstroom van patiënten in het ziekenhuis, aan om ook voor de “surge” intensieve bedden dezelfde ratio toe te passen.” Deze maatregel was volgens u Duidelijk Uitvoerbaar	Array single choice
C1da	Pouvez-vous décrire pourquoi cette mesure n'était pas claire ?	Kan u omschrijven waarom deze maatregel niet duidelijk was?	Open. If C1d = helemaal niet of eerder niet duidelijk
C1db	Pouvez-vous décrire pourquoi cette mesure n'était pas faisable ?	Kan u omschrijven waarom deze maatregel niet uitvoerbaar was?	Open. If C1d = helemaal niet of eerder niet uitvoerbaar
C1e	Pas du tout – Plutôt non – Plutôt oui – Tout à fait – Pas de réponse	Helemaal niet – Eerder niet – Eerder wel – Helemaal – Geen antwoord	Array single choice

	La lettre du 25/3 du comité HTSC indique : « Dès que 75% de la capacité d'utilisation des lits intensifs (agréés et "surge") ET/OU non intensifs disponibles pour les patients COVID-19 est atteinte, ET/OU s'il ne reste plus que 3 lits intensifs, l'hôpital commencera les renvois sur la base de la concertation avec les hôpitaux du réseau hospitalier locorégional.» Selon vous, cette mesure était Claire Faisable	In de brief van 25/03 van het comité HTSC staat: “Zodra 75% bezettingsgraad van de voor COVID-19 beschikbare capaciteit van intensieve (erkend en “surge”) EN/OF niet-intensieve bedden wordt bereikt, EN/OF er slechts 3 intensieve bedden meer resteren, start het ziekenhuis, op basis van samenspraak met de ziekenhuizen binnen het locoregionaal ziekenhuisnetwerk, de verwijzingen.” Deze maatregel was volgens u Duidelijk Uitvoerbaar	
C1ea	Pouvez-vous décrire pourquoi cette mesure n'était pas claire ?	Kan u omschrijven waarom deze maatregel niet duidelijk was?	Open. If C1e = helemaal niet of eerder niet duidelijk
C1eb	Pouvez-vous décrire pourquoi cette mesure n'était pas faisable ?	Kan u omschrijven waarom deze maatregel niet uitvoerbaar was?	Open. If C1e = helemaal niet of eerder niet uitvoerbaar
C1f	Pas du tout – Plutôt non – Plutôt oui – Tout à fait – Pas de réponse La lettre du 24/4 du comité HTSC indique : « La réservation permanente d'au moins 4 fois la somme du nombre de lits intensifs agréés (a) et supplémentaires (b) réservés : ce nombre de lits (c) doit être réservé pour le traitement non intensif des patients COVID-19.» Selon vous, cette mesure était Claire Faisable	Helemaal niet – Eerder niet – Eerder wel – Helemaal – Geen antwoord In de brief van 24/04 van het comité HTSC staat: “Het permanent reserveren van minimaal 4 maal de som van het aantal permanent gereserveerde erkende (a) en bijkomende (b) bedden met intensief karakter: dit aantal bedden (c) moet worden gereserveerd voor de niet-intensieve behandeling van COVID-19-patiënten.” Deze maatregel was volgens u Duidelijk Uitvoerbaar	Array single choice
C1fa	Pouvez-vous décrire pourquoi cette mesure n'était pas claire ?	Kan u omschrijven waarom deze maatregel niet duidelijk was?	Open. If C1f = helemaal niet of eerder niet duidelijk
C1fb	Pouvez-vous décrire pourquoi cette mesure n'était pas faisable ?	Kan u omschrijven waarom deze maatregel niet uitvoerbaar was?	Open. If C1f = helemaal niet of eerder niet uitvoerbaar
C1g	Pas du tout – Plutôt non – Plutôt oui – Tout à fait – Pas de réponse	Helemaal niet – Eerder niet – Eerder wel – Helemaal – Geen antwoord	Array single choice

	La lettre du 30/4 du comité HTSC indique : « Deuxième phase : le doublement de l'effort de la première phase, c'est la "capacité réflexe supplémentaire". La deuxième phase suppose que l'on soit prêt à doubler la capacité réservée en permanence dans la phase 1 dans un délai de 7 jours calendrier suivant un signal du Comité.» Selon vous, cette mesure était Claire Faisable	In de brief van 30/04 van het comité HTSC staat: “Tweede fase: het verdubbelen van de inspanning van de eerste fase, dit is de “bijkomende reflexcapaciteit”. De tweede fase veronderstelt het verzekeren van een paraatheid om, binnen een periode van 7 kalenderdagen na een signaal vanwege het Comité, de in fase 1 permanent gereserveerde capaciteit te verdubbelen.” Deze maatregel was volgens u Duidelijk Uitvoerbaar	
C1ga	Pouvez-vous décrire pourquoi cette mesure n'était pas claire ?	Kan u omschrijven waarom deze maatregel niet duidelijk was?	Open. If C1g = helemaal niet of eerder niet duidelijk
C1gb	Pouvez-vous décrire pourquoi cette mesure n'était pas faisable ?	Kan u omschrijven waarom deze maatregel niet uitvoerbaar was?	Open. If C1g = helemaal niet of eerder niet uitvoerbaar
C1h	Pas du tout – Plutôt non – Plutôt oui – Tout à fait – Pas de réponse La lettre du 30/4 du comité HTSC indique : « Dès qu'un hôpital atteint un taux d'occupation de 75% de sa capacité réflexe et/ou qu'il ne reste que 2 lits à caractère intensif, l'hôpital commence les transferts sur la base d'une collaboration avec les hôpitaux du réseau hospitalier loco-régional.» Selon vous, cette mesure était Claire Faisable	Helemaal niet – Eerder niet – Eerder wel – Helemaal – Geen antwoord In de brief van 30/04 van het comité HTSC staat: “Zodra een ziekenhuis een bezettingsgraad van 75% van zijn reflexcapaciteit bereikt en/of er slechts 2 intensieve bedden meer resteren, start het ziekenhuis, op basis van samenspraak met de ziekenhuizen binnen het locoregionaal ziekenhuisnetwerk, de verwijzingen.” Deze maatregel was volgens u Duidelijk Uitvoerbaar	Array single choice
C1ha	Pouvez-vous décrire pourquoi cette mesure n'était pas claire ?	Kan u omschrijven waarom deze maatregel niet duidelijk was?	Open. If C1h = helemaal niet of eerder niet duidelijk
C1hb	Pouvez-vous décrire pourquoi cette mesure n'était pas faisable ?	Kan u omschrijven waarom deze maatregel niet uitvoerbaar was?	Open. If C1h = helemaal niet of eerder niet uitvoerbaar
C1i	Pas du tout – Plutôt non – Plutôt oui – Tout à fait – Pas de réponse	Helemaal niet – Eerder niet – Eerder wel – Helemaal – Geen antwoord	Array single choice

	La lettre du 20/5 du comité HTSC indique : « L'encadrement (staffing) des lits supplémentaires créés en plus de la capacité USI agréée (25 % dans la première phase jusqu'à 50 % dans la deuxième phase de la "deuxième vague") doit être identique à celui des lits USI agréés.» Selon vous, cette mesure était Claire Faisable	In de brief van 20/05 van het comité HTSC staat: “Wat de bestaffing van de bijkomende bedden (25% in de eerste fase tot 50% in de tweede fase van de “tweede golf”) bovenop de erkende ICU-capaciteit betreft, dient deze te voldoen aan de bestaffing die voorzien is voor erkende ICU-bedden.” Deze maatregel was volgens u Duidelijk Uitvoerbaar	
C1ia	Pouvez-vous décrire pourquoi cette mesure n'était pas claire ?	Kan u omschrijven waarom deze maatregel niet duidelijk was?	Open. If C1i = helemaal niet of eerder niet duidelijk
C1ib	Pouvez-vous décrire pourquoi cette mesure n'était pas faisable ?	Kan u omschrijven waarom deze maatregel niet uitvoerbaar was?	Open. If C1i = helemaal niet of eerder niet uitvoerbaar

Table A. 5 – Capacity (2/3)

Code	Question in French	Question in Dutch	Type answer / condition
C2	Pas du tout – Plutôt non – Plutôt oui – Tout à fait – Pas de réponse Au cours de la période du 1er mars 2020 au 30 avril 2020, dans quelle mesure votre hôpital a-t-il connu des problèmes relatifs aux domaines suivants, pour accroître la capacité en USI ? Unité physiquement séparée pour les lits covid-19 en unité de soins intensifs Nombre d'infirmiers ayant une expertise en soins intensifs Nombre de médecins ayant une expertise en soins intensifs Absentéisme du personnel infirmier Absentéisme des médecins Disponibilité de suffisamment d’espace Disponibilité de respirateurs appropriés Disponibilité de dispositifs ECMO Disponibilité d’équipements de protection individuelle	Helemaal niet – eerder niet – eerder wel – zeker wel – geen antwoord In welke mate heeft uw ziekenhuis in de periode 1 maart 2020 – 30 april 2020 problemen ervaren voor onderstaande domeinen bij het uitbreiden van ICU-capaciteit? Architectonisch afgescheiden eenheid voor covid-19 ICU-bedden Aantal verpleegkundigen met expertise in intensieve zorgen Aantal artsen met expertise in intensieve zorgen Absenteïsme verpleegkundigen Absenteïsme artsen Beschikbaarheid ruimte Beschikbaarheid geschikte ventilatoren Beschikbaarheid ECMO-apparaten Beschikbaarheid persoonlijk beschermingsmateriaal	Array single choice

C2a	Si vous désirez ajouter quelque chose à la question précédente, merci de le détailler ici.	Indien u aan de vorige vraag iets wil toevoegen, gelieve dit hier te verduidelijken.	Open
C3	Quelles stratégies relatives à la capacité d'accueil des patients (lits ou services), votre hôpital a-t-il mises en œuvre au cours de la période allant du 1er mars 2020 au 30 avril 2020 pour permettre une capacité suffisante en USI ? Utilisation de salles d'opération en tant qu'USI Utilisation des unités de soins post-anesthésiques en tant qu'USI Utilisation des services de middle care (par exemple, le CCU) en tant qu'USI Utilisation d'unités de soins générales en tant qu'USI Utilisation du NICU en tant qu'USI Réouverture d'USI fermées Augmentation du nombre de lits dans les USI existantes Séparation (par de petites modifications) de l'USI en USI covid-19 et non covid-19 Autres:	Welke strategieën in termen van ruimte (bedden of afdelingen) heeft uw ziekenhuis toegepast om voldoende ICU-capaciteit te voorzien in de periode 1 maart 2020 – 30 april 2020? Inschakelen van operatiezalen als ICU Inschakelen van PAZA als ICU Inschakelen van medium-care afdeling (bv. CCU) als ICU Inschakelen van algemene verpleegeenheden als ICU Inschakelen van NICU als ICU Heropenen van gesloten ICU Verhogen van aantal bedden in bestaande ICU Splitsen van ICU (door kleine verbouwing) in covid-19 en niet-covid-19 ICU Anders:	Multiple choice + other
C4	Quelles stratégies relatives au personnel infirmier votre hôpital a-t-il mises en œuvre au cours de la période allant du 1er mars 2020 au 30 avril 2020 pour permettre une capacité suffisante en USI? Recours à des infirmiers ayant des compétences en soins intensifs affectés à d'autres services (tels que urgences, unités de soins post-anesthésiques, autres services avec expérience récentes en matière de soins intensifs) Recours à des infirmiers normalement affectés à des unités de soins générales (telles que médecine interne ou chirurgie) Recours à des étudiants en cours de spécialisation en soins intensifs Recours à d'anciens infirmiers spécialisés en soins intensifs Organisation de formations rapides en soins intensifs pour des infirmiers affectés à des services en lien avec	Welke strategieën in termen van verpleegkundig personeel heeft uw ziekenhuis toegepast om voldoende ICU-capaciteit te voorzien in de periode 1 maart 2020 – 30 april 2020? Inzetten van verpleegkundigen met ICU-vaardigheden werkzaam op andere afdelingen (zoals spoed, PAZA, andere afdelingen met recente ervaring op ICU) Inzetten van verpleegkundigen werkzaam op algemene verpleegeenheden (zoals inwendige of chirurgie) Inzetten van studenten verpleegkundige intensieve zorgen Inzetten van voormalige ICU-verpleegkundigen Organiseren van een spoedcursus ICU voor verpleegkundigen werkzaam op ICU-gerelateerde afdelingen (zoals operatiekwartier, PAZA, medium-care afdeling) Organiseren van een spoedcursus ICU voor verpleegkundigen werkzaam op algemene verpleegeenheden (zoals inwendige of chirurgie)	Multiple choice + other

	les soins intensifs (tels que salles d'opération, salles de réveil, services de middle-care) Organisation de formations rapides en soins intensifs pour des infirmiers affectés à des unités de soins générales (telles que médecine interne ou chirurgie) Augmentation du nombre de patients par infirmier en USI, par rapport à la normale Recours à des équipes mixtes d'infirmiers spécialisés et non spécialisés en soins intensifs Ajustement des conditions de travail des infirmiers en USI (tels que report de congé, augmentation temporaire du pourcentage de temps de travail) Autres:	Verhogen van het aantal patiënten per verpleegkundige op de ICU in vergelijking met de normale praktijk Inzetten van gemengde teams ICU- en niet-ICU-verpleegkundigen Aanpassen arbeidsomstandigheden ICU-verpleegkundigen (zoals intrekken van verlof, tijdelijke verhoging van percentage tewerkstelling) Anders:	
C5	Quelles stratégies relatives au personnel médical votre hôpital a-t-il mises en œuvre au cours de la période allant du 1er mars 2020 au 30 avril 2020 pour permettre une capacité suffisante en USI? Recours à des médecins ayant des compétences en soins intensifs affectés à d'autres services (tels que urgences, unités de soins post-anesthésiques, autres services avec expérience récentes en matière de soins intensifs) Recours à des médecins normalement affectés à des unités de soins générales (telles que médecine interne ou chirurgie) Recours à des médecins-spécialistes en formation Recours à d'anciens médecins intensivistes Organisation de formations rapides en soins intensifs pour des médecins affectés à des services en lien avec les soins intensifs (tels que salles d'opération, unités de soins post-anesthésiques, services de middle-care) Organisation de formations rapides en soins intensifs pour des médecins affectés à des unités de soins générales (telles que médecine interne ou chirurgie) Recours à des équipes mixtes de médecins intensivisites et non intensivistes	Welke strategieën in termen van artsen heeft uw ziekenhuis toegepast om voldoende ICU-capaciteit te voorzien in de periode 1 maart 2020 – 30 april 2020? Inzetten van artsen met ICU-vaardigheden werkzaam op andere afdelingen (zoals spoed, PAZA, andere afdelingen met recente ervaring op ICU) Inzetten van artsen werkzaam op algemene verpleegeenheden (zoals inwendige of chirurgie) Inzetten van arts-specialisten in opleiding Inzetten van voormalige ICU-artsen Organiseren van een spoedcursus ICU voor artsen werkzaam op ICU-gerelateerde afdelingen (zoals operatiekwartier, PAZA, medium-care afdeling) Organiseren van een spoedcursus ICU voor artsen werkzaam op algemene verpleegeenheden (zoals inwendige of chirurgie) Inzetten van gemengde teams ICU- en niet-ICU-artsen Aanpassen arbeidsomstandigheden ICU-artsen (zoals intrekken van verlof, tijdelijke verhoging van aantal werkuren) Anders:	Multiple choice + other

	Ajustement des conditions de travail des médecins des USI (tels que report de congé, augmentation temporaire du nombre d'heures de travail) Autres:		
C6	Quelles stratégies relatives aux autres types de personnel votre hôpital a-t-il mises en œuvre au cours de la période allant du 1er mars 2020 au 30 avril 2020 pour permettre une capacité suffisante en USI ? Recours à du personnel de maintenance supplémentaire (par exemple pour la maintenance des équipements) Recours à des techniciens supplémentaires Recours à du personnel de laboratoire supplémentaire Recours à du personnel de nettoyage supplémentaire Autre:	Welke strategieën in termen van ander personeel dan verpleegkundigen of artsen heeft uw ziekenhuis toegepast om voldoende ICU-capaciteit te voorzien in de periode 1 maart 2020 – 30 april 2020? Inzetten van extra onderhoudspersoneel (bv. voor onderhoud apparatuur) Inzetten van extra technici Inzetten van extra labomedewerkers Inzetten van extra schoonmaakpersoneel Anders:	Multiple choice + other
C7	Quelles stratégies relatives au matériel votre hôpital a-t-il mises en œuvre au cours de la période allant du 1er mars 2020 au 30 avril 2020 pour permettre une capacité suffisante en USI ? Achat de respirateurs supplémentaires Remise en service d'anciens respirateurs Prêt de respirateurs par d'autres hôpitaux Utilisation d'un seul respirateur pour plusieurs patients Achat de dispositifs ECMO supplémentaires Prêt de dispositifs ECMO par d'autres hôpitaux Gestion conjointe dans le réseau hospitalier loco-régional des médicaments essentiels pour l'unité de soins intensifs Autre:	Welke strategieën in termen van materiaal heeft uw ziekenhuis toegepast om voldoende ICU-capaciteit te voorzien in de periode 1 maart 2020 – 30 april 2020? Aankopen van extra ventilatoren Opnieuw in gebruik nemen van oude ventilatoren Lenen van ventilatoren bij andere ziekenhuizen Gebruiken van één ventilator voor meerdere patiënten Aankopen extra ECMO-apparaten Lenen van ECMO-apparaten bij andere ziekenhuizen Gezamenlijk beheren in het locoregionaal ziekenhuisnetwerk van essentiële geneesmiddelen voor de ICU Anders:	Multiple choice + other
C8	Quelles stratégies destinées aux patients votre hôpital a-t-il mises en œuvre au cours de la période allant du 1er mars 2020 au 30 avril 2020 pour permettre une capacité suffisante en USI ? Application d'une politique de sorties précoces des USI Application d'une politique de sorties précoces de l'hôpital Utilisation des critères d'admission ou non en USI (p.ex. âge, comorbidités)	Welke strategieën gericht op patiënten heeft uw ziekenhuis toegepast om voldoende ICU-capaciteit te voorzien in de periode 1 maart 2020 – 30 april 2020? Toepassen van versneld ontslagbeleid uit de ICU Toepassen van versneld ontslagbeleid uit het ziekenhuis Hanteren van criteria voor wel of niet ICU-opname (bv. leeftijd, co-morbiditeit)	Multiple choice + other

	Utilisation des critères d'admission ou non à l'hôpital (p.ex. âge, comorbidités)	Hanteren van criteria voor wel of niet ziekenhuisopname (bv. leeftijd, co-morbiditeit)
	Mise en place de structures intermédiaires	Opzetten van intermediaire structuren
	Prises d'accords avec les maisons de repos pour le retour des patients	Afspraken maken met woonzorgcentra over terugname van patiënten
	Autre:	Anders:

Table A. 6 – Capacity (3/3)

Code	Question in French	Question in Dutch	Type answer / condition
C9	Pas du tout d'accord – plutôt pas d'accord – plutôt d'accord – tout à fait d'accord – pas de réponse	Helemaal niet akkoord – eerder niet akkoord – eerder wel akkoord – helemaal akkoord – geen antwoord	Array single choice
	Dans quelle mesure êtes-vous d'accord avec les affirmations suivantes ? Afin de pouvoir permettre à l'avenir une capacité hospitalière suffisante en cas d'une crise telle que celle du covid-19, les autorités doivent assurer…	In hoeverre gaat u akkoord met de volgende uitspraken? Om in de toekomst bij een crisis zoals de covid-19 crisis voldoende ziekenhuiscapaciteit te kunnen voorzien, moet de overheid zorgen voor het	
	une plus grande attractivité de la profession infirmière, via la rémunération	Aantrekkelijker maken van het beroep van verpleegkundige via verloning	
	une plus grande attractivité de la profession infirmière, via les normes de personnel	Aantrekkelijker maken van het beroep van verpleegkundige via personeelsnormen	
	le maintien des connaissances et de l'expertise des anciens infirmiers en USI via par exemple des formations complémentaires	Instandhouden kennis en expertise van voormalig ICU-verpleegkundigen via bv. bijkomende opleiding	
	le maintien des connaissances et de l'expertise des anciens médecins en USI via par exemple des formations complémentaires	Instandhouden kennis en expertise van voormalig ICU-artsen via bv. bijkomende opleiding	
	la création d'un stock (roulant) stratégique d'équipements de protection individuelle	Aanleggen strategische (rollende) voorraad persoonlijke beschermingsmiddelen	
	le financement de la capacité tampon (buffer capacity) au niveau des hôpitaux	Financieren van buffercapaciteit op ziekenhuisniveau	
	le financement de la capacité tampon (buffer capacity) au niveau des réseaux hospitaliers locorégionaux	Financieren van buffercapaciteit op het niveau van het locoregionale ziekenhuisnetwerk	
	la mise en place d'un programme de soins pour les maladies respiratoires	Inrichten van een zorgprogramma respiratoire aandoeningen	
	la mise en place d'un programme de soins pour les maladies infectieuses	Inrichten van een zorgprogramma infectieuze aandoeningen	
		Organiseren van externe liaisons naar de huisartsen (geriatrie, infectiepreventie, etc.)	

	l'organisation de liaisons externes avec les médecins généralistes (gériatrie, prévention des infections, etc.) l'organisation de liaisons externes avec les maisons de repos (gériatrie, prévention des infections, etc.) la définition du rôle des réseaux hospitaliers locorégionaux le développement d'applications de soins numériques	Organiseren van externe liaisons naar de woonzorgcentra (geriatrie, infectiepreventie, etc.) Vastleggen van de rol van de locoregionale ziekenhuisnetwerken Ontwikkelen van digitale zorgtoepassingen	
C9a	Si vous désirez ajouter quelque chose à la question précédente, merci de le détailler ici.	Indien u aan de vorige vraag iets wil toevoegen, gelieve dit hier te verduidelijken.	Open
C9c	Si vous avez répondu "pas du tout d'accord" ou "plutôt pas d'accord" à la question précédente, merci de préciser	Indien u op de vorige vraag "helemaal niet akkoord" of "eerder niet akkoord" hebt geantwoord, gelieve te verduidelijken	Open. If C9 = helemaal niet akkoord of eerder niet akkoord
C10	Lors de la première vague de la crise du covid-19, plusieurs instances ont fourni des instructions sur la capacité de traitement des hôpitaux. Cela a-t-il entraîné un manque de clarté pour votre hôpital ? Oui, cela a conduit à un manque de clarté Non, cela n'a pas conduit à un manque de clarté	In de eerste golf van de covid-19 crisis hebben meerdere instanties aanwijzingen gegeven omtrent de behandelcapaciteit van ziekenhuizen. Heeft dit voor uw ziekenhuis geleid tot onduidelijkheid? Ja, dit heeft tot onduidelijkheid geleid Nee, dit heeft niet tot onduidelijkheid geleid	Single choice
C10a	Pouvez-vous en donner l'exemple le plus important selon vous ?	Kan u het voor u belangrijkste voorbeeld hiervan geven?	Open. If C10 = ja

Table A. 7 – Hospital emergency plan

Code	Question in French	Question in Dutch	Type answer / condition
ZNP1	Quel était le statut de votre plan d'urgence hospitalier au 1er mars 2020 ? Soumis à la cellule de sécurité communale mais pas encore de réponse Avis favorable (avec ou sans remarques) Avis favorable moyennant conditions Avis défavorable Pas encore soumis Autre:	Wat was het statuut van uw ziekenhuisnoodplan op 1 maart 2020? Ingediend bij de gemeentelijke veiligheidscel maar nog geen antwoord Gunstig advies voor een goedkeuring Voorwaardelijk advies voor een goedkeuring Afkeuring Nog niet ingediend Anders:	Single choice + other
ZNP1a	Avis favorable reçu le dd-mm-yyyy	Gunstig advies voor een goedkeuring ontvangen op dd-mm-yyyy	Date. If ZNP1 = gunstig advies voor een goedkeuring

ZNP1b	Avis favorable moyennant conditions reçu le dd-mm-yyyy	Voorwaardelijk advies voor een goedkeuring ontvangen op dd-mm-yyyy	Date. If ZNP1 = voorwaardelijk advies voor een goedkeuring
ZNP1c	Avis défavorable reçu le dd-mm-yyyy	Afkeuring ontvangen op dd-mm-yyyy	Date. If ZNP1 = afkeuring
ZNP2	Un plan d'urgence hospitalier comprend une phase d'information et une phase d'action. Dans la phase d'action, deux niveaux sont prévus. Dans votre hôpital, à quelle date a eu lieu le passage à la phase d'information dans le cadre de la première vague du covid-19 ? Phase d'information le dd-mm-yyyy	Een ziekenhuisnoodplan bestaat uit een informatiefase en een actiefase. In de actiefase worden 2 niveaus voorzien. Wanneer werd in uw ziekenhuis de informatiefase afgekondigd in het kader van de eerste covid-19 golf? Informatiefase op dd-mm-yyyy	Date
ZNP3	Dans votre hôpital, à quelle date a eu lieu le passage au niveau 1 de la phase d'action dans le cadre de la première vague du covid-19 ? Phase d'action niveau 1 le dd-mm-yyyy	Wanneer werd in uw ziekenhuis actiefase niveau 1 afgekondigd in het kader van de eerste covid-19 golf? Actiefase niveau 1 op dd-mm-yyyy	Date
ZNP4	Votre hôpital est-il passé au niveau 2 de la phase d'action dans le cadre de la première vague du covid-19 ? Oui Non	Heeft uw ziekenhuis actiefase niveau 2 afgekondigd in het kader van de eerste covid-19 golf? Ja Nee	Single choice
ZNP4a	A quelle date a eu lieu le passage au niveau 2 de la phase d'action dans le cadre de la première vague du covid-19 ? Phase d'action niveau 2 le dd-mm-yyyy	Wanneer werd actiefase niveau 2 afgekondigd in het kader van de eerste covid-19 golf? Actiefase niveau 2 op dd-mm-yyyy	Date. If ZNP4 = ja
ZNP5	Votre plan d'urgence hospitalier comprend-il une composante pandémie (une partie spécifique liée à l'apparition d'une maladie infectieuse à grande échelle dans la population générale) ? Oui Non	Bevat uw ziekenhuisnoodplan een pandemieluik (een specifiek onderdeel met betrekking tot het uitbreken van een grootschalige besmettelijke ziekte in de algemene bevolking)? Ja Nee	Single choice
ZNP5a	Selon vous, le plan d'urgence hospitalier devrait-il obligatoirement comprendre une composante pandémie ? Oui Non	Zou volgens u het ziekenhuisnoodplan verplicht een pandemieluik moeten bevatten? Ja Nee	Single choice

ZNP5aa	Pourquoi pensez-vous qu'un plan d'urgence hospitalier ne doit pas obligatoirement comprendre une composante pandémie ?	Waarom bent u van oordeel dat een ziekenhuisnoodplan niet verplicht een pandemieluik moet bevatten?	Open. If ZNP5a = nee
ZNP5ab	Quelles parties cette composante pandémie devrait-elle au minimum contenir ?	Welke onderdelen zou een pandemieluik minstens moeten bevatten?	Open. If ZNP5a = ja
ZNP6	Lorsque le plan d'urgence hospitalier entre en vigueur, la cellule de coordination hospitalière (CCH) est activée. Dans votre hôpital, parmi les personnes suivantes (membres obligatoires et additionnels), lesquelles ont fait partie de la CCH durant la période du 1er mars au 30 avril 2020 ? Directeur général Directeur médical Directeur des soins infirmiers Coordinateur du plan d'urgence Médecin chef de service des soins intensifs Médecin hygiéniste hospitalier Infirmier en hygiène hospitalière Autre:	Wanneer het ziekenhuisnoodplan in werking treedt, wordt de coördinatiecel van het ziekenhuis (CCZ) geactiveerd. Welke van onderstaande personen (verplichte en extra leden) maakte in uw ziekenhuis deel uit van de CCZ in de periode van 1 maart 2020 tot 30 april 2020? Algemeen directeur Hoofdarts Verpleegkundig directeur Noodplancoördinator Diensthoofd ICU Ziekenhuishygiënist arts Ziekenhuishygiënist verpleegkundige Anders:	Multiple choice + other
ZNP6a	Souhaitez-vous ajouter une remarque supplémentaire sur cette question ?	Wenst u nog een aanvullende opmerking te maken bij deze vraag?	Open
ZNP7	A quelle fréquence la CCH s'est-elle réunie durant la période du 1er mars au 30 avril 2020 ? Quotidiennement 3 à 6 fois par semaine 2 fois par semaine 1 fois par semaine Moins d'1 fois par semaine	Met welke frequentie kwam de CCZ bijeen in de periode van 1 maart 2020 tot 30 april 2020? Dagelijks 3 tot 6 keer per week 2 keer per week 1 keer per week Minder dan 1 keer per week	Single choice + comment (open)
ZNP7a	Souhaitez-vous ajouter une remarque supplémentaire sur cette question ?	Wenst u nog een aanvullende opmerking te maken bij deze vraag?	Open
ZNP8	Les lettres du comité HTSC ont-elles été discutées en CCH ? Oui, chaque lettre a fait l'objet d'une discussion Oui, la plupart des lettres ont fait l'objet d'une discussion	Werden de brieven van het comité HTSC besproken in de CCZ? Ja, elke brief werd besproken Ja, de meeste brieven werden besproken Nee, de meeste brieven werden niet besproken	Single choice

	Non, la plupart des lettres n'ont pas été discutées		
ZNP8a	Pourquoi la plupart des lettres n'ont-elles pas été discutées en CCH ?	Waarom werden de meeste brieven niet besproken in de CCZ?	Open. If ZNP8 = nee
ZNP9	Quels sont les comités consultatifs qui ont été mis en place par la CCH ou les comités déjà existants qu'elle a sollicités ?	Welke adviescomités werden door het CCZ opgericht of op welke reeds bestaande comités werd beroep gedaan?	Open
ZNP10	Une évaluation interne du fonctionnement de la CCH a-t-elle été réalisée ? Oui, et un PV a été rédigé à ce sujet Oui, mais il n'y a pas de PV sur ce sujet Non	Is er een interne evaluatie uitgevoerd van de werking van het CCZ? Ja, en hiervan is een verslag gemaakt Ja, maar hiervan is geen verslag gemaakt Nee	Single choice
ZNP10a	Accepteriez-vous de mettre ce PV à la disposition du KCE pour cette étude (si oui, le KCE prendra contact par la suite avec vous à ce sujet) ? Oui Non	Gaat u ermee akkoord om dit verslag ter beschikking te stellen van het KCE voor deze studie (indien wel, dan zal het KCE u contacteren voor verdere afspraken hieromtrent)? Ja Nee	Single choice. If ZNP10 = "Ja, en hiervan is een verslag gemaakt"
ZNP11	Une évaluation interne du plan d'urgence hospitalier a-t-elle été réalisée ? Oui, et un PV a été fait à ce sujet Oui, mais il n'y a pas de PV sur ce sujet Non	Is er een interne evaluatie uitgevoerd van het ziekenhuisnoodplan? Ja, en hiervan is een verslag gemaakt Ja, maar hiervan is geen verslag gemaakt Nee	Single choice
ZNP11a	Accepteriez-vous de mettre ce PV à la disposition du KCE pour cette étude (si oui, le KCE prendra contact par la suite avec vous à ce sujet) ? Oui Non	Gaat u ermee akkoord om dit verslag ter beschikking te stellen van het KCE voor deze studie (indien wel, dan zal het KCE u contacteren voor verdere afspraken hieromtrent)? Ja Nee	Single choice. If ZNP11 = "Ja, en hiervan is een verslag gemaakt"
ZNP12	(très difficile - difficile - facile - très facile – pas d'application) D'après vous, comment s'est déroulée la mise en œuvre du plan d'urgence hospitalier pour les actions suivantes ? L'arrêt des procédures électives L'augmentation ou la réaffectation des lits ou des services La séparation des patients covid-19 et non covid-19 (cohorte)	(zeer moeizaam – moeizaam – gemakkelijk – zeer gemakkelijk – niet van toepassing) Hoe verliep volgens u de uitvoering van het ziekenhuisnoodplan voor de volgende acties? Het stopzetten van electieve procedures Het opschalen of heralloceren van bedden of afdelingen Het scheiden van covid-19 en niet-covid-19 patiënten (cohorteren)	Array single choice

	La recherche/réaffectation du personnel adéquat L'augmentation de la durée ou de la fréquence des shifts du personnel La recherche de l'équipement nécessaire (par exemple, respirateurs) La recherche d'équipements de protection individuelle La gestion des stocks de médicaments La réalisation d'adaptations architecturales Le triage des traitements pour les patients (quels patients reçoivent un traitement en premier et/ou combien de temps les traitements sont poursuivis sans ou avec peu de résultats)	Het vinden/heralloceren van geschikt personeel Het verhogen van de duur of frequenties van de shiften van het personeel Het vinden van benodigde apparatuur (bv. ventilatoren) Het vinden van persoonlijke beschermingsmiddelen Het beheer van de geneesmiddelenvoorraad Het uitvoeren van architectonische aanpassingen De triage van behandelingen voor patiënten (welke patiënten krijgen eerst een behandeling en/of hoe lang worden behandelingen aangehouden zonder of met weinig resultaat)	
ZNP12a	Si vous désirez ajouter quelque chose à la question précédente, merci de le détailler ici.	Indien u aan de vorige vraag iets wil toevoegen, gelieve dit hier te verduidelijken.	Open
ZNP12c	Pouvez-vous décrire ce qui a été difficile pour les actions suivantes ?	Kan u omschrijven wat er juist moeizaam verliep voor de volgende acties?	Array of text. For each answer in ZNP12 = redelijk moeizaam of zeer moeizaam
ZNP13	Une partie du plan d'urgence hospitalier concerne le système « Incident Crisis Management System (ICMS) », que l'hôpital doit alimenter avec des données sur la capacité de traitement. Par rapport à aux instructions actuelles concernant l'enregistrement des données ICMS, quels sont, selon vous, les principaux points qui doivent potentiellement être améliorés dans le contexte d'une pandémie ?	Een onderdeel van het ziekenhuisnoodplan betreft het 'Incident Crisis Management System (ICMS)', waarbij het ziekenhuis geacht wordt dit systeem te voeden met gegevens over de behandelcapaciteit. Welke zijn voor u de belangrijkste potentiële verbeterpunten voor de ICMS gegevens in het kader van een pandemie in vergelijking met de huidige registratie?	Open

Table A. 8 – Collaboration between hospitals

Code	Question in French	Question in Dutch	Type answer / condition
	Les questions suivantes portent sur la collaboration entre hôpitaux, et non sur la collaboration entre sites d'un même hôpital.	De volgende vragen hebben betrekking op samenwerking tussen ziekenhuizen, niet op samenwerking tussen sites van eenzelfde ziekenhuis.	
S1	□ Avec 1 ou plusieurs hôpitaux appartenant au même réseau hospitalier locorégional □ Avec tous les hôpitaux du réseau hospitalier locorégional □ Avec 1 ou plusieurs hôpitaux de la province qui n'appartiennent pas au réseau hospitalier locorégional □ Avec 1 ou plusieurs hôpitaux hors province qui n'appartiennent pas au réseau hospitalier locorégional □ Pas de collaboration Les hôpitaux ont été encouragés, dans plusieurs lettres du comité HTSC, à collaborer avec d'autres hôpitaux. Quelles formes de collaboration votre hôpital a-t-il eu durant la première vague de la crise du covid-19 ? Transfert de patients lorsque que le taux d'occupation maximum des lits intensifs a été atteint Transfert de patients lorsque que le taux d'occupation maximal des lits non intensifs a été atteint Transfert de patients présentant un degré de gravité élevé Accueil de patients d'hôpitaux ayant atteint le taux d'occupation maximum des lits intensifs Accueil de patients d'hôpitaux ayant atteint le taux d'occupation maximal des lits non intensifs Accueil de patients présentant un degré de gravité élevé Répartition de la capacité nécessaire en termes de lits Réalisation d'activités non liées au covid-19 Investissements conjoints en équipements Achat d'équipements de protection individuelle Échanges d'équipements de protection individuelle Échanges de médicaments Échanges de personnel : médecins	□ Met 1 of meerdere ziekenhuizen van het locoregionale ziekenhuisnetwerk □ Met alle ziekenhuizen van het locoregionale ziekenhuisnetwerk □ Met 1 of meerdere ziekenhuizen in de provincie die niet tot het locoregionale ziekenhuisnetwerk behoren □ Met 1 of meerdere ziekenhuizen buiten de provincie die niet tot het locoregionale ziekenhuisnetwerk behoren □ Geen samenwerking In meerdere brieven van het comité HTSC werden de ziekenhuizen aangemoedigd om samen te werken met andere ziekenhuizen. Welke vormen van samenwerking had uw ziekenhuis met andere ziekenhuizen tijdens de eerste golf van de covid-19 crisis? Verwijzen van patiënten omdat de maximale bezettingsgraad van intensieve bedden bereikt was Verwijzen van patiënten omdat de maximale bezettingsgraad van niet-intensieve bedden bereikt was Verwijzen van patiënten met een hoge ernstgraad Opvangen van patiënten uit ziekenhuizen die de maximale bezettingsgraad van intensieve bedden bereikt hebben Opvangen van patiënten uit ziekenhuizen die de maximale bezettingsgraad van niet-intensieve bedden bereikt hebben Opvangen van patiënten met een hoge ernstgraad Verdelen van de nodige beddencapaciteit Uitvoeren van niet covid-19 activiteiten	Array checkbox

	Echanges de personnel : personnel infirmier Échanges de personnel : personnel soignant Échanges de personnel : personnel logistique Échanges de personnel : autres Collaboration clinique Formation du personnel Mise en place de centres de test (pour le personnel, les patients) Mise en place de structures intermédiaires Soutien aux maisons de repos Soutien aux soins à domicile Mise en place de possibilités de télésanté Autre:	Gezamenlijk investeren in apparatuur Aankopen van persoonlijk beschermingsmateriaal Uitwisselen van persoonlijk beschermingsmateriaal Uitwisselen van geneesmiddelen Uitwisselen van personeel: artsen Uitwisselen van personeel: verpleegkundig personeel Uitwisselen van personeel: verzorgend personeel Uitwisselen van personeel: logistiek personeel Uitwisselen van personeel: andere Klinische samenwerking Opleiden van personeel Opzetten van testcentra (voor personeel, patiënten) Opzetten van schakelzorgcentra Ondersteunen van woonzorgcentra Ondersteunen van thuiszorg Opzetten van telehealth mogelijkheden Anders:	
S2	Selon vous, quelles sont les principales raisons pour lesquelles votre hôpital n'a pas collaboré avec d'autres hôpitaux durant la première vague de la crise covid-19 ?	Wat zijn volgens u de belangrijkste redenen waarom uw ziekenhuis tijdens de eerste golf van de covid-19 crisis niet heeft samengewerkt met andere ziekenhuizen?	Open. If no collaboration for all propositions in S1
S3	Avec quels hôpitaux avez-vous le plus collaboré pendant la première vague de la crise du covid-19 ? Avec un ou des hôpitaux appartenant au même réseau hospitalier locorégional Avec un ou des hôpitaux de la province qui n'appartiennent pas au réseau hospitalier locorégional Avec un ou des hôpitaux hors province qui n'appartiennent pas au réseau hospitalier locorégional Pas de collaboration	Met welke ziekenhuizen heeft u het meest samengewerkt tijdens de eerste golf van de covid-19 crisis? Met ziekenhuizen van het locoregionale ziekenhuisnetwerk Met ziekenhuizen in de provincie die niet tot het locoregionale ziekenhuisnetwerk behoren Met ziekenhuizen buiten de provincie die niet tot het locoregionale ziekenhuisnetwerk behoren Geen samenwerking	Single choice
S3a	Pourquoi avez-vous le plus collaboré avec ces hôpitaux ?	Waarom heeft u het meest samengewerkt met deze ziekenhuizen?	Open. If S3 = no collaboration
S5	Selon vous, quel est le niveau de collaboration le plus approprié entre les hôpitaux lors d'une crise telle que celle du covid-19 ? Réseau hospitalier locorégional	Wat is volgens u het meest geschikte niveau van samenwerking tussen ziekenhuizen tijdens een crisis zoals de covid-19 crisis?	Single choice + other

	Province Autre:	Locoregionaal ziekenhuisnetwerk Provincie Anders:	
S6	Pourquoi désignez-vous ce niveau comme étant le niveau de collaboration le plus approprié ?	Waarom verkiest u dit niveau als het meest geschikte niveau van samenwerking?	Open
S7	Quelles initiatives de collaboration existaient déjà au sein de votre réseau hospitalier locorégional avant le déclenchement de la crise du covid-19 ? Investissements conjoints en équipements Collaboration entre les pharmacies Collaboration entre laboratoires Collaboration clinique Il n'y avait pas de collaboration du tout Autre:	Welke initiatieven tot samenwerking bestonden er reeds binnen het locoregionale ziekenhuisnetwerk voor de uitbraak van de covid-19 crisis? Gezamenlijke investeringen in apparatuur Samenwerking tussen de apotheken Samenwerking tussen de laboratoria Klinische samenwerking Er was geen enkele samenwerking Anders:	Multiple choice + other
S8	(Pas du tout pertinent – plutôt pas pertinent – plutôt pertinent - très pertinent – pas de réponse) Dans quelle mesure estimez-vous que les mesures suivantes au niveau d'un réseau hospitalier locorégional sont pertinentes pour faire face à une crise telle que celle du covid-19 ? Élaboration d'un plan d'urgence pour les hôpitaux au niveau du réseau hospitalier locorégional Élaboration d'un plan d'urgence pour les hôpitaux, au niveau du réseau hospitalier locorégional, qui inclut les maisons de repos et les acteurs de la première ligne Répartition des hôpitaux en deux groupes (tels que hôpitaux covid-19 et hôpitaux non covid-19) au sein du réseau hospitalier locorégional Formation commune du personnel infirmier Formation commune des médecins Échanges de personnel Politique de ressources humaines (par exemple, support supplémentaire, psychologues) Équipes mobiles au niveau du réseau Accords avec les maisons de repos / soutien aux maisons de repos	(Helemaal niet pertinent – eerder niet pertinent – eerder wel pertinent – zeer pertinent – geen antwoord) In welke mate vindt u onderstaande maatregelen op het niveau van een locoregionaal ziekenhuisnetwerk pertinent voor de aanpak van een crisis zoals de covid-19 crisis? Opmaak van een noodplan voor ziekenhuizen op het niveau van het locoregionale ziekenhuisnetwerk Opmaak van een noodplan voor ziekenhuizen op het niveau van het locoregionale ziekenhuisnetwerk, met inbegrip van woonzorgcentra en eerstelijnsactoren Opdeling van ziekenhuizen in twee groepen (zoals covid-19 en niet- covid-19 ziekenhuizen) binnen het locoregionale ziekenhuisnetwerk Gezamenlijke opleiding van verpleegkundig personeel Gezamenlijke opleiding van artsen Uitwisseling van personeel HR-beleid (bv. crisisondersteuning, psycholoog) Mobiele equipes op netwerkniveau Afspraken met en ondersteunen van woonzorgcentra Verdelen van de nodige beddencapaciteit	Array single choice

	Répartition de la capacité nécessaire en termes de lits Provision conjointe d'équipements de protection individuelle Gestion conjointe des stocks de médicaments Gestion des laboratoires au niveau du réseau Organisation de soins intensifs à distance entre les hôpitaux du réseau hospitalier locorégional Mise en place de possibilités de télésanté	Gezamenlijke voorziening van persoonlijk beschermingsmateriaal Gezamenlijk beheer van geneesmiddelenvoorraad Aansturing laboratoria op netwerkniveau Tele-intensieve zorgen tussen de ziekenhuizen van het locoregionale ziekenhuisnetwerk Opzetten van telehealth mogelijkheden	
S8a	Si vous désirez ajouter quelque chose à la question précédente, merci de le détailler ici.	Indien u aan de vorige vraag iets wil toevoegen, gelieve dit hier te verduidelijken.	Open
S8c	Pouvez-vous préciser quelle(s) formation(s) commune(s) pour le personnel infirmier ? Soins intensifs Prévention et contrôle des infections Liaison gériatrique Autre:	Welke gezamenlijke opleiding van verpleegkundig personeel? Intensieve zorgen Infectiepreventie- en controle Geriatrische liaison Anders:	Multiple choice + other. If “gezamenlijke opleiding van verpleegkundig personeel” in S8 = pertinent of zeer pertinent
S8d	Pouvez-vous préciser quelle(s) formation(s) commune(s) pour les médecins ? Soins intensifs Prévention et contrôle des infections Liaison gériatrique Autre:	Welke gezamenlijke opleiding van artsen? Intensieve zorgen Infectiepreventie- en controle Geriatrische liaison Anders:	Multiple choice + other. If “gezamenlijke opleiding van artsen” in S8 = pertinent of zeer pertinent
S9	Quelles initiatives de collaboration au sein du réseau hospitalier locorégional votre hôpital a-t-il prises en prévision de la deuxième vague ?	Welke initiatieven tot samenwerking binnen het locoregionale ziekenhuisnetwerk heeft uw ziekenhuis genomen ter voorbereiding van de tweede golf?	Open
S10	Selon vous, les autorités devraient-elles obliger les hôpitaux à collaborer au sein du réseau hospitalier locorégional lors d'une crise telle que celle du covid-19 ? Oui Non	Moet volgens u de overheid de ziekenhuizen verplichten om samen te werken binnen het locoregionale ziekenhuisnetwerk tijdens een crisis zoals de covid-19 crisis? Ja Nee	Single choice
S10a	(Pas du tout prioritaire – Plutôt pas prioritaire – Plutôt prioritaire – Très prioritaire – pas de réponse)	(Helemaal niet prioritair – eerder niet prioritair – eerder wel prioritair – zeer prioritair – geen antwoord)	Array single choice. If S10 = ja

	Selon vous, quelle(s) collaboration(s) au sein du réseau hospitalier locorégional devrait être rendue obligatoire en priorité par les autorités ? Élaboration d'un plan d'urgence pour les hôpitaux au niveau du réseau hospitalier locorégional Élaboration d'un plan d'urgence pour les hôpitaux, au niveau du réseau hospitalier locorégional, qui inclut les maisons de repos et les acteurs de la première ligne Répartition des hôpitaux en deux groupes (tels que hôpitaux covid-19 et hôpitaux non covid-19) au sein du réseau hospitalier locorégional Formation commune du personnel infirmier Formation commune des médecins Échanges de personnel Politique de ressources humaines (par exemple, support supplémentaire, psychologues) Équipes mobiles au niveau du réseau Accords avec les maisons de repos / soutien aux maisons de repos Organisation de la capacité nécessaire en termes de lits Provision conjointe d'équipements de protection individuelle Gestion conjointe des stocks de médicaments Organisation de soins intensifs à distance entre les hôpitaux du réseau hospitalier locorégional Mise en place de possibilités de télésanté	Welke samenwerking binnen het locoregionale ziekenhuisnetwerk moet volgens u prioritair verplicht worden door de overheid? Opmaak van een noodplan voor ziekenhuizen op het niveau van het locoregionale ziekenhuisnetwerk Opmaak van een noodplan voor ziekenhuizen op het niveau van het locoregionale ziekenhuisnetwerk, met inbegrip van woonzorgcentra en eerstelijnsactoren Opdeling van ziekenhuizen in twee groepen (zoals covid-19 en niet- covid-19 ziekenhuizen) binnen het locoregionale ziekenhuisnetwerk Gezamenlijke opleiding van verpleegkundig personeel Gezamenlijke opleiding van artsen Uitwisseling van personeel HR-beleid (bv. crisisondersteuning, psycholoog) Mobiele equipes op netwerkniveau Afspraken met en ondersteunen van woonzorgcentra Organisatie van de nodige beddencapaciteit Gezamenlijke voorziening van persoonlijk beschermingsmateriaal Gezamenlijk beheer van geneesmiddelenvoorraad Tele-intensieve zorgen tussen de ziekenhuizen van het locoregionale ziekenhuisnetwerk Opzetten van telehealth mogelijkheden	
S10aa	Si vous désirez ajouter quelque chose à la question précédente, merci de le détailler ici.	Indien u aan de vorige vraag iets wil toevoegen, gelieve dit hier te verduidelijken.	Open

Table A. 9 – Future

Code	Question in French	Question in Dutch	Type answer / condition
F1	Pas du tout– plutôt non– plutôt oui – tout à fait – pas de réponse Dans quelle mesure trouvez-vous que les facteurs suivants soient préoccupants en cas de résurgence ou de seconde vague de la crise du covid-19 ? Impact sur la situation financière de l'hôpital Contamination du personnel Bien-être des visiteurs Bien-être des médecins Bien-être du personnel infirmier et autres personnels soignants Bien-être du personnel non soignant Absentéisme du personnel Capacité USI Capacité d'hospitalisation Capacité des services d'urgence Report des soins électifs Impact des retards de soins sur l'état de santé des patients Stocks d'équipements de protection individuelle Capacité de tests Mise en œuvre de soins numériques Stock de médicaments Disponibilité des respirateurs	Helemaal niet – eerder niet – eerder wel – helemaal – geen antwoord In welke mate maakt u zich zorgen over onderstaande factoren bij een heropflakkering of tweede golf van de covid-19 crisis? Impact financiële toestand ziekenhuis Besmetting van personeel Welbevinden bezoekers Welbevinden artsen Welbevinden verpleegkundigen en ander verzorgend personeel Welbevinden niet-verzorgend personeel Absenteïsme personeel Capaciteit ICU Capaciteit beddenhuis Capaciteit spoeddienst Uitstel electieve zorg Impact van uitgestelde zorg op gezondheidstoestand patiënten Voorraad persoonlijke beschermingsmiddelen Testcapaciteit Implementatie digitale zorg Geneesmiddelenstock Beschikbaarheid ventilatoren	Array single choice
F1a	Si vous désirez ajouter quelque chose à la question précédente, merci de le détailler ici.	Indien u aan de vorige vraag iets wil toevoegen, gelieve dit hier te verduidelijken.	Open

Table A. 10 – Additional comments

Code	Question in French	Question in Dutch	Type answer
END0	Qui a contribué à répondre à ce questionnaire ? Directeur médical Directeur général Chef du département infirmier Coordinateur du plan d'urgence Médecin chef de service des soins intensifs Autre (…)	Wie heeft bijgedragen bij het invullen van de vragenlijst? Hoofdarts Algemeen directeur Verpleegkundig directeur Noodplancoördinator Diensthoofd ICU Anders (…)	Multiple choice + other
END1	Souhaitez-vous ajouter un commentaire additionnel sur cette enquête ou sur l'étude KCE ?	Wenst u nog een aanvullende opmerking te maken bij deze enquête of bij de KCE studie?	Open (long)

Table A. 11 – Send responses

Code	French	Dutch	Type answer
END2	Merci de cliquer sur « envoyer » pour soumettre vos réponses. Si vous le désirez, vous pourrez ensuite imprimer vos réponses.	Door op "verzenden" te klikken, worden uw antwoorden doorgestuurd. Indien u dat wenst, kan u uw antwoorden afdrukken.	None

Table A. 12 – Survey closing text

French	Dutch
Nous vous remercions d'avoir pris le temps de compléter cette enquête. Pour toute question, vous pouvez contacter melanie.lefevre@kce.fgov.be.	Bedankt dat u de tijd heeft genomen om deze enquête in te vullen. Mocht u nog vragen hebben, aarzel dan niet om contact op te nemen met carine.vandevoorde@kce.fgov.be.

Appendix 2.3. Timeline

Table A. 13 – Survey timeline

Deadline	Action
August 18	Test the survey in French and Dutch (KCE team + 3 other KCE members)
August 20	Send the survey to pilot hospitals (3)
August 28	Deadline for pilot hospitals
September 2	Send the survey to all hospitals
September 9	Send reminder
September 11	Deadline survey
September 27	Closing survey

APPENDIX 3. APPENDIX TO CHAPTER 7

Appendix 3.1. Methods international comparison

Appendix 3.1.1. Country selection

In line with KCE process notes on international comparisons[112] we explored potential countries to choose, based on similarities and contrasts to Belgium or to each other. We used the following criteria for our choice:

- European countries;
- countries that were hit strongly by the COVID-19 crisis (Italy, England) and countries that were relatively less hit (the Netherlands, Germany);
- countries that have a large number of hospital (ICU) beds (Germany) and countries with a relatively low number of it (England, Italy, the Netherlands);
- pandemic approach: UK and the Netherlands opted in the beginning of the epidemic for "herd immunity" and were relatively more reticent regarding lockdown in contrast to Germany, Italy and Belgium;
- central versus regional competences for healthcare organisation: we chose for Germany and Italy since the competences for healthcare in these countries are also organised by a federal government and several federated governments like it is the case in Belgium. In contrast we chose for England, since one central player, the NHS, organises healthcare but with strong regional trusts in which all healthcare components (primary care, secondary care) are combined;
- pandemic preparedness.[43, 44]

The country selection was also inspired by other already performed international comparisons related to the COVID-19 crisis that we were aware of in the beginning of this project.[43-45, 52, 53, 57, 59, 64, 113-124]

After careful consideration, we selected finally England, Germany, Italy and the Netherlands.

Appendix 3.1.2. Topics to compare

The focus of the international comparison is each country's approach of the hospital surge capacity during the COVID-19 crisis. More specifically we tried to gather information on:

- Who was responsible for surge capacity planning and measures
  - Special newly raised committees?
  - Tasks and assignments? (surge and desurge?) (scope: hospital – healthcare – quid transport?)
  - Relationship with other COVID-19 committees and government?
  - Composition of the committee?
  - Communication processes?
  - Budgetary constraints?
  - Transparency of committee's functioning?
  - Control and evaluation mechanisms?
- Surge capacity measures taken
  - Content: staff – stuff – space – systems?
  - Evidence base for measures?
  - Use and type of (real time) data?
  - Tools and instruments used?
  - etc.
- Resuming regular care
- Evaluation of surge capacity plans and performance

Appendix 3.1.3. Data-gathering

Relevant information for each country was sought in several ways. General information on surge capacity approaches was sought by Pubmed searches and searches by Google advanced. From these searches we kept of course the literature for each included country, but we also retained documents from international organisations or more general documents related to surge capacity tools or guidelines not specifically focused on one particular country (Chapter 8 is devoted to those tools & guidelines for surge capacity). Publications, retrieved by these searches, in which already international comparisons were performed and included our selected countries, were kept aside and used as a cross-check for our own findings.

Next to this, country specific information was sought by consulting websites of governments, the assigned epidemiological surveillance institutes, scientific organisations and hospital healthcare professionals' organisations. Also we contacted for each country the first author of the Health System Response Monitor[39-42] with the request to send relevant sources and documents related to their country surge capacity approach.

Document search

General

- PUBMED:

  ("surge capacity" OR "hospital capacity" OR "ICU capacity" OR "hospital preparedness" OR government*[Ti]) AND (COVID-19 OR corona OR Pandemic) AND (2019/12[PDAT] OR 2020[PDAT]) -> 165 hits (on 08/07/20). A daily alert was set for this search until the end of September 2020, in order to keep as much as possible the information up to date.

- Google Advanced: "surge capacity" AND hospital filetype:pdf (and restricted to 01/01/20-10/07/20)

- Websites from international organizations:
  - World Health Organization:
    - https://www.who.int/emergencies/diseases/novel-coronavirus-2019
    - https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance-publications
  - European Centre for Disease Prevention and Control: https://www.ecdc.europa.eu/en/covid-19-pandemic
  - European Observatory on Health Systems and Policies:
    - The Health System Response Monitor: https://www.covid19healthsystem.org/mainpage.aspx
  - The Organisation for Economic Co-operation and Development (OECD):
    - http://www.oecd.org/coronavirus/policy-responses/beyond-containment-health-systems-responses-to-covid-19-in-the-oecd-6ab740c0/
    - http://www.oecd.org/coronavirus/policy-responses/building-resilience-to-the-covid-19-pandemic-the-role-of-centres-of-government-883d2961/
    - https://analysis.covid19healthsystem.org/

- Handsearching of reference lists in retrieved documents

Country specific

- England
  - Government:
    - https://www.gov.uk/coronavirus
    - SAGE: https://www.gov.uk/government/groups/scientific-advisory-group-for-emergencies-sage
    - NERVTAG: https://www.gov.uk/government/groups/new-and-emerging-respiratory-virus-threats-advisory-group
    - https://www.gov.uk/government/groups/scientific-advisory-group-for-emergencies-sage-coronavirus-covid-19-response
    - https://www.gov.uk/government/publications/scientific-advisory-group-for-emergencies-sage-coronavirus-covid-19-response-membership/list-of-participants-of-sage-and-related-sub-groups
    - https://www.gov.uk/guidance/coronavirus-covid-19-statistics-and-analysis
    - https://www.gov.uk/government/publications/coronavirus-action-plan/coronavirus-action-plan-a-guide-to-what-you-can-expect-across-the-uk
    - https://www.gov.uk/government/collections/coronavirus-covid-19-list-of-guidance#guidance-for-health-professionals
    - https://www.england.nhs.uk/coronavirus/publication/operating-framework-for-urgent-and-planned-services-within-hospitals/
    - https://digital.nhs.uk/about-nhs-digital/corporate-information-and-documents/directions-and-data-provision-notices/data-provision-notices-dpns/icnarc-intensive-care-data-collection
    - https://digital.nhs.uk/coronavirus/capacity-planning-and-analysis-system-cpas
    - Public Health England: https://phelibrary.koha-ptfs.co.uk/coronavirusinformation/
    - the Office for National Statistics:
      - https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/conditionsanddiseases/articles/coronaviruscovid19roundup/2020-03-26
      - https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/conditionsanddiseases/articles/coronaviruscovid19roundup/2020-03-26
  - Epidemiological surveillance institute:
    - Public Health England: https://phelibrary.koha-ptfs.co.uk/coronavirusinformation/
  - Scientific organisations:
    - Nuffield Trust:
      - https://www.nuffieldtrust.org.uk/spotlight/covid-19-and-the-nhs
      - https://www.nuffieldtrust.org.uk/news-item/what-has-been-the-impact-of-covid-19-on-urgent-and-emergency-care-across-england
      - https://www.hsj.co.uk/coronavirus
    - King's fund: https://www.kingsfund.org.uk/
    - The Health Foundation:
      - https://www.health.org.uk/what-we-do/responding-to-covid-19
      - https://www.health.org.uk/news-and-comment/charts-and-infographics/covid-19-policy-tracker
    - University of Oxford: https://www.bsg.ox.ac.uk/research/research-projects/coronavirus-government-response-tracker (https://supertracker.spi.ox.ac.uk/policy-trackers/)
    - Imperial College London: https://www.imperial.ac.uk/mrc-global-infectious-disease-analysis/covid-19/covid-19-reports/
    - National institute for health data science: https://www.hdruk.ac.uk/covid-19/
    - The Intensive Care National Audit & Research Centre: https://www.icnarc.org/
    - Center for Global Development: https://www.cgdev.org/blog/uk-response-covid-19-urgent-need-inclusive-transparent-decision-making-process

- Healthcare professional organisations:
  - https://www.england.nhs.uk/coronavirus/wp-content/uploads/sites/52/2020/04/second-phase-of-nhs-response-to-covid-19-letter-to-chief-execs-29-april-2020.pdf
  - https://www.england.nhs.uk/coronavirus/secondary-care/
  - The Strategy Unit: https://www.strategyunitwm.nhs.uk/covid19-and-coronavirus
  - National Care Forum: https://www.nationalcareforum.org.uk/ncf-voice/covid-19-coronavirus/discharge-critical-care-and-commissioning/
  - The Intensive Care Society: https://www.ics.ac.uk/ICS/COVID-19/COVID-19/COVID-19_Home.aspx?hkey=d176e2cf-d3ba-4bc7-8435-49bc618c345a
  - British Association of Critical Care Nurses: https://www.baccn.org/
- Google search: ("surge capacity" OR (capacity AND hospital)) AND site:uk

- Germany
  - Government:
    - https://www.bundesregierung.de/breg-en
    - https://www.bundesregierung.de/breg-en/federal-government/ministries/federal-ministry-of-health
    - https://www.bundesgesundheitsministerium.de/
    - https://www.bundesgesundheitsministerium.de/coronavirus.html
    - https://www.intensivregister.de/#/index
    - Bundesamt für Bevölkerungsschutz und Katastrophenhilfe: https://www.bbk.bund.de/DE/DasBBK/dasbbk_node.html
    - Die Bundeszentrale für gesundheitliche Aufklärung: https://www.bzga.de/
  - Epidemiological surveillance institute:
    - Robert Koch Institute:
      - https://www.rki.de/DE/Home/homepage_node.html
  - Scientific organisations:
    - Sachverständigenrat Gesundheit: https://www.svr-gesundheit.de/index.php?id=2 (health advisory council)
    - Robert Koch Institute:
      - https://www.rki.de/DE/Home/homepage_node.html
      - https://www.rki.de/DE/Content/InfAZ/N/Neuartiges_Coronavirus/nCoV.html
      - https://www.rki.de/DE/Content/InfAZ/N/Neuartiges_Coronavirus/Situationsberichte/2020-06-22-en.pdf?__blob=publicationFile
    - Paul-Ehrlich-Institut: https://www.pei.de/EN/home/home-node.html
    - German National Academy of Sciences Leopoldina: https://www.leopoldina.org/en/leopoldina-home/
  - Healthcare professional organisations:
    - Deutschen Interdisziplinären Vereinigung für Intensiv- und Notfallmedizin: https://www.divi.de/
    - Deutsche Gesellschaft für internistische Intensivmedizin und Notfallmedizin': https://www.dgiin.de /
    - Deutsche Krankenhausgesellschaft: https://www.dkgev.de/
  - Google search: (Krankenhauskapazität OR Intensivbetten) AND covid AND site:de

- Italy
  - Government:
    - http://www.salute.gov.it/nuovocoronavirus
    - http://www.salute.gov.it/portale/nuovocoronavirus/archivioNormativaNuovoCoronavirus.jsp

- http://www.salute.gov.it/portale/nuovocoronavirus/dettaglioContenutiNuovoCoronavirus.jsp?lingua=italiano&id=5373&area=nuovoCoronavirus&menu=vuoto

- Epidemiological surveillance institute:
  - Italian Civil Protection Department: http://www.protezionecivile.gov.it/home
  - Istituto Superiore di Sanità: https://www.iss.it/web/iss-en
- Scientific organisations:
  - Istituto Superiore di Sanità: https://www.iss.it/coronavirus
  - Istituto Nazionale della Salute: https://www.epicentro.iss.it/coronavirus/
- Healthcare professional organisations:
  - Società Italiana di Anestesia Analgesia Rianimazione e Terapia Intensiva: http://www.siaarti.it/default.aspx
  - Associazione Nazionale Infermieri di Area Critica: https://www.aniarti.it/covid-19/
- Google search: capacità AND aumento AND ospedale AND covid site:it filetype:pdf

- The Netherlands
  - Government:
    - www.rijksoverheid.nl
    - https://www.rijksoverheid.nl/ministeries/ministerie-van-volksgezondheid-welzijn-en-sport
    - https://www.rijksoverheid.nl/onderwerpen/coronavirus-covid-19/nieuws
    - https://zoek.officielebekendmakingen.nl/resultaten?q=(publicationName==%22handelingen%22+or+subrubriekparlementair=%22Motie%22+or+publicationName=%22kamervragen%22+or+publicationName==%22kamerstuk%22+or+publicationName==%22agenda%22+or+publicationName==%22niet-dossierstuk%22)+and+(keyword=%22(corona%22+or+keyword=%22covid-19%22+or+keyword=%22covid)%22)+and+keyword=%22ziekenhuis%22&pg=10&svel=Publicatiedatum&svol=Aflopend&zv=(corona%2bOR%2bcovid-19%2bOR%2bcovid)%2bAND%2bziekenhuis&col=AlleParlementaireDocumenten
  - Epidemiological surveillance institute:
    - Rijksinstituut voor Volksgezondheid en Milieu (RIVM): https://www.rivm.nl/en/novel-coronavirus-covid-19/omt
  - Scientific organisations:
    - Rijksinstituut voor Volksgezondheid en Milieu: www.rivm.nl https://www.rivm.nl/en/novel-coronavirus-covid-19/omt
      - En hier PV's van Outbreak management team: https://www.rivm.nl/coronavirus-covid-19/omt
    - Nederlands Instituut voor Onderzoek van de Gezondheidszorg: www.nivel.nl
    - Zorgonderzoek: www.zonmw.nl
    - Nederlandse Organisatie voor Wetenschappelijk Onderzoek: https://www.nwo.nl/
    - Landelijk Coördinatiecentrum patiëntenspreiding: https://www.lcps.nu/#/
    - Onderzoeksraad: https://www.onderzoeksraad.nl/nl/page/16666/aanpak-coronacrisis
  - Healthcare professional organisations:
    - Landelijk netwerk acute zorg: https://www.lnaz.nl/
    - Nederlandse Vereniging voor Intensive Care: https://nvic.nl/covid-19
    - V&VN Intensive Care: https://www.venvn.nl/afdelingen/intensive-care/
    - Nationale Intensive Care Evaluatie: https://www.stichting-nice.nl/

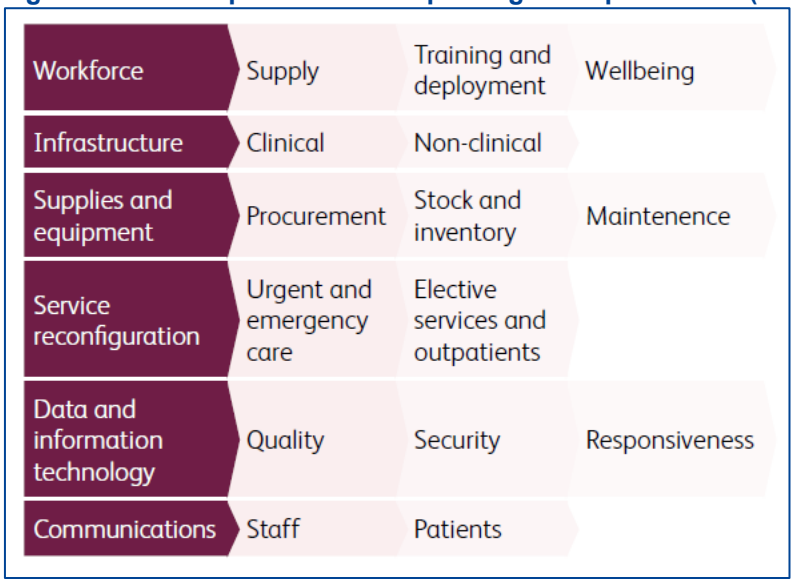
- Nederlandse Federatie van Universitair Medische Centra: https://www.nfu.nl/actueel/covid-19/
- Nederlandse Vereniging van Ziekenhuizen: https://nvz-ziekenhuizen.nl/

- Google search: ("surge capacity" OR (opschalen AND ziekenhuiscapaciteit)) AND site:nl

Appendix 3.1.4. Analysis

Adelaja et al.[92, 125] produced a tool to allow hospitals to rapidly prepare for a surge. This tool is called the CHAPs (Comprehensive Hospital Agile PreparednesS) and highlights six key domains of surge capacity: workforce; infrastructure; supplies and equipment; service reconfiguration; data and information technology; and communications (see Figure A. 1).

Figure A. 1 – Comprehensive Hospital Agile PreparednesS (CHAPs)



Source: Adelaja et al.[92, 125]

The WHO[7] describes that creating surge capacity involves a comprehensive approach linking the four S's of surge capacity: staff, space, supplies and systems.

- "Staff: entails sufficient numbers of appropriately skilled and supervised health (and social care) workers during the emergency situation. Surge capacity must account for varying degrees of staff need, specialisations needed and, crucially, analysis of potential shortfalls. Potential staff shortfalls can occur for several reasons including nonattendance due to stress, overwork, mental health concerns, and prospective sickness. In the context of COVID-19, healthcare professionals may have concerns about their own health, or health of their (vulnerable) members of their family.

- Space or structure: this covers hospitals and beds, but also the facilities that are either already available in those settings or which could be repurposed for specific emergency needs (for example areas for appropriate triage and cohort wards with adequate air ventilation).
- Stuff: relates to the availability of specific equipment for patient care and healthcare professional safety, in order to deal with specific emergency needs. In the context of the current COVID-19 crisis this domain covers mechanical ventilators, essential medication, oxygen supply, extracorporeal membrane oxygenation equipment (ECMO), and personal protective equipment (PPE).
- Systems: refers to modes of working to ensure ongoing and proactive coordination of optimal surge capacity response. These models of working ensure that integrated policies and procedure exist and are active to develop optimised sustainable surge capacity. Systems cover decision making, communication, continuity of operation and supply chain management, and must be based on shared values, including teamwork and mutual respect (across settings)."

The "workforce" component of Adeladja et al. 2020 compares to the "staff" component of the WHO, "infrastructure" to "space", "supplies and equipment" to "stuff" and "service reconfiguration" together with "data & information technology" and "communications" could be compared to the "systems" component of the WHO.

We used these frameworks to structure the data we obtained from the different countries.

Appendix 3.2. England

Appendix 3.2.1. Background

In the United Kingdom, an emergency legislation was passed on 25 March 2020 in response to the COVID-19 crisis. The "Coronavirus Act 2020"[126] legislation allowed the government to restrict the movement of infected persons, to restrict or prohibit gatherings and events, to increase capacity in the health workforce by increasing registration of health and social care professionals and to reduce barriers to working.[41]

The Government based its decisions related to COVID-19 on evidence-based scientific advices from the Scientific Advisory Group for Emergencies (SAGE)[iii].[127] SAGE relies on external science advice, including advice from expert groups. In the case of COVID-19, this includes the New and Emerging Respiratory Virus Threats Advisory Group (NERVTAG), Scientific Pandemic Influenza Group on Modelling (SPI-M) in the Department for Health and Social Care, and the Independent Scientific Pandemic Influenza Group on Behaviours (SPI-B).[128] All SAGE advices and the minutes of the meetings are publicly[jjj] available.

The Department of Health & Social Care is the lead UK government department with responsibility for responding to a pandemic. The first mile stone of government's action was the release of the "government's coronavirus action plan"[129] on 3 March[130, 131], which was discussed in the parliament.[132] Within the UK there are four nations (Scotland, England, Wales, and Northern Ireland) and each has its own National Health Service (NHS) that has to deploy action plans under the lead of its Chief Medical Officer.[130] Below we will concentrate on the actions deployed by NHS England.

[iii] https://www.gov.uk/government/organisations/scientific-advisory-group-for-emergencies

[jjj] https://www.gov.uk/government/collections/scientific-evidence-supporting-the-government-response-to-coronavirus-covid-19#meeting-minutes-and-supporting-papers

On 16 March the government decided on additional measures to fight the COVID-19 crisis and as a consequence the NHS England issued a letter on 17 March[133] in which hospitals were enacted to

- Free-up the maximum possible inpatient and critical care capacity by
  - postpone all non-urgent elective operations from 15 April at the latest
  - urgently discharge all hospital inpatients who are medically fit to leave
  - hire capacity in independent hospitals
- Prepare for, and respond to, large numbers of inpatients requiring respiratory support
- Support the staff, and maximise staff availability
- Support the wider population measures newly announced by Government
- Stress-test the operational readiness
- Remove routine burdens.

On 11 April, NHS England and NHS Improvement issued a series of guidance regarding (re)organisation of healthcare and hospital surge capacity during the COVID-19 crisis, including guidelines to workforce, infrastructure, training, waste management, fire safety, care of deceased people, etc.[125]

The starting points for the COVID-19 crisis plans were based on earlier documents regarding incidence management and pandemic response strategies.[134-136]

The Health Foundation[137] summarised all following COVID-19 policy measures concerning healthcare in England.

Appendix 3.2.2. Staff / Workforce

The national government issued several measures making it easier to find extra staff (e.g. adapted regulation[kkk] to allow retired healthcare personnel to work more than 16 hours, more flexibility in rules to register as a nurse[138], enabling emergency volunteer leave to join healthcare workforce[lll]).

In addition several guidance documents were issued by the NHS England during the COVID-19 crisis.

A framework issued in May 2020[139] gave instructions to hospitals on how to handle planned and elective care and urgent and emergency care and to carefully split COVID-19 from non-COVID patients.

NHS and NHS England produced guidelines[125, 140, 141] related to surge workforce capacity in which several strategies were presented on how to increase nursing workforce and in which the importance of training was mentioned, as well as the importance for emotional support strategies for nurses. Main points can be grouped in three categories: workforce, wellbeing and training.

Regarding workforce, the main principle is that **flexibility and skill mix** should be considered. This includes converting all shifts to long day or night shifts and increase flexibility in rota. **Expansion of workforce** can be achieved by stratifying potential hospital ward staff to redeploy into ICU, incorporating extra staff who would have been on leave, employing any extra staff on rolling/short-term contracts, deploying in a supporting role to the nursing workforce clinical staff who are otherwise not being used in delivery of patient care, considering the role that staff who are unable to have patient contact could play in supporting staff remotely, using co-ordinators without direct responsibility for patient care to facilitate the effective management of an expanded critical care unit during a surge.

With respect to **wellbeing**, ensuring the health and wellbeing of staff is a priority. It is important to provide the resources staff need to find their own local solutions: ensuring adequate rest facilities exist as well as dedicated

kkk Art. 45 to 47 of Coronavirus Act 2020.[126]

lll Art. 8 and 9 of Coronavirus Act 2020.[126]

wellbeing area which provides privacy, food, hot drinks, toiletries, and access to psychological first aid and mindfulness app. Also, psychological support should be made available to staff.

Regarding **training**, it should be acknowledged that it takes time. Therefore it should start as long as possible before clinical need increases and make efficient use of time. Health Education England[mmm] developed **freely available online training** programmes for returning healthcare providers.

Several documents[94, 140, 142] advise that work should be done in mixed teams in which experienced staff is combined with new less competent staff; they all stress that careful supervision and emotional support for these "new" critical nurse/doctor should be provided. One NHS document[94] included principles for deploying and redeploying staff to match the needs of an ICU. It sets out indicative staffing ratios and competencies and suggested professional groups that could potentially form part of the new workforce during times of (super) surge. The document advises to work with **mixed ICU teams**, composed of nurses with several levels of expertise and training. Regarding ratios for nurses it is advised to aim for 1:1 or 1:2 bedside staff to patient ratios even at time of super-surge by augmenting the usual workforce with "bedside support workers" sourced from the student workforce and other professions. A nurse/patient ratio scheme (Figure A. 2) is presented, in which a categorisation is made according to the level of expertise. The scheme also details which tasks could be done by the different levels of expertise, e.g. patient hygiene tasks by bedside support workers, preparation and administration of drugs by registered nurses, management of ventilators by a critical care nurse and supervision by a senior critical care nurse. For each level of nurse expertise, the document outlines what type and amount of education/training is required and from where this staff could be recruited. A same type of scheme is also presented for the medical staff.

The General Medical Council has also facilitated rapid re-registration of retired doctors and lifted pension tariffs to remove barriers to doctors willing to work overtime.[143] The visas of NHS frontline workers from abroad were extended so that they can continue working.[144] Medical and nursing students towards the end of training were being licensed to practice so that they can support the response.[41]

It is not clear from the documents we gathered to what extent the advices described above were feasible and were de facto implemented and followed by the hospitals.

According to the National Audit Office[46] an extra 18 200 NHS staff were deployed by the end of April, in clinical and support roles, including 7 000 nursing and midwifery students and 8 000 returning retired and former staff.

According to McCabe et al. 2020[145] England implemented a range of hospital provision interventions including the procurement of equipment, the establishment of additional hospital facilities and the redeployment of staff and other resources to meet the growing demand for hospital care due to the COVID-19. They concluded that "*The most severe constraint in English NHS hospitals is the number of critical care nurses. This suggests that two interventions must be sustained: the deployment of former healthcare staff and the use of private healthcare provision. It will be necessary to increase the desirability of nursing to keep former healthcare staff in the profession over the course of both the pandemic and post-pandemic period. An essential intervention would be recruiting and training more critical care nurses*." (page 17).

[mmm] https://www.e-lfh.org.uk/programmes/coronavirus/

Figure A. 2 – Nurse staffing for Critical Care

Source: NHS England[94]

Appendix 3.2.3. Space / Infrastructure

Two guidelines were published by NHS England[141, 146] regarding infrastructure, in which it is recommended to **convert clinical areas** into critical care spaces and how this could be executed. These guidelines also contain specifications about the necessary cohorting of COVID-19 and non-COVID-19 patients.

NHS England together with the army also created seven **emergency field hospitals**, the so-called "Nightingale hospitals" that were intended to serve as temporary large-scale critical care hospitals. These Nightingale hospitals were created in repurposed exhibition centres and aimed to house a total of 30 000 patients (e.g. the London Nightingale hospital has a capacity to treat 4 000 patients, with 500 beds equipped with ventilators and oxygen). However, most of these units have been run at extremely low bed occupancy[41] and only two of the hospitals had admitted patients in the first COVID-19 wave: just over 50 were treated at the Nightingale Hospital in London and just over 100 in Manchester.[147]

Transferring patients from overcrowded regions or hospitals to other hospitals with still open capacity has also been used in England. However, several challenges arose, e.g. the staffing of transfer teams, number of available well-equipped ambulances and the streamlining of transfers from several hospitals.[148]

There are six **Severe Respiratory Failure Centres** (five in England and one in Scotland). These are highly specialised centres in which patients who require Extracorporeal Membrane Oxygenation (ECMO) are centralised.[149] The centres have a total capacity of 27 beds with a possibility for additional surge capacity. The centres work together in times of increased numbers of referrals in a co-ordinated manner. This surge activity is overseen by NHS England Highly Specialised Commissioning and the NHS England Emergency Preparedness and Resilience Response (EPRR) team.

The National Audit Office[46] reported that between 17 March and 12 April, the number of available beds increased from 12 600 to 53 700, and the NHS additionally increased capacity through a deal to access up to 8 000 beds in independent hospitals, and by establishing temporary Nightingale hospitals, although use of these was limited up to mid-May.

Appendix 3.2.4. Stuff / Supplies and equipment

NSH England published two guidelines[141, 150] regarding supplies and equipment, in which hospitals are recommended to register their own stock supplies and use of it. In case shortage is threatening, they are advised to search in a first step for mutual aid options with other hospitals in the network, and in a second step to upscale the problem to the regional trust and when still unsolvable to upscale it in a third step to the national level, where there is a "national loan programme".

Appendix 3.2.5. System / Service reconfiguration

Data and information technology

The Secretary of State has issued notices[151] requiring the processing and sharing of confidential patient information amongst health organisations and other bodies (e.g. NHS Digital and NHS England and Improvement) engaged in disease surveillance *"for the purposes of research, protecting public health, providing healthcare services to the public and monitoring and managing the Covid-19 outbreak and incidents of exposure*". According to Rajan and Curry[41], there is currently no centralised IT system for shared electronic health records in the UK and data on the percentage of patients who are hospitalised for COVID-19 and are subsequently discharged is unknown.

Hospital bed availability

According to Ewbank et al.[152] national data from NHS England do not provide a full picture of NHS bed capacity and requirements. However, they state that the total number of hospital beds in England has more than halved over the past 30 years, but the number of critical care beds increased from around 5 400 in 2011 to 5 900 in 2019.

Regarding ICU capacity, there is a monthly survey (SITREPS) in which critical care capacity and occupancy is measured as a snapshot at midnight on the last Thursday of the month. Reports are published monthly[nnn]; the most recent data relate to February 2020.

Hospital bed occupancy

Public Health England[153] has established the "**COVID-19 Hospitalisation in England Surveillance System" (CHESS)**; this was adapted from the UK Severe Influenza Surveillance System. The aim of CHESS is to collect epidemiological data on COVID-19 infection in persons requiring hospitalisation and Intensive Care Unit (ICU) or High Dependency Unit (HDU) admission to "*monitor the impact of severe COVID-19 infection on the population, inform understanding of natural history of disease, clinical severity of cases and provide data to inform models of transmission dynamics to forecast and estimate disease burden and health services utilisation*".

The CHESS surveillance system was initiated across all NHS Trusts in England on 15 March 2020 and is mandatory for all hospitals.

Each hospital had to report daily before 9am the following data:

- aggregate data on
  - all hospitalised cases of COVID-19
  - all acute respiratory infection admissions
  - ICU/HDU admissions with acute respiratory infection
  - ICU/HDU admissions with acute respiratory infection who have been tested for COVID-19
- individual patient-level data on every ICU/HDU admission with COVID-19.

Furthermore, the website of NHS England[ooo] mentions that a number of data collections have been implemented on **COVID-19 Hospital Activity** to support management of the COVID-19 crisis. According to the website, the collections were activated at short notice and the content of the collections has evolved as the crisis developed. However, it is not further specified what exactly those different data collections are. The website only states that data had to be collected on a daily basis. The website contains links to daily, weekly and monthly published excel-files[ppp] in which the following data are reported, per hospital:

- the number of patients in hospital with COVID-19 including those in mechanical ventilation;
- the number of patients admitted to hospital with COVID-19, per age categories;
- the number of patients diagnosed in hospital with COVID-19, per age categories;
- the number of patients discharged from hospital, per age categories;
- staffing absences.

nnn https://www.england.nhs.uk/statistics/statistical-work-areas/critical-care-capacity/critical-care-bed-capacity-and-urgent-operations-cancelled-2019-20-data/

ooo https://www.england.nhs.uk/statistics/statistical-work-areas/covid-19-hospital-activity/

ppp e.g. https://www.england.nhs.uk/statistics/wp-content/uploads/sites/2/2020/10/Covid-Publication-08-10-2020v3.xlsx

It is not clear if the website refers to other data collections than the aforementioned CHESS and if the data collections that were implemented were based on already existing data collections or on completely new developed.

Hospital mortality

The COVID-19 Patient Notification system **(CPNS)**[154] was set up in March 2020 to capture COVID-19 related deaths in hospitals in England. Each death had to be reported within 24 hours for all deceased patients with a confirmed COVID-19 diagnosis. The data are made available to the Department of Health and Social Care, Public Health England and The Office for National Statistics.

Clinical data

The **Intensive Care National Audit & Research Centre**[qqq] invited ICU services (across England, Northern Ireland and Wales) to participate in its registration. They were asked to send patient demographics, clinical status data, use of organ support devices for each patient with confirmed COVID-19 at four moments: at ICU admission, 24 hours after ICU admission, at discharge from ICU and at discharge from hospital. On 31 August data on 10 900 COVID-19 patients admitted to ICU had been collected. From the reports[155, 156] it could be learned for example that 72% of patients required advanced respiratory support and that the median length of stay in ICU was 12 days for survivors and 9 days for non-survivors.

The aforementioned six **Severe Respiratory Failure Centres** have their own surveillance system[157] and collect data on every patient admitted to one of these centres, whether for ECMO or other advanced respiratory support, and whether or not the primary cause is known to be infection-related.

So, there are several monitoring instruments in England, but almost all are about bed occupancy and no monitoring instrument on actual bed availability could be detected.

Appendix 3.2.6. Communication

NHS England[141] wrote a clinical guideline for the management of surge during the COVID-19 crisis, which contained also recommendations for hospitals regarding communication. This document stresses the importance of efficient channelling of information to save time and create a single version of truth. However, it is not clear from the document how communication from hospital management to its healthcare professionals should be handled and how healthcare professionals should communicate with patients and their relatives.

Appendix 3.2.7. Tools (UK)

The Imperial College[64, 145, 158, 159] developed and tested a tool, the J-IDEA planner, to calculate the capacity of beds, staff and ventilator equipment when implementing a number of healthcare provision interventions – such as cancelling elective surgeries and converting operating theatres to critical care wards (see also Chapter 8). The J-IDEA planner allows users to compare hospital capacity under various hospital capacity interventions, intending to inform pandemic response planning. It allows the user to explore potential shortfalls and requirements in response to the COVID-19 pandemic across three key inputs to hospital care: beds, staff and ventilators. The tool presents a snapshot of healthcare capacity and users can enter their own forecasts on number of expected COVID-19 and other patients requiring care, to compare potential deficits in capacity on a particular day. The user must enter setting-specific data on the following components of existing capacity at baseline: total number of critical care (CC) beds, total number of general and acute (G&A) beds, number of CC beds occupied by non-COVID-19 patients, number of G&A beds occupied by non-COVID-19 patients, total number of ventilators, total CC nurses, total

qqq https://www.icnarc.org/

G&A nurses, total CC senior doctors, total CC junior doctors, total G&A senior doctors, and total G&A junior doctors. The user must also enter the observed or expected number of COVID-19 patients in CC, number of COVID-19 patients in G&A care, COVID-19-related sickness rate for nurses, and COVID-19-related sickness rate for doctors. **It is not clear to what extent this tool has actually been used by English hospitals.**

Appendix 3.2.8. Restart regular activities

When the COVID-19 crisis was beyond its peak, NHS published on 14 May a roadmap[160] concerning the restart of elective non-urgent procedures that were cancelled earlier in the crisis.

The Royal College of Anaesthetists[161], the Royal College of Surgeons[162] and the Academy of Medical Royal Colleges[163] formulated conditions on the restart and warned that resuming regular care needs a stepwise approach and that it should be taken into account that the COVID-19 virus will remain for a while and will still require staff, stuff and space.

Appendix 3.2.9. Evaluations

According to an email from our informant in England, the COVID-19 surge plans have not been evaluated as such, but clinical guidelines for the management of surge during the coronavirus pandemic have been updated regularly to include rapid learning on COVID-19 treatment and management.

In addition, the National Audit Office[rrr] started a broad programme in which it looked at government preparedness for the pandemic, the spending on the direct health response and the wider emergency response. It already produced two reports.[46, 164] From this evaluation[46] it appeared among others that between 17 March and 12 April, the number of available beds increased from 12 600 to 53 700, while the proportion of these beds occupied by a COVID-19 patient peaked at 29%. The proportion of critical care beds occupied by COVID-19 patients in England was highest between 5 April and 14 April, at 50% or just over. The NHS additionally increased capacity through a deal to access up to 8 000 beds in independent hospitals, and by establishing temporary Nightingale hospitals, although use of these was limited up to mid-May.

By the end of April, an extra 18 200 NHS staff were deployed in clinical and support roles, including 7 000 nursing and midwifery students and 8 000 returning retired and former staff. During the outbreak, the absence rate for NHS acute hospital staff almost doubled, peaking on 4 April 2020 with 9% absent for reasons related to COVID-19.

NHS trusts were instructed to free up capacity in part by postponing their elective activity from 15 April at the latest and for a period of up to three months. Data from NHS England & NHS Improvement suggest that hospital elective activity fell by 24% in March 2020 compared with March the previous year.

Hospital admissions of COVID-19 patients increased quickly at the start of April, and some hospitals have faced great pressure at times. However, the NHS system's capacity for COVID-19 patients, in terms of beds and respiratory support, has been sufficient during the pandemic to date.

Furthermore, the National Audit Office evaluated the government's strategy used to obtain sufficient number of ventilators[165] and a report on PPE availability is currently in progress.[166]

[rrr] https://www.nao.org.uk/covid-19/

Appendix 3.3. Germany

This section is mainly based on the text of Winkelman et al.[42]

Appendix 3.3.1. Background

In Germany, the Federal Ministry of Health[sss] is responsible for national health policy. Its activities focus predominantly on drafting bills, ordinances and administrative regulations for a variety of policy areas. Its tasks also include European and international health policy.

The Federal Civil Protection and Disaster Assistance Act (Gesetz über den Zivilschutz und die Katastrophenhilfe des Bundes (ZSKG)) regulates the interaction between the federal and federated governments in averting and combating natural disasters, particularly serious accidents and armed conflicts.[167]

Federated states (Bundesländer) are responsible for the implementation of federal laws and have the supervision of the local health authorities. They are responsible for hospital planning and capital investment of hospitals. The federated state health ministers met regularly together with the federal minister of health as part of the state health ministers' conference. According to Siewert et al.[168], there was large variety between federated states regarding how they acted during the coronacrisis but it allowed to adopt policies tailored to specific conditions and needs. **So surge capacity plans during the COVID-19 crisis were the competence of federated states.**

The responsibility of the Federal Ministry of Health also extends to several institutes which are under its technical and administrative supervision: the Federal Institute for Vaccines and Biomedicines (Paul Ehrlich Institut); the Federal Institute for Drugs and Medical Devices which focus is the approval of proprietary medicines; the Federal Centre for Health Education; and the Robert Koch-Institute (RKI) which is the central federal institution in the field of public health responsible for identifying, preventing and combating diseases.

The Robert Koch-Institute is the lead organisation to scientifically advise the authorities in the COVID-19 crisis. It advises competent authorities on measures for the prevention and detection of serious communicable diseases and the prevention of their spread and advises the supreme health authorities on measures involving more than one federal state. It collaborates with the respective competent federal authorities, the competent federated authorities, the national reference centres, other scientific establishments and professional societies as well as foreign and international organisations.

On 25 March, the parliament approved the COVID-19 Hospital Relieve Act[169] including a number of measures to guarantee hospital funding and financial liquidity. The objectives of these measures were to compensate hospitals for the decreased number of admissions, to provide financial support for the expansion of treatment capacities and to reduce administrative burden. Financial compensation for postponed non-essential surgery and treatment consisted until the end of September, in a lump sum payment of € 560 per day for every bed that was not occupied. For every additional ICU bed with ventilation capabilities that hospitals set up, they received a bonus of € 50 000. Hospitals also received an additional payment of € 50 per patient to cover the additional costs, especially of personal protective equipment. In addition, hospitals received increased fees for nurses.

Beginning March the Robert Koch-Institute released a national pandemic plan[170] and begin April, a new partial guideline regarding hospital emergency plans and the COVID-19 pandemic was released[171]. On 8 April, a federal law[172] obliged all hospitals to register daily their ICU capacity.

sss https://www.bundesgesundheitsministerium.de/en/ministry/the-federal-ministry-of-health.html

On 3 June, the federal government announced the agreement on a stimulus package of 130 billion euro. One of the aims of this package was to strengthen the healthcare system and improve pandemic preparedness.

Appendix 3.3.2. Staff / Workforce

Germany implemented several measures to expand the workforce during the COVID-19 crisis. These measures were however often initiated by individual hospitals, cities or regions, with limited overall coordination and planning at the federal level.[42]

On 12 March, the federal government urged all hospitals to **postpone elective surgeries and treatments** as well as to recruit additional workforce in preparation to an increased number of admission of seriously ill COVID-19 patients.

On 16 March, the federal Minister of Health announced to **suspend the directive on minimum nurse staffing levels in hospitals** and the professional nurse/nursing assistant ratios in nursing homes and ambulatory nursing practices. The objective was to allow more flexibility for managers when planning personnel and staffing in preparation for the anticipated shortage.

Expansion of the workforce has mainly been done using four strategies: *part-time* healthcare professionals were asked to work full time; medical, nursing and allied health *students* were called upon to work in clinical practice; *retired health professionals* were asked to return to clinical practice; and mutual recognition procedures of *foreign-trained health professionals* were eased. In some cities or hospitals *volunteers* with no or very limited experience in healthcare were called upon to support nurses in basic tasks. Some states asked *military services* to expand the hospital workforce.

No reliable data are available on the amount of additional staff these strategies have generated. In addition, no monitoring nor planning of workforce supply and demand is in place, neither nationwide nor across regions. This may be problematic in case of regional and local surges of patients or in case of capacity losses due to infection of staff.

An additional strategy to ensure sufficient appropriate staffing was to apply **role flexibility and task shifting,** e.g. by giving ICU training to non-ICU healthcare professionals or by adapting state exams for medical students (e.g. non-patient related courses/ lectures can happen digitally or patient-related courses can be done using simulated patients or postponing exams)[173, 174] and allowing temporary flexibility for trainees, medical and dental students during the epidemic in regard to duration of training.

Following the COVID-19 Hospital Relieve Act, approved by the parliament on 25 March, hospitals received a **higher payment for nurses**; the pre-existing nationwide nurse fee of € 146 per day was increased to € 185 as of 1 April. This gave hospitals some financial flexibility in scheduling nursing staff and allowed them to adapt to the increased need for nursing. Also some states provided **financial incentives** for healthcare professionals. And according to Reed[53], staff working in departments most affected by COVID-19 received bonus payments of € 1 500.

The German Society of Hospital Disaster Response Planning and Crisis Management (Deutsche Arbeitsgemeinschaft Krankenhaus Einsatzplanung) developed a guideline for hospital surge capacity, in which possible strategies regarding stuff, staff and space are presented.[171, 175, 176] In this document it is stated that *"the primary goal must be to maintain the response category "conventional care" or at least "contingency care" for as long as possible, taking into account current and accepted medical standards"* and that *"crisis care" based on disaster medicine principles must be avoided at all costs or delayed as long as possible by appropriate measures"*.[176] Hereto, hospitals need to install an appropriate command structure, in which management, communication, logistics, infection control and IT staff should be represented and that is supported by performant information gathering and assessment. Regarding the latter, the document recommends that information should be available on number of patients, clinical status and progress, bed capacity, staff capacity, epidemiological situation including hotspots, burden on regional health care facilities, regulations of governmental bodies and up to date clinical scientific insights. A solid communication structure to wards and hospital departments is necessary and it must be made clear that commands are binding. Adequate stock management of PPE and other needed equipment must be put in

place, as well as strict cohorting of COVID-19 and non-COVID-19 patients (including setting up new areas and transforming areas for COVID-19 patients). Furthermore training should be organised in infection control measures and handling PPE. Regarding increasing hospital capacity, it is recommended to reduce elective procedures, since this releases space, beds and staff that could be used for treatment of COVID-19 patients. Postponement of elective procedures should be done based on a categorisation of treatment urgency. Regarding increasing staff, the document recommends to recruit and train nurses and doctors from other specialities, recruit and train medical students and to cooperate with other hospitals. When the point is reached where the lack of resources forces the treating physicians to triage patients and to allocate resources in a limited and prioritised manner, then the distribution should be made in such a way that the greatest possible number of lives can be saved and triage should be made by an experienced team of doctors and nurses in a joint effort guided by stringent criteria. However, **it is not clear to what extent those recommendations were considered as feasible and de facto implemented by the hospitals.**

Appendix 3.3.3. Space / Infrastructure

Surge capacity plan

On 17 March, the federal government and the federal states approved a hospital emergency plan for German hospitals developed by the federal chancellery as a "rough concept for a hospital surge capacity plan".[177] It stipulated that

- Intensive care capacity should be doubled;
- Ventilator capacity should be increased;
- Rehabilitation facilities, hotels or larger halls could become hospital units;
- All healthcare facilities should search through their stocks for equipment that could be used if necessary;
- Every hospital should conduct a foresighted personnel planning, provide additional training to existing staff additionally for possible deployment in intensive care, develop concepts for the deployment of (senior) medical students, as well as for the deployment of doctors and nurses who are retired or working in other areas;
- The federated states should develop as to how doctors and nurses employed outside the acute care setting can provide support in acute care.

It was up to the federated authorities to further expand, detail and implement this general plan. This means surge capacity strategies could differ from state to state; below examples from states will be given.

Following this government's recommendation, the number of ICU beds has been increased to about 40 000 beds, that is 12 000 additional ICU beds have been created by 1 April.

Repartition plan

Several federated states coordinated approaches in controlling the admission of patients across hospitals in their region. In Berlin for example the SAVE Berlin @COVID-19 action plan steered patients across different types of hospitals, with the objective of avoiding admission of COVID-19 patients to hospitals that are not able to treat them, for instance because they do not have available ventilators or they lack trained staff. Keeping these non-COVID hospitals free from COVID-19 patients also aimed to avoid infection of other patients. The initiative has been mainly developed by the Charité Berlin Hospital (a third-level hospital). The Charité coordinated and advised the management of ICU capacity. The most serious cases were treated there while an additional 16 specialised second-level hospitals were intended to provide ICU care to COVID-19 patients. The 60 remaining Berlin emergency hospitals initially provided ICU care to non-COVID patients, as first-level hospitals.

Specialised COVID-19 centres

On 12 March, the first specialised treatment centres for COVID-19 patients and patients with respiratory symptoms were set up by the Regional Association of SHI Physicians in North-Rhine Westphalia.

Field hospitals

Following a decision of the federated state government of Berlin (19 March), a provisional COVID-19 treatment centre[ttt] was set up to treat mild COVID-19 cases as well as emergency respiratory patients. The hospital was built with the help of the German army and opened on 11 May. It has a capacity to house up to 1 000 patients. The army prepared the five military hospitals for the general public.

Digital solutions

Existing restrictions on the volume of consultations that a physician can provide via video or telemedicine were relaxed. Indeed, an increased number of such consultations has been reported during the crisis. At the hospital level, some initiatives for digital support were put in place. For instance, The Charité Berlin launched the "CovApp"[uuu], a web-based online tool to assess a patient's medical condition, provide recommendations for action (doctor's visit or testing) and inform about relevant contacts, healthcare services, access to hospitals or examination centres.

The same hospital also supported the treatment of ventilated COVID-19 patients by tele-visit with the help of a visit robot. Information was exchanged with the treating physicians using a video communication platform. Digital support for ICU patients also took place in other hospitals: all Berlin second-level hospitals have been equipped with telemedicine equipment and there are currently 25 visiting robots in use.

Future modernisation

A "Hospitals of the Future Programme" (of 3 billion euro from the federal government and an additional 1.3 billion from the federated states) will be set up to modernise the hospital sector by funding necessary investments in better **digital infrastructure** and improved **emergency care capacities**. Projects eligible for funding are listed in the "Hospital Future Act"[vvv] that was passed on 18 September. Modernisation include both space and equipment to improve capacities, cross-sectoral provision of care, process organisation, communication, telemedicine, robotics, high-tech medicine and electronic documentation of care and treatment services. In addition, investments in IT and cybersecurity and strengthening of regional healthcare, are to be supported by the programme.

Appendix 3.3.4. Stuff / Supplies and equipment

PPE

Insufficient resources of PPE and disinfecting agents were a major problem for all types of healthcare facilities and providers and raised serious concerns among healthcare professionals. Purchasing of PPE has been centrally handled by the Ministry of Health who started **central procurement of PPE** on 4 March. This central procurement addressed medical practices, hospitals, nursing homes, ambulatory care and federal agencies. In the meantime, companies have donated PPE, if available. Export of PPE abroad was prohibited, except under very strict conditions. On 5 April, the federal government delivered an important stock of PPE to the federated states who were responsible for allocating and distributing them to healthcare providers.

The lack of PPE (especially masks) led hospitals to **re-use** disposable material. On 13 March, the RKI provided recommendations[178] on how to re-use surgical mask and FFP2-FFP3 masks in case of shortages. On

ttt https://www.corona-zentrum-berlin.de/

uuu https://covapp.charite.de/

2 April, the crisis management of the federal government decided that FFP2 and FFP3 masks could be re-used under certain circumstances by medical personal in healthcare and residential facilities.

Medication

During the crisis Germany faced a shortage of medications necessary for the care of COVID-19 patients. Therefore, on 7 July, the federal government issued an ordinance[179] to increase stockpile of drugs used in ICU.

Appendix 3.3.5. System / Service reconfiguration

Data and information technology

At the beginning of the COVID-19 crisis a reliable overview of the number of ICU beds in Germany was lacking.[180] Therefore a new capacity registration tool was developed, in which both ICU beds availability and ICU beds occupancy were registered. The tool was developed by the German Interdisciplinary Association for Intensive Care and Emergency Medicine (DIVI), the RKI and the German Hospital Federation (DKG). On 8 April, a federal law[172] obliged all hospitals to register daily their ICU capacity in this new tool (DIVI registry).

For three types of ICU beds (without ventilation, with ventilation, and with ECMO), hospitals have to register on a daily basis the number of occupied beds, the number of available beds, and an estimation of the maximum capacity for new admissions in the following 24 hours. Information is publicly available[www]. In addition, the hospitals had to provide a one-time estimate of the number of ICU beds they have installed as of 1 January 2020. Further, hospitals have to report the number of COVID-19 patients that have been treated in ICU, with ventilators or that have been discharged from hospital since 1 January. As of May 13, 1 227 hospitals or departments reported to the DIVI registry.[42]

Communication

No specific information found on this.

Appendix 3.3.6. Tools

Several tools were developed in Germany to assist hospitals in handling pandemic responses, or to predict potential ICU case-load of COVID-19 patients, or to monitor surge capacity. For example Cwojdzinski et al.[181] developed a checklist for hospitals to be used in case of a pandemic; Kanz et al.[182] made a tool to monitor actual ICU-bed availability and occupancy, which was used by hospitals in Bayern; Stang et al.[183] developed a prediction model, based on the numbers in the initial weeks as registered in the DIVI-register, to calculate potential case-load for ICU in the next months (this model showed that Germany has sufficient ICU care capacity, as long as new COVID-19 cases would not increase exponentially; factors included in the model were number of new daily cases of COVID-19, number of patients requiring ICU, length of stay in ICU). In the Saxon region the DISPENSE tool[184, 185] was developed; this tool provides an overview of regional information on the number of laboratory-confirmed cases over time, bed occupancy in East Saxon hospitals with a special focus on intensive care medicine and a forecast of bed occupancy and the short and medium-term need for intensive care treatment capacities. Also in the region of Munchen, a tool[186] was developed to predict the course of the COVID-19 epidemic and the resulting utilisation of the intensive care beds in the short, medium and long term. **However, it is not clear to what extent those tools were used and on what level and if they were satisfactory in the surge capacity decision making.**

[www] At https://www.intensivregister.de/#/intensivregister.

Appendix 3.3.7. Restart regular activities

Step-by-step approach

Return to regular activities from the beginning of May was announced by the Minister of Health on 17 April. On 27 April, the Ministry of Health recommended a step-by-step procedure for re-planning hospital bed capacities.[187] Hospitals were asked to keep 25% of all ICU beds available for COVID-19 patients (the previous target was 50%). Surgical capacity could be used up to 70% for elective procedures. This had to be organised step-by-step: 10% increase every two weeks coupled with a re-evaluation of ICU bed capacity. Once the elective surgical capacity was reached 90%, a step-by-step adjustment followed with increments of 5% in ICU bed capacity every three weeks.

Regional plans

The federated states developed their own regional plans, ensuring that each state has 25% of ICU capacity reserved to COVID patients, throughout the whole state instead of in each hospital. It was possible for a state to have all these ICU beds in one COVID-hospital and other hospitals without COVID units, as long the 25% ICU capacity target was met.[188]

Prioritisation criteria

A prioritising list of elective procedures was developed by the German Association for General and Visceral Surgery (Deutsche Gesellschaft für Allgemein- und Viszeralchirurgie). Surgeries of patients with rapidly progressing diseases and manageable comorbidities were favoured but individual physicians still made the treatment decisions. The association also listed diseases that may always require urgent surgery (e.g. hernias with incarceration, gastrointestinal bleeding, organ transplants, etc.).[188]

On 27 April, the German Society of Surgery (DGCH), the German Society of Anaesthesia and Intensive Care (DGAI), the Professional Association of German Surgeons (BDC) and the Association of German Anaesthetists (BDA) released a joint statement[189] with a list of principles and considerations that physicians, nursing staff and hospitals must take into account when restarting elective surgery.

Also the University Hospital Würzburg developed a list of priorities in four urgency levels[190] and Deutschen Arbeitsgemeinschaft Krankenhaus proposed criteria on which it could be decided what type of regular care could be continued.[175, 176]

Appendix 3.3.8. Evaluations

The German hospital association[191] published a paper on what was learned from the COVID-19 crisis. It stated that the initial availability of a large number of hospital (ICU) beds was a clear advantage to tackle the COVID-19 crisis. Also the collaboration of hospitals within a regional network was a strong element. On the other hand, the financing of additional outpatient and inpatient capacities was considered insufficient by the hospitals in many places; hospitals were partly forced to fall back on their own resources. Also procurement of personal protective equipment for employees in the hospitals, was a very difficult topic and it was recommended to develop suitable supply and stock pile strategies. The hospitals also see a need for short-term action with regard to the legally required nurse-patient ratios; the pandemic has confirmed that a flexible and needs-based personnel deployment with the existing performance-related personnel structure specifications, especially the minimal nursing staff, cannot be reached. They also plea for an enlargement of the IT-budget, development of a pathogen-independent pandemic plan, establishment of a national stockpile for protective equipment, regional networks as the central model, more attention for an appropriate mix of qualifications in the hospitals, improvement of the working conditions for all employees, making the nursing profession more attractive, reduction of administrative burden (e.g. obligatory registrations) and further development of digital care.

The German National Academy of Sciences Leopoldina[192] observed that due to the care of the high number of severely ill COVID-19 patients, many patients with other, sometimes serious, illnesses could not be examined and cared for at all, or only to a limited extent. It stated that it has to be ensured in the future that all patients receive appropriate care again and that their

trust in a good and safe treatment is strengthened – in particular in times of an ongoing pandemic threat. The following conditions should be met in this respect: functioning networks with a tiered (regional, national and Europe-wide) care of COVID-19 patients; provision of sufficient hospital, ambulatory and post-hospital capacities for the care of COVID-19 patients and the adjustment of patient occupancy in healthcare facilities, depending on the regional development of infection rates, including the use of digital early warning systems. According to the report, one of the main conclusions from the COVID-19 crisis is that rapid access to the latest and valid data, their integration and visualisation are crucial for the management of healthcare, especially in complex situations. Therefore central digital registration and regional co-ordination of all operational treatment units (infrastructure, technology and personnel) and reserve capacities, not only for intensive care, should be installed. Leopoldina also pleas for the expansion of digitisation and digital skills (e.g. telemedicine and consultation services, disease monitoring at home, data availability, integration and exchange), also to reduce the possibility of direct infection. This requires the standardisation and compatibility of systems, and the protection of digital infrastructure and data.

Finally, a conference paper by Piwernetz and Neugebauer[193] stated that the German health system had coped with the COVID-19 pandemic better than numerous other countries, but that does not mean that everything went smoothly. They plea for a more regional approach and cooperation, the establishment of a new “National Institute for Health” to which operational crisis management could be transferred and that takes care of data-based health reporting and ensures IT interoperability.

Appendix 3.4. Italy

This section is mainly based on the text of Fattore et al.[40] and additional information obtained from them by email correspondence.

Appendix 3.4.1. Background

The Italian National Healthcare System is strongly decentralised.[194] The delivery of services is a competence of the 20 Italian regions who are steered by the Central Government. According to the National Hospital Surge Capacity Plan (2018), regions are responsible for the development of provisions aimed at ensuring that each local health authority and hospital adopts a plan for the management of overcrowding in emergency departments, elaborated according to the aforementioned national guidelines. Generally, it is then up to the Medical Directorates of hospitals to guide such organisational changes. Given the decisional autonomy granted to the 20 regions, such processes might present some variations. It caused that each region developed its own emergency task force and plan.[195]

On the other hand the Remote Health Rescue Operations Centre "Centrale Remota Operazioni Soccorso Sanitario” is assigned[xxx] for the coordination of urgent medical aid as well as the Regional Healthcare Representatives in case of national emergency and was supposed to carry out all the functions of regional and interregional operational coordination, deriving from the COVID-19 crisis, relating to:

- acquisition, through the regional healthcare contact, of the requests for availability of beds and any organisational needs from the regions particularly affected by the COVID-19 crisis and timely allocation of patients, with mandatory provision by the other regions, of beds and

human, instrumental and technological resources responding to urgencies and therapeutic needs;

- simultaneous activation of all connection measures for immediate and safe transport of patients.

On 5 February[196] a scientific committee was established by the government to consult and support for coordination activities for overcoming the epidemiological emergency due to the spread of COVID-19.

On 29 February the Italian Ministry of Health[197] considered it necessary for the regions to prepare an emergency plan for management of critically ill patients affected by COVID-19, which allows for guaranteed adequate levels of treatment through an appropriate number of ICU beds. Each region had to identify one or more facilities to be dedicated to the **exclusive management of the patients affected by COVID-19 ("COVID Hospital")** and had to prepare plans that include:

- The identification of isolated locations in each hospital that allows observation of ventilated / intensive patients with suspected COVID-19 infection;
- The creation of cohort ICU (with physical separation from other units within the hospital) intended for the hospitalisation and treatment of COVID-19 patients. These ICU should be created primarily in hospitals equipped with infectious disease wards and in the reference hospital for ECMO devices;
- The creation of protocols that identify the criteria for access to the intensive treatment for COVID-19 patients, their clinical and care management, including also the aspects of distribution and use of PPE and staff training;
- A plan to expand the capacity of each individual hospital through the activation of ICU beds that are currently not used or by reshaping the planned activity;
- The urgent planning of staff training regarding the operating of ventilation systems and the correct use of PPE;
- The activation of a dedicated system for continuous monitoring of ICU beds at the regional level, to be carried out by the territorial emergency system (118 operation centres).

In addition, each region had to communicate to the Ministry of Health information on ICU beds availability (See Appendix 3.4.5).

On 16 March the government issued a document[198] in which was specified which hospital activities could be postponed and which not (e.g. oncology care) based on a priority list that was developed in 2019. On 25 March the government[199] declared that non-COVID patients still hospitalised should be allocated to alternative facilities in order to avoid dangerous nosocomial infections.

The Decree-Law n° 34 of 19 May 2020[200] established that regions, through specific reorganisation plans aimed at dealing with emergencies such as the COVID-19 crisis, should guarantee an increase in hospitalisation activities, specifically regarding intensive care. Among others it stipulated a conversion of units to medium or high intensity of care units for COVID-19 patients. Further explanation followed in the Ministry of Health's circular of 29 May, titled "Organisational guidelines for the increase of hospital capacity in response to the COVID-19 Emergency"[200] (see Appendix 3.4.3).

However, since the Italian healthcare system is strongly decentralised, many regions and hospitals developed their own surge capacity plans; some of them are well described in the literature.[201-207] Common elements in these local plans are:

- stop all routine and non-urgent outpatient activity;
- send all patients hospitalised in "sub-intensive" (pulmonary failure or cardiac failure) observation beds to general units so that beds are recovered as ICU beds;
- redistribution of medical and nursing staff for structural changes and redistribution of the staff on duty (not quarantined);
- recruitment of external staff;
- suspension of holidays and temporary leaves;

- regional network and transfers to avoid collapse of hospitals;
- coordination of the crisis unit with regional military and government authorities;
- mixed ICU teams.

Appendix 3.4.2. Staff / Workforce

Initial situation

According to Fattore[40] the shortage of healthcare professionals has been a major on-going public health issue in Italy, that was even more highlighted by the COVID-19 crisis. In response to the imbalance, the country had already made efforts to increase the number of nurses in training (the number of graduates per year was 3 100 in 2000 and went up to over 13 000 in 2014), while the number of medical graduates stayed relatively constant (around at 6 500 per year).[40] However, creating enough positions to absorb this growing potential workforce remained a challenge.

Circular of 1 March

In light of the situation in hospitals of the Lombardia region, the Technical-Scientific Committee of the Italian Civil Protection Department, requested on 1 March[208] to increase the availability of beds (see below). It also considered necessary to redistribute the health personnel destined for assistance, providing a **"rapid" training course qualifying for respiratory support for nurses and doctors to be dedicated to the sub-intensive areas**. To this end, the use of the distance learning courses available at the Higher Institute of Health was recommended. Also accredited private structures were to be used.

In the same circular, it was explained that, upon the occurrence of a first confirmed case of coronavirus in an area not yet affected, the competent authority had to determine the **reshaping of the elective surgical activity**. On 16 March all elective procedures were stopped.[199]

To ensure the transport of critically ill patients, pools of anaesthetists / resuscitators had to be set up, not only from the concerned region, but also from other less affected regions. Finally, in order to maintain an adequate care performance of the health teams operating in the affected areas, **a shift programme** had to be planned, also recruiting operators who carry out activities in other areas of the country less subjected to care loads related to the management of patients affected by COVID-19.

Expansion of workforce

Facing the COVID-19 crisis, a series of measures have been implemented by the Decrees of 9 and 17 March to increase the availability of health workers (for a total of 660 million euro). In particular, the government approved the hiring of 20 000 healthcare professionals (**fast recruitment tracks**), allocated 250 million euro for **staff working overtime**, authorised the possibility for healthcare facilities to **hold back their staff eligible for pension**, offered **retired doctors and nurses** the possibility to volunteer to practice and requested **temporary enrolment of doctors and nurses from the army**. In addition, doctors and nurses who were not listed in the Medical Register yet were permitted to work on **freelance contracts** and those who had been practising abroad were allowed to **temporarily practice in Italy**.

On 20[209] and 26[210] March, the Department of Civil Protection issued two Ordinances to **establish a Specialist Medical Unit and a Technical Nursing Unit**. Participation was voluntary and recruitment took place through an online call. Almost 7 000 doctors and 10 000 nurses applied as candidates, from which 300 physicians and 500 nurses (from the National Health Service, private clinics and freelancers) were selected on the basis of specific requirements by the Head of the Department of Civil Protection. Volunteers were to be **sent to areas facing greater difficulty in the COVID-19 emergency**. The hosting regions were to reimburse transfer and accommodation. In addition to their normal salary, each professional received a flat-rate solidarity premium of € 200 for each day of work, paid by the Department of Civil Protection. On 9 April, 86 voluntary doctors from the South of Italy were deployed in the hospitals of the most affected cities in the North to support COVID-19 clinical response.

Since the beginning of the crisis, workforce has increased in several regions of the country: by 8 May, Lombardy hired 589 additional doctors (+ 3.8%) and 1 016 nurses (+ 2.6%), Emilia Romagna hired 421 doctors (+ 4.7%) and 1 032 nurses (+ 4.0%) and Marche increased its capacity of clinicians by 15.8% and of nurses by 7.3%.[40]

On 19 May, the "Relaunch Decree" (and its latest amendments of 28 June) permitted healthcare professionals with precarious work contracts (for at least 36 months by the end of 2020) to **switch to an open-ended employment contract**. Furthermore, **a bonus up to € 2 000** was awarded to healthcare workers active on the COVID-19 frontline. In parallel, an additional 50 **Continuing Medical Education credits** for the year 2020 were awarded on 28 May to doctors, dentists, nurses and pharmacists who continued working during the COVID-19 crisis, as a compensation for the knowledge and skills acquired during that time.

International solidarity

Several countries sent doctors and nurses to support response to the COVID-19 crisis in Italy. Ukraine sent over 16 doctors and four nurses in support of the Marche region. Albania sent 30 medical personnel to Lombardy. Integrated doctors/nurses teams from Albania, Tunisia, China, Cuba, Poland and Russia were sent to the most affected areas of Lombardy. Moreover, a team of 19 medical doctors from Norway and another team of 11 doctors and four nurses from Romania were deployed to Lombardy through the European Civil Protection mechanism.

Safeguarding health workers' mental health

Following the advice of the Technical-Scientific Committee, the National Institute for Insurance against Accidents at Work in collaboration with the National Council of the Order of Psychologists jointly promoted the activation of psychological support services for healthcare professionals during the crisis. They developed directives and tools to help all healthcare facilities providing services for stress management and burnout prevention to their staff. In particular, healthcare facilities were advised to set up task forces of psychologists even through distance counselling. Training material was sent specific for dealing with the COVID-19 crisis. Also a triage system was designed for psychologists to timely assess their patients' situation and monitor them over time.

Special Units for Continuity of Care

The Special Units for Continuity of Care, established by the government's decree of 9 March (Art 8)[211], are teams of young doctors, tasked with making home visits to COVID-19 patients (or suspected ones) who did not need to be hospitalised. These units were set up so that COVID-19 patients in isolation at home could be examined safely by a doctor. Due to the lack of PPE, it was indeed risky for family doctors, particularly for many of them close to retirement, to visit patients with COVID-19 symptoms.[212] According to the decree, these units are made up of a number of doctors equal to those who make up the medical guards. Depending on the region, the units included young graduates, students, but also specialists who normally work in hospitals, including some dentists.[212]

Special Units for Continuity of Care are responsible for guaranteeing continuous communication with infectious disease specialists at the hospital and protocols to be followed.[40] By 9 June, Special Units for Continuity of Care reached coverage of 47% of the population, with an increase mainly due to the progressive activation of more units in Marche, Sicily, Liguria, Sardinia, Campania and Puglia. The highest coverage rates belong to Valle d'Aosta and Emilia Romagna while in Campania (South), Lombardy and Lazio the lowest coverage rates in the country were experienced.[40]

Appendix 3.4.3. Space / Infrastructure

Although the number of ICU beds had increased in the last decade, the COVID-19 crisis in the Lombardy Region required doubling activity in ICU: while the average number of patients discharged per month was 680 between 2013 and 2017, it was 1 350 in March 2020.[40]

A study by Remuzzi et al.[49] initially assessed that between 9 to 11% of COVID-19 cases required to be admitted in ICU. On 29 March, the number of positive cases was 73 880. According to the above estimate, around 7 380 ICU beds would be needed, which corresponds to almost 70% of the

ICU bed capacity for 2017. By 3 April, 4 068 patients had been admitted to ICU, of which 2 842 in the North, occupying 113% of their bed capacity.[40] At this point, ICU specialists had no choice but to deny ventilation to the frailest and give priority to those who were more likely to benefit and survive.[40] A paper by Nacoti et al.[50] published on 21 March recounts in vivid detail the extreme pressures facing facilities by describing the situation in Bergamo (Lombardy), a city that was severely hit by the pandemic. Out of a total of 900 beds in this hospital, 300 were occupied by COVID-19 patients and 70% of the ICU beds were reserved for critically ill patients who had a chance of survival. In the surrounding area, according to the article, most hospitals were next to collapse and overcrowded. Pharmaceuticals, ventilators, oxygen, and PPE were out of stock. Doctors had no choice but to lay their patients on floor mattresses.

As mentioned earlier, on 29 February the Italian Ministry of Health[197] considered it necessary that the regions prepared an emergency plan for management of critically ill patients affected by COVID-19. Each region had to identify one or more facilities to be dedicated to the **exclusive management of patients affected by COVID-19 ("COVID Hospital")** and had to prepare plans that include creation of cohort ICUs, expansion of ICU capacity by reshaping elective care activities and activation of a dedicated system for continuous monitoring of ICU beds at the regional level.

In light of the situation in hospitals of the Lombardy Region, the Ministry of Health issued on 1 March a circular[208] that aimed to strengthen the most affected hospital departments and increase the number of beds. More specifically, it was requested to **increase the availability of beds** (50% of the number of ICU beds and 100% of the number of beds in pulmonology units and infectious disease units, isolated and equipped with the necessary equipment for ventilator support). Also the reactivation of a **single logistic coordination centre for the transport of patients** who require hospitalisation in ICU and mechanical ventilation up to ECMO was regulated in this act of 1 March.

The Decree-Law of 19 May 2020[200] established that regions should guarantee an increase in hospitalisation activities, specifically regarding intensive care, through specific reorganisation plans. Among others it stipulated a conversion of units to medium or high intensity units for COVID-19 patients. This was further explained in the Ministry of Health's circular of 29 May 2020, titled "Organizational guidelines for the increase of hospital capacity in response to the COVID-19 Emergency"[200] of which the main points are detailed below.

- Phase 1:
  - Deferrable elective hospitalisations were suspended and their units were reconverted to COVID-19 wards/services suitable for semi-intensive and intensive care.
  - Regions and Autonomous Provinces could stipulate agreements with accredited and not accredited private structures even over the spending limit set by legislation for the purchase of goods and services (an extra expenditure of 240 million euro was authorised).
- Phase 2: need for a structural reinforcement of the hospital network through regional reorganisation plans. For all interventions, 1 467 billion euro were allocated for 2020 to cover the following:
  - Delivery of at least 3 500 intensive care beds (increase of 70%) throughout the entire country;
  - Requalification of 4 225 beds in semi-intensive areas throughout the entire country;
  - Delivery of additional 300 intensive care beds in the areas with increased need;
  - Restructuring of emergency departments, with separation of care pathways.

Lombardy ICU Network

In Italy, decisions about the re-organisation of services are taken at regional and local level. In particular, the design and organisation of operative healthcare contingency plans is the responsibility of the regions. At the beginning of the crisis, the plan put in place in the most affected areas such as Lombardy became obsolete very soon due to the high demand for ICU

beds, PPE, ventilators and human resources. After the first COVID-19 patients were hospitalised (on 20 February), Lombardy rapidly set up an **"ICU Network" of 15 hospitals**, then expanded it to 72 hospitals in the following weeks. These facilities were selected either for their expertise in treatment of infectious diseases or because they were already part of the so-called Veno-Venous ECMO Respiratory Failure Network (RESPIRA).

The first step undertaken by these hospitals was **to group and isolate ICU beds for COVID-19 patients** to minimise transmission between patients within the hospital. Then, they set up a triage area for patients to receive mechanical ventilation while waiting for the result of their diagnostic tests. They formalised local protocols for triage of patients with respiratory symptoms, reorganised PPE supply and distribution chain and organised staff training**. Every suspected or positive case in critical condition had to be reported to the regional coordinating centre**. **Non-urgent elective procedures were cancelled** and 200 ICU beds were set up in 10 days. In the first 18 days of the crisis, the network introduced 482 new ICU beds. A study[47] published by JAMA on 6 April analysed a set of 1 591 COVID-19 patients admitted to the ICU network and found that the average length of stay in ICU was 10 days, reaching 15 to 20 days in several cases. While at the beginning of March Lombardy had a total ICU capacity of 724 beds, this number increased to 1 100 by 16 March, of which 898 were exclusively for COVID-19 patients. To date, Lombardy has increased its initial ICU bed capacity by 86% mainly thanks to the private sector (responsible for 30% of the expansion of ICU beds).

Field hospitals

In the most severely affected areas, the Department of Civil Protection set-up **military camp hospitals** with additional ICU or semi-ICU beds and lower intensity care beds for those in recovery. The city of Milan has **repurposed large existing industrial spaces or convention buildings into hospitals**. On 5 April, a new hospital opened in the Exposition Palace. It has become the largest ICU hospital in Italy, with 200 ICU beds and diagnostic facilities. The government considered to replicate this model with two additional hubs located in the centre and in the South of Italy. In some cases, **re-adapted hotels or dormitories** were used for patients discharged from hospitals who required low intensity surveillance. A **field hospital** with 142 beds (including 72 ICU beds) was also opened on 1 April in Bergamo.

Intermediate care structures

Intermediate care structures aimed to provide patients with nursing assistance and monitoring requiring low amount of medical attention. Several approaches have been adopted by Italian regions. Almost all regions (85%) made available exclusively to COVID-19 patients some of their existing nursing homes or health and social care facilities.[40] During the months of the epidemic, hotels or community hospitals were converted to deliver intermediate intensity care. Each region selected its own ratio to balance intermediate care services and home care.

Financial measures

On 17 March, the national government issued the "Cure Italy decree"[213] which focused on physical infrastructure. The decree foresaw the financing of an increase of ICU, pulmonology and infectious diseases beds in derogation from budget limits. The decree also designated 340 million euro to hire healthcare professionals, facilities, equipment and transport vehicles from private facilities.

Transfers

The **Remote Health Rescue Operations Centre** "Centrale Remota Operazioni Soccorso Sanitario" (CROSS) was assigned[214] for the coordination of urgent medical aid in case of national emergency and was supposed to carry out all the functions of regional and interregional operational coordination, deriving from the COVID-19 crisis, relating to availability and use of beds as well as immediate and safe transport of patients. It was activated by the Department of Civil Protection on 7 March.[215] When activated, the CROSS manages requests for support from regions having difficulty in finding beds for patients in need of hospital ICU care. The CROSS then carries out a survey of the health resources that the other regions have available (bed provision by other regions is made mandatory). It then proceeds to the timely allocation of patients, identifying

the most suitable solutions depending on medical needs, and takes care of the transport using the most suitable means.

When regional capacity is saturated, the **patients in need of ICU were transferred to other regions by helicopter/airplane with the support of the army**.

Foreign capacity

By 4 April, a total of 38 Italian COVID-19 patients were **hospitalised in ICU in German hospitals** after being transferred by airplane, thanks to the Italian and German Air Force.[40]

Triage

An ethical framework was issued by the Italian Society of Anaesthesia Analgesia Reanimation and Intensive Care (Società Italiana di Anestesia Analgesia Rianimazione e Terapia Intensiva (SIAARTI)).[216, 217] Key elements of this framework are:

- When the availability of resources is overwhelmed by their need, a decision to deny access to one or more life-sustaining therapies, solely based on the principle of distributive justice, may ultimately be justified.
- Criteria for allocation should be flexible and adapted locally in response to available resources, the potential for patient transfer, and the ongoing or foreseen number of admissions.
- An age limit for admission to the ICU may ultimately need to be set.
- Together with age, the comorbidities and functional status of any critically ill patient should be carefully evaluated.
- Every admission to the ICU should be considered and communicated as an “ICU trial”. The appropriateness of life-sustaining treatments should be re-evaluated daily.

One motivating concern for the SIAARTI guidance was that, if no balanced and consistent allocation procedures were applied to prioritise patients, there would be a risk for unfair choices, and that the prevalent “first come, first served” principle would lead to many avoidable deaths. Among the drivers of decision for admission to ICU, age, comorbidities, and pre-existing functional status were included.[218] However, this ethical guidance has been criticised. [219]

Crowding

To avoid crowding within healthcare facilities and ensure social distancing in common areas, the Ministry of Health issued on 1 June some "Guidelines for the reorganisation of deferrable elective activity during the COVID-19 emergency".[220] It suggests to:

- Define separate pathways, with particular attention to fragile and immunosuppressed patients (e.g. oncologic, paediatric or geriatric patients);
- Define separate routes for entering and exiting the structures;
- Re-organise patient flows in waiting rooms according to the available space to guarantee social distancing;
- Extend opening hours to better distribute appointments throughout the day.

Digital solutions

Between March and June, a total of 174 initiatives were launched to enhance the delivery of services through digital technology.[40] Of these, 50 were COVID-specific, while the others were dedicated to diabetology, cardiology, general medicine, oncology, neurology and psychology and aimed to respond to health needs that are not COVID-19 related. The services include phone calls (20%) or video calls (29%), with the possibility of exchanging documents by e-mail or through instant messaging platforms. Some of these Apps were specifically designed for teleconsultations and monitoring (13%) and some web platforms allow access collaboration between multiple operators (38%). The services mostly provided by using digital solutions are medical examinations (47%) and monitoring of some vital parameters (33%), followed by counselling (8%). The initiatives also included assistance to nursing homes and contacts with family members. By

26 May, five Italian regions – Emilia Romagna, Lombardy, Tuscany, Veneto and Trento – formally issued regional resolutions enabling the provision of health services through telemedicine.

Appendix 3.4.4. Stuff / Supplies and equipment

PPE

According to Fattore et al.[40], the National Institute for Insurance against Accidents at Work has been attributed extraordinary competences for the duration of the crisis to respond faster to the shortage of PPE. On 27 March, it authorised a fast-track process to produce, import and sell PPE without compromising quality standards. The "Cure Italy decree" of 17 March authorised to release subsidised loans and non-refundable aid for a total of 50 million euro to companies converting their production to fast-track production of medical devices and PPE. Overall, in the month of March, 39.2 million masks were delivered.

Ventilators

In the press media attention was given to a tweet[yyy] of an Italian doctor who suggested the use of one ventilator for two patients, because of scarcity of ventilators. However, no further literature was identified on the extent this mechanism was applied in Italy, except for a publication[221] in which such a system was tested in the laboratory.

According to Fattore et al.[40], the government aimed to increase the number of ventilators by a total of 5 000, at a cost of 185 million euro. Between 23 and 29 March, 318 ventilators were distributed to the Italian regions by means of airplanes provided by the army and a defence and security company. A total of 1 231 ventilators were distributed during the month of March.

Appendix 3.4.5. System / Service reconfiguration

Data and information technology

In Italy there are two main sources of information on the COVID-19 epidemic: the Civil Protection data and those from the Istituto Superiore di Sanità[zzz] (ISS).[aaaa] Data from both institutions may differ because the type of data and the way they are collected are different.

Since 24 February, **the Civil Protection collects aggregated data** on a daily basis on the total number of positive tests, deaths, hospitalisations and intensive care admissions in each Province of Italy. Data are daily collected by the regional institutions and sent to the Ministry of Health, who in turn, sends the data to the Civil Protection Department.[222] The database is freely available at https://github.com/pcm- dpc/COVID- 19. An interactive dashboard is also available at http://arcg.is/C1unv.

Since 28 February, **the ISS coordinates a surveillance system** that integrates the microbiological and epidemiological data provided by the regions and by the National Reference Laboratory for SARS-CoV-2 of the ISS at an individual level. The ISS asks the regions to provide individual details on all cases, including demographics, clinical status and comorbidities. In addition, the ISS collects individual patient data from the medical records of deceased patients with positive COVID-19 test. The ISS created a dedicated IT platform, which allows the collection of data both through a web interface connected to the platform itself and by sending a dataset.[223] An interactive dashboard is also available at

yyy https://twitter.com/drmarcogarrone/status/1241135134188937218?s=20

zzz https://www.iss.it/web/iss-en

aaaa ISS has received the mission from the Ministry of Health to set up integrated surveillance system https://snlg.iss.it/wp-content/uploads/2020/03/CircolareMinSal_DefinizioneCasoCOVID19.pdf

https://www.epicentro.iss.it/en/coronavirus/sars-cov-2-dashboard. The ISS also established many working groups.[bbbb]

On 29 February the Italian Ministry of Health[197] requested that each region communicates to the Ministry of Health the following information:

- number of ICU beds that allow observation of patients waiting for the test result;
- number of ICU beds in a single negative pressure room;
- date of possible activation of each individual ICU per cohort;
- total number of beds in each individual ICU per cohort;
- number of single beds in each individual ICU per cohort;
- number of beds in pulmonology and sub-intensive respiratory therapy;
- number of isolation beds in infectious diseases;
- need for invasive and non-invasive monitoring and ventilation equipment.

Although the Civil Protection data include the number of patients hospitalised and admitted in ICU, we could not identify a national monitoring system of hospital (ICU) bed availability.

According to Fattore[40] **data scarcity** in the initial phases of the epidemic has hampered the collect and dissemination of data for policy assessment and evaluations. According to some experts' hypotheses, the inability of hospital ICT systems to record and signal initial infection peaks may have facilitated the spread of the virus in the beginning of 2020. In addition, there are differences in data at the micro level, both within and between regions, reflected by significant differences in mortality rates that cannot be fully explained by differences in testing approaches. It seems that these two weaknesses had an impact on the management of the pandemic as truly comparable data were lacking not only within Italy but also across countries. This complicated appropriate resource allocation and the identification of appropriate measures. The crisis has highlighted room for substantial reinforcement in the health system's digital infrastructure.

In addition Lazzerini and Putoto[224] state that *"While an open-access monitoring dashboard containing several essential indicators was created on March 8, no official Italian Government websites provide a full description of the characteristics (both age and comorbidities) of cases in the ICU, nor of those hospitalised, while unofficial and sometimes conflicting data are circulating in the media. Data are lacking on the prevalence of the disease among asymptomatic populations, so the real prevalence of COVID-19, its spectrum of presentation, and the real mortality rate all remain unknown. Clearly, better data are needed to support decision making and to build public awareness. As priority actions, we call for (1) a uniform system to count deaths and estimate case fatality rates across different countries, (2) surveillance of key characteristics (e.g., age, pre-existing pathologies) of both deceased patients and those admitted to the ICU to identify populations at risk and to estimate health service needs, and (3) more research to identify the prevalence and characteristics of the infection in the overall population and to better estimate COVID-19 death rates*"

Communication

No specific publications identified.

Appendix 3.4.6. Tools

Several publications were identified in which forecasting tools were presented. For example, Bollon et al.[225] developed two models to forecast the demand for hospital ICU and non-ICU beds for COVID-19 patients assuming either gradual easing of restrictions or intermittent lockdown. Remuzzi[49] presented a prediction model about possible ICU overload.

[bbbb] https://www.iss.it/documents/20126/0/20200514_COVID-19-Gruppi_di_lavoro.png/

Rodriguez Llanes[226] made estimations of national surge capacity for critical care utilisation and showed that ICU capacity would not be sufficient to deal with the peak of the epidemic that was coming. Berta et al.[227] developed a prediction model to forecast ICU demand that can be used at the local level. Graselli[195] is talking about using a prediction model without much specification. Finally, Sebastiani[228] made projections of infection rates and checked influence of governmental measures on the spread of the epidemic, but did no further calculation on hospital (ICU) occupancy.

Appendix 3.4.7. Restart regular activities

On 16 March the government issued a document[198] in which was specified which hospital activities could be postponed and which not (e.g. oncology care) based on a priority list that was developed in 2019. On 26 April, the Prime Minister announced the containment measures of the so-called “Phase 2” that gradually lifted restrictions starting from 4 May.

Outpatient services

In Phase 2 regions started to individually define guidelines to restart outpatient and elective surgical activity that were nationally suspended in the beginning of the crisis. This was the case in most Southern regions, while in the North only Emilia Romagna and Veneto resumed these services by 8 May. By 26 May, practices, recommendations and instructions to reactivate outpatient and elective surgeries were defined in 85% of the regions and this proportion was 90% by 9 June.[40] On 1 June, the Ministry of Health issued "Guidelines for the reorganisation of deferrable elective activity during the COVID-19 emergency", that gradually reactivated all essential levels of assistance guaranteeing safety in social or health services that had been reduced or suspended.

Regions were allowed to progressively reactivate specialised outpatient services, with particular attention to all activities related to oncologic screening, following the priority given to such services defined in the National Waiting Lists Governance Plan (PNGLA)[229] for the period 2019-2021. This plan categorises all outpatient services into four categories: class U (Urgent) include services to be performed as soon as possible and, in any case, within 72 hours; class B (Brief) includes services to be performed within 10 days; class D (Deferrable) are visits to be performed within 30 days and diagnostic tests to be performed within 60 days; and class P (Programmed) are services to be performed within 120 days. For both latter categories and all outpatient activities that were deferred due to the COVID-19 crisis, it was required to guarantee general prevention measures with specific attention to:

- Favouring virtual management of booking and payments, including access to waiting rooms;
- Favouring virtual delivery of services (telemedicine, video call, video conference) when possible;
- Reorganising logistics and flows to avoid overcrowding within hospitals and to guarantee social distancing, for example by setting up dedicated routes, extending opening hours;
- Detecting body temperature and respiratory symptoms for everybody accessing the facilities;
- Maintaining hand hygiene;
- Monitoring of the correct use of compulsory PPE.

Inpatient care

During Phase 1, most regions defined their own plan for re-organising hospital care. Regarding delivered services, Phase 1 was characterised by the high volume of hospitalisations for COVID-19 patients and the saturation of ICU, as well as by a decrease in the number of hospitalisations for non-COVID-19 patients. Comparing volumes of interventions in 2019 and in 2020, significant reductions of procedures with greater impact on intensive care (e.g. percutaneous transluminal coronary angioplasties) appeared. At a national level impacts on timeliness and accessibility to hospitalisation emerged even for acute events like acute myocardial infarction with repercussions in terms of mortality and time-to-care.[40] Nevertheless, it has been shown that cardiologic Hub&Spoke models allowed to contain the

impact of COVID-19 on clinical outcomes with a crucial role played by the re-definition of patient pathways.[230]

An ALTEMS report[231] showed that, at a national level, only 2.5% of the gastroenterology departments continued their activities without change. Centres carrying out endoscopic activity suspended their activities in 3.8% of the cases, while 66.7% reported a reduction of 60% or more in activity volumes. The variation, however, was lower for emergency procedures. The "guidelines for the reorganisation of deferrable elective activity during the COVID-19 emergency" suggested the same progressive approach as for outpatient services (see above) for elective hospitalisations belonging to classes B, C and D. For such services, however, the Ministry of Health recommended to base the reprogramming also on risk-benefit evaluations in relation to the clinical status of the patients.[40]

During the first week of the so-called "Phase 2", only two regions out of 20 (Tuscany and Emilia Romagna) started planning and remodelling the hospital network for the new phase. The situation was judged sustainable as the number of beds had been increased and the number of patients requiring ICU decreased. By 26 May, the organisation of hospital care was showing a very heterogeneous behaviour across regions, however none of them had issued specific formal regulations related to the reorganisation of hospital care for the second phase.

COVID-19 hospitals will be kept in place to address future waves of patients, but measures are undertaken to strengthen local and community healthcare. In particular, it is foreseen that the Ministry of Health will coordinate a series of activities in 2020 and 2021 to promote the integration between social and health services.[40]

Appendix 3.4.8. Evaluations

Prior to the crisis, the number of ICU beds was 5 300 and it was planned to double such amount. A report by the Bank of Italy[232] showed that the national volume increased by 3 360 (almost 65%) between 1 March and 21 April. The variation, however, was not homogeneous among regions due both to different starting capacities and unequal severity of the epidemics.

- Situation in the North and Centre of the country: Before the epidemic, the average number of beds per 100 000 inhabitants was in general from 7 to 10 with the highest values found in the North; the highest number was in Liguria having 12 beds per 100 000 inhabitants and the lowest in Trentino-Alto Adige having 6.7 beds per 100 000 inhabitants. The emergency interventions significantly increased regional differences as many regions of the North and Centre have doubled their capacity: Trentino-Alto Adige almost tripled the amount reaching 17.6 per 100 000 inhabitants. At present, Emilia Romagna (North) is the region with the highest incidence of ICU beds at 21.6, followed by Tuscany (Centre-North), Lazio (Centre). Lombardy and Veneto (North), which for many months were the most hit by the epidemic, provide around 16.5 beds per 100 000 inhabitants.
- Situation in the South: In most southern regions, the increase in capacity was more contained as the disease spread significantly less. The expansion plans indicate that in April regions were still strengthening their capacity in case their situation worsened.

A report by WHO Europe[51] described the first wave of the COVID-19 crisis in Italy and pointed among others to difficulties in "command and control" structures between national and regional governments and problems in obtaining accurate monitoring data needed for quick decision making.

According to Armocida et al.[233] and Garattini et al.[194], the Italian decentralisation and fragmentation of health services seemed to have restricted timely interventions and effectiveness, and they plea for a stronger national coordination.

Appendix 3.5. The Netherlands

This section is mainly based on the text of Kroneman et al.[39] and additional information obtained from them by email correspondence.

Appendix 3.5.1. Background

When the COVID-19 crisis emerged, the response was first at the regional level, then scaled up to the national level when it became more severe.[39] The National Institute for Public Health and the Environment (RIVM) was in charge of the coordination (also of testing and reporting cases).[cccc] An Outbreak Management Team (OMT)[234] was set up, hosted by the RIVM and composed of the relevant medical specialists, virologists, medical micro-biologists and representatives of the national references lab.[dddd] The OMT advises the Prime Minister and his Cabinet on necessary measures to be taken. The OMT gathered periodically during the COVID-19 crisis to discuss the medical situation and prepare measures to be taken and advice for the government.

In the Netherlands, a national pandemic response plan[236] existed before the COVID-19 crisis. The plan contains the actions to be taken in case of an infectious disease outbreak. It also details how the organisation of the Public Health Service should be modified to cope with the crisis. Measures to be taken are grouped in three categories (direct measures, upscaling, and downscaling) depending on the phase of the crisis and the plan also describes who is responsible for determining such phases. After the first case is reported, direct measures include treatment of the patient, testing, contact tracing, and lab diagnostics. Upscaling measures include cooperation with other parties, data registration, information provision, additional staff and continuation of regular care. Further measures include social distancing, refining contact tracing and diagnostics, hygiene measures, medical supervision, isolation and quarantine, vaccination and prophylaxis. Finally, downscaling measures include cancelling the crisis organisation, after care, evaluation and reporting.

Furthermore, the National Association of ICU physicians[237] has a specific pandemic action plan for ICUs which uses colour codes (green, yellow, orange, red and black).

There was no surge capacity plan available before the COVID-19 crisis. The Ministry of Health assigned in March a person to develop a plan on how to increase the current ICU capacity in a quick way.[238, 239] This plan recommended the establishment of 14 super specialised ICU that would only take care of ventilation of COVID-19 patients. It is unclear to us what exactly happened with this plan.

Later (in May), the Minister of Health commissioned the National Network of Acute Care to draft a surge capacity plan in preparation of a second wave. That plan had to take into account the following:

- There should be a plan to scale up ICU capacity to 1 700 beds (normal capacity is around 1 150 beds, actual capacity due to shortage of personnel is 1 050 beds);
- In case of a peak pressure on ICU capacity, the use of beds in Germany should be considered in an early stage;
- There should be a plan to scale up care to more than 1 700 beds in the case of peak pressure, in this case, regular care should be scaled down.

This resulted in a comprehensive report “Opschalingsplan COVID-19”[240] with sub-guidelines[241, 242] containing recommendations for surge in staff, space, stuff and system. This document was discussed in the Dutch parliament and in the debate the Ministry of Health stated that in future decision making, it is necessary to find a balance between:

[cccc] https://www.rivm.nl/coronavirus-covid-19

[dddd] The Outbreak Management Team was criticised for only having experts with a medical background and some suggested that social scientists should have been added to the team.[235]

- Feasibility of the plan: is increase in ICU capacity feasible in terms of sufficient staff availability and consequences for regular care in and outside the hospital.
- Necessity: what amount of extra ICU capacity is absolutely necessary to control the pandemic and to continue with regular care.
- Efficacy: ICU care is relatively expensive and it should be avoided to create extra capacity that remains empty only to stay ready.

The Minister of Health and the health insurers prepared a rescue plan for the healthcare sector so that no healthcare institution will go bankrupt due to the COVID-19 crisis.[243] The exact measure and the distribution of the cost between the Ministry of Health and the health insurers is still subject to negotiation.

Appendix 3.5.2. Staff / Workforce

Various strategies to surge staff

A shortage of healthcare personnel in hospitals, especially nurses, already existed before the COVID-19 outbreak. According to Kroneman et al.[39], a problem in scaling up hospital capacity was the availability of skilled ICU personnel.

Various strategies were used to surge staff. Hospitals made an appeal to **former healthcare personnel** (retired or not working in hospitals anymore) to volunteer for a job. A special **vacancy website** (https://www.gezondheidszorgbanen.nl/covid19)[244] was set-up where hospitals posted vacancies and persons who were willing to help could register themselves. Healthcare professionals whose official registration had expired after 1 January 2018 but were still sufficiently skilled were allowed to **return to practice** for COVID-19 related care. Additionally, **obligations for re-registration** were postponed.[245] For physicians willing to help on an ICU an **online training**[eeee] was available to refresh their knowledge. The **army provided medical personnel** and ventilators to several civilian hospitals. Although schools and childcare facilities were closed, children of healthcare professionals could still go to school and childcare in order to permit their parents to work. The Parliament accepted a motion stipulating that care personnel should receive **a bonus**. However, it is not clear how large this bonus will be and who is going to pay for it.[39]

Solidarity

Almost 100 Dutch physicians who worked abroad in tropical medicine volunteered to help the hospitals. Most of them were repatriated from Africa as a result of the COVID-19 crisis. They were familiar with working in acute situations and with limited facilities. They have been deployed in the triage teams of Dutch hospitals.

Testing

According to Kroneman 2020[39], healthcare personnel was not tested. Symptomatic personnel with a fever above 38ºC had to stay at home until 24 hours after the symptoms disappeared. In all other cases, when there was unprotected contact with a confirmed patient and the healthcare worker had symptoms, he/she had to either stay at home up to 24 hours after the symptoms disappeared or be tested.

Surge capacity plan for the second wave

Based on lessons from the first wave, the LNAZ developed a comprehensive surge capacity plan[240] detailing that the follow-up to the COVID-19 pandemic requires **careful monitoring** of its progress. This requires a detailed dashboard at the regional and national level, with early and late parameters such as the number of new infections and the number of hospital and ICU admissions, respectively. Regarding staff, it said that, in case of a new COVID-19 wave, healthcare personnel work should be facilitated (e.g. flexible contracts, children day-care, self-scheduling of shifts). The main

[eeee] https://nvic.nl/covid-19

challenge would be to find and retain qualified ICU nurses. Surge in staff capacity requires several parallel measures, e.g. temporary use of former ICU nurses, deployment of non-ICU nurses, deployment of non-nursing support personnel, and reduction of administrative burdens. The plan also recommended increasing influx into ICU training. Concerning training, a manual was developed by the LANZ.[242]

The Dutch Society for Intensive Care[246] calculated that for the intended 1 700 ICU beds a total of 7 650 FTE extra nurses would be needed. For this to be realised, much more nurses should enter the ICU education. Also it suggested to change the nurse/patient ratio from 1:2 to 1:3.

Appendix 3.5.3. Space / Infrastructure

Many strategies have been used in the Netherlands to improve surge in space for COVID-19 patients.

Stop elective procedures

In many hospitals, especially in the areas where the outbreak was the most severe, **all non-urgent medical procedures have been postponed**. Whenever possible, face-to-face consultations were reverted into telephone consultations. The freed-up capacity due to postponements was used for COVID-19 patients. Currently there are no hospitals exclusively treating COVID-19 patients.

Scale up of ICU

In the Netherlands, there were 1 150 ICU beds available, generally occupied at 70%.[39] It was aimed to scale up to 1 600 ICU beds for the week of 30 March of which 1 100 available for COVID-19 patients, then 2 000 beds available the next week and 2 500 the week after.

In “normal” situations, hospitals are responsible for their own capacity, they negotiate with health insurers on the care that can be provided and based on the negotiated result, capacity may be added or diminished. During the COVID-19 crisis, in principle hospitals were still responsible for the available capacity. **When their own capacity became insufficient, they could approach other hospitals in the region to take over patients.** ICU care was temporarily scaled up, but this was at the expense of regular care, which came to almost a complete standstill (except emergency care). Furthermore, extra beds were made available by **making use of beds at recovery rooms** that are normally used after surgery.

Dispersion of patients

When it became clear that regional capacity was not sufficient, the Health Inspectorate and the Minister of Health tasked the National Network Acute Care (Landelijk Netwerk Acute Zorg) to coordinate the national redistribution of patients. For this a **national coordination centre for patient distribution** “Landelijk Coördinatiecentrum voor patiëntenspreiding”[ffff] was established on 21 March by the National Network Acute Care and the Ministry of Health. The mission of this coordination centre is to create a nationwide system to disperse COVID-19 patients across the country based on the demand and (ICU) bed availability in regions in order to use all ICU capacity efficiently. In particular, patients from the southern and most affected provinces have been hospitalised in the North.

Patient transport

When distributing patients over other hospitals at national level, a **problem emerged in the capacity of patient transport**. Creative solutions were found such as the introduction of an **ICU bus (ambubus)** that could transport six patients at a time and with the **help of the army**.

In the first wave, the transportation of COVID-19 patients, especially those transported by helicopters, formed a health threat to regular emergency care for the inhabitants of the islands in the Wadden Sea. The helicopter that is normally used for emergencies on these islands was used for transportation

[ffff] https://lcps.nu/

of COVID-19 patients. Extra high speed boats were used to transport regular emergency cases.

During the first wave, at first hospitals had to organise themselves the transfer of patients to other hospitals. This took quite a lot of time in getting this organised. Later on, this task was performed by the National Network Acute Care.

Military aid

The Calamity Hospital, which is part of the University Medical Centre Utrecht and which is targeted to treat patients in case of large disasters or incidents, was preparing to have a maximum of 80 extra beds available. The military provided the personnel necessary for deploying these beds (56 nurses, 10 doctors and 26 support staff).[247] The army also helped in re-allocating patients to other hospitals.

Cross-boarder aid

There exists a cross border collaboration with Germany that took over some COVID-19 patients from the Netherlands to relieve pressure on Dutch ICU capacity. However, also here transport capacity raised issues. In addition, communication problems arose for patients and their families due to a language barrier that could be traumatic.

For the use of German hospital capacity, it appeared to be helpful to have a coordinating hospital in Germany for distributing the patients. German hospitals offered to help out when the peak was going on in two hardest hit provinces in the Netherlands.

Intermediate care

At the Jeroen Bosch Hospital in Den Bosch, patients were considered to be better off at home than in the hospital because hospital care is impersonal due to the use of protective equipment by the personnel and the interdiction of visits. Patients staying at home, if necessary with additional oxygen supply, stay in their own environment, which is considered to be favourable to their healing. **For people who cannot stay at home, the hospital has created corona care centres, where people are cared for in a homely environment.** In these centres, patients are allowed to be accompanied by one relative and care is provided by GPs and home care personnel. As of 1 April, two of these centres had opened already (with a total of 56 beds) and others were expected to follow.[248]

A few rehabilitation centres have set up special departments for treating post-ICU patients, to help them overcome not only the physical aftermath of the disease, but also the emotional and mental consequences. These special departments can admit patients from hospitals in a relatively early stage of recovery and thus free hospital capacity.[249, 250]

Telehealth

At the Leiden Medical Centre, patients were discharged early with a self-test kit enabling them to measure their temperature, blood oxygen levels and blood pressure. Patients report their values in a daily video call with the hospital. According to the hospital, this allowed care to be provided at home when possible and in the hospital when necessary. The hospital had previous experience with this type of telecare for heart surgery patients.[251]

Also, the Dutch Healthcare Authority allowed to conduct the initial patient consultation by telephone or otherwise remotely in case of regular care.

To limit the number referrals to hospital, GPs and medical specialists have introduced a **low-threshold consultation between a GP and medical specialist.** In addition, one medical specialist coordinated the care for patients with multi-morbidities, and this medical specialist had to take over the care of other specialists as much as possible. In most cases, these specialists are general specialists such as a specialists for the care of the elderly.[252]

Super specialised ICU for COVID-19 patients

The idea was launched to create super specialised ICU centres that only care for COVID-19 patients who need ventilation therapy.[238, 239] This would be along the 14 trauma centres across the country. It is not clear to us if these have been established.

Triage

Guidelines were developed for triage detailing who to admit to ICU in times of overpressure and what criteria to follow.[237, 253]

For some patients with underlying conditions, admission to ICU may worsen their initial condition in such a way that either survival may be at risk or recovery may take long and returning to a functional condition is unlikely. Before admission to an ICU and in case a patient is still capable of communication, the physician discusses with him such consequences. The patient and physician may then decide to refrain from ICU admission. This process for care decision making is usual in the Netherlands. Before the patient is sent to hospital, the GP starts the same type of discussion and some patients may decide to stay at home. However, this may be problematic due to limited personnel in home care.[254]

Surge capacity plan for the second wave

As already mentioned, the LNAZ developed a comprehensive surge capacity plan[240] for optimisation of care for COVID-19 patients based on the clinical lessons learned during the first wave. The plan offers opportunities for better triage, referral and treatment and in this way it could diminish the number of patients requiring hospital (ICU) admission. The starting point is that both COVID-19 and non-COVID-19 patients should receive care locally. However, from the first wave, it was learned that sometimes regional and national coordination might be required. This assumes clear agreements about how and when up-scaled coordination is needed. Hereto, the plan contains a 7-step upscale model. The phased coordination assumes as well that the National Coordination Centre for the Redistribution of Patients remains functional. Information on available capacity is essential for the coordination. Hereto hospitals need to submit data an availability and occupancy to the regional coordination centres, preferably in an automatic way with actual information. Beside a national coordination centre, regional coordination centres are also needed to disperse patients across hospitals in the region.

Care for COVID-19 patients will be needed for a long time. This means that ICU capacity should be structurally extended to 1 350 beds. In case of a second wave of COVID-19, ICU capacity should have the flexibility to upscale to 1 700 beds. Upscaling ICU capacity assumes as well an upscaling of regular care beds with 1 300 beds in order to be able to care of COVID-19 patients and non-COVID-19

..0 patients. Hospitals need to adjust their infrastructure, organisation and equipment to be able to extend to these required 1 700 ICU and 1 300 non-ICU beds. Hereto, agreements are needed for the financing of it.

Sufficient ICU and hospital care also require sufficient and adequate care in primary care, home and residential care settings. Increase of ICU capacity also assumes an increase of ambulance capacity and mobile medical teams. It is estimated that seven mobile intensive care teams (and an additional 25 ambulances) will be needed on top of the seven existing ones. Transfer of patients to ICUs in Germany might still be required in the future.

Appendix 3.5.4. Stuff / Supplies and equipment

PPE

Also **shortages in protective equipment** were reported, especially face masks. A large order of face masks (that was already distributed to hospitals) appeared to be of insufficient quality and had to be recalled.[255] The guidelines for mask use were adjusted on 9 and 18 March so that FFP2 masks could only be used when treatment may cause a lot of aerosols (as is the case with intubation and some other medical procedures). In all other cases, surgical masks were considered sufficient. Hospitals were advised to keep used masks in order to disinfect **and re-use** them as soon as an approved method becomes available.

A **central reporting point for shortages in PPE**, initiated by a professional association for nurses, was created in order to have an overview of where shortages become problematic.

As a result of the shortage of PPE, a central allocation model was developed to monitor the availability and manage distribution. The **Regional Coordination Centre Acute Care (Regionaal Overleg Acute Zorg)** assessed the demand for this equipment at the regional level, and regional

data were aggregated every day to create an overview at the national level. The **National Consortium Assistive Devices** (Landelijk Consortium Hulpmiddelen)[256] manages the physical distribution of the available resources.[257, 258] Initially, this model focused on supplying hospitals as a first priority.

Drugs

Also a national coordination centre for medication necessary in the care for COVID-19 patients was established.[259] This centre makes daily contacts with the hospital pharmacies and pharmaceutical distributors to monitor demand and supply of these drugs. It also plays a mediator role in obtaining medication from abroad.

Ventilators

A **shortage of ventilator** equipment was reported. **Private hospitals** (independent treatment centres) provided equipment that could be used for treating COVID-19 patients. The **army** also provided ventilator equipment (and personnel) to hospitals. The Ministry of Health ordered 1 000 additional devices, of which 100 were delivered as of 29 March.[260]

The Dutch government ordered 2 000 additional devices from several manufacturers, but it is unsure whether these are all delivered.[39] Several initiatives to develop simple ventilators have been initiated, such as a company that already delivers parts of ventilators, intended to deliver 500 “simple” devices to the government.

The Dutch Society for Intensive Care[261] prepared a guideline for **shared ventilation**, just in case it would be needed, but they warned that this should only be applied in extreme circumstances. As far as we know shared ventilation was not applied in the Netherlands in the first wave.

Appendix 3.5.5. System / Service reconfiguration

Data and information technology

To ensure optimal use of available beds, all hospitals in the Netherlands were obliged to share their (ICU) bed availability with the National Coordination Centre real-time computer system. This national coordination was required, as the transfer of large numbers of patients led to chaotic situations.[262] However, at the start there was a hassle about which system should be used. The Network of Medical Information Specialists criticised the system, arguing that there were already alternatives in place (such as www.zorg-capaciteit.nl). However, the National Coordination Centre system is real-time and therefore claimed to be more accurate than systems requiring manual updates.[263]

As mentioned before, a national coordination centre for patient distribution “Landelijk Coördinatiecentrum voor patiëntenspreiding” was established on 21 March with the mission to create a nationwide system to disperse COVID-19 patients across the country based on the demand and (ICU) bed availability in regions. To fulfil this mission a good overview of available bed capacity and transport means was necessary. Hereto, it made use of the data of the national platform care coordination (Landelijk Platform zorgcoordinatie 2TWNTY4)[gggg] regarding bed availability and data of the “Stichting Nationale Intensive Care Evaluatie” (NICE)[hhhh] regarding number of hospital and ICU admissions (NICE receives each half an hour data on new admissions of COVID-19 patients).

gggg https://2twnty4.nl/

hhhh https://www.stichting-nice.nl/covid-19-op-de-ic.jsp

https://stichting-nice.nl/dd/#modules

https://stichting-nice.nl/download/file?link=20201026102339COVID19registratieitemlijstnl

Regarding bed capacity, hospitals were required to enter information[iiii] on the number of beds available in general units (split by COVID-19 and non-COVID-19 patients), number of ICU beds with ventilator equipment available (split by COVID-19 and non-COVID-19 patients) and number of ICU beds without ventilator equipment available for non-COVID-19 patients.

Data registration did not always go smoothly and there were differences in numbers depending on the source; e.g. hospital admission figures used in the national corona-dashboard appeared to be less than in reality[264]; on the dashboard it was mentioned that there were 1 500 hospital admissions in the period 1 July – 13 October while NICE counted 3 380.

Communication

No specific information was found on this.

Appendix 3.5.6. Restart regular activities

When an exit strategy was envisaged, the Outbreak Management Team, which advises the government on measures to be taken, formulated five conditions that should be met before measures could be gradually eased:

- The number of newly infected persons by each infected person (R0) should be below one for a long period;
- The healthcare system, including ICU, should not be working at or above its capacity and should have had time to recover;
- Testing capacity should be sufficient;
- Capacity for contact tracing should be sufficient, including the capacity to analyse large numbers of data;
- Measurement systems should be available to evaluate the effect of the strategy.

Resuming care was coordinated by the Regional Coordination Centres Acute Care (Regionale Overleggen Acute Zorg, ROAZ), as demand for care varies by region.[265]

A strategy to gradually resume regular care while avoiding negative health outcomes was developed by the Dutch Healthcare Authority when ICU occupation by COVID-19 patients decreased.[266] As a first step, the National Centre for the Distribution of Patients (Landelijk Centrum Patiënten Spreiding, LCPS) drafted a list[267, 268] of diagnoses, for which the Medical Professional Associations assigned an urgency indication. The list aimed to facilitate restarting the most urgent elective care first. The list was validated by the Dutch Healthcare Institute (Zorginstituut Nederland).[269] In addition, the Federation of Medical Specialists developed a guideline on restart of regular outpatient care.[270]

For drafting the plan for the second wave all stakeholders were involved: the professional association for nurses, the professional association for Intensive Care Units, the Federation of Medical Specialists, the national association of hospitals, the national association of university hospitals, the association of health insurers, the association of ambulance services, and the Dutch Healthcare Authority. A core team was assembled from the stakeholders and several working groups, consisting of professionals from the relevant disciplines (on personal title) developed parts of the plan. According to a report of the Dutch Healthcare Inspectorate[271] all parties involved agreed that maintaining regular care should be a priority, in the preparation of a second wave.

Appendix 3.5.7. Tools

At the beginning of June, the government launched a coronavirus dashboard (https://coronadashboard.rijksoverheid.nl/) providing figures on the spread of the virus and the health impact, presented in a graphical way.

https://stichting-nice.nl/download/file?link=20201026102053COVID19registratievolledignl

[iiii] https://www.zorg-capaciteit.nl/beddencapaciteit/

As mentioned before, a registration system was set up for evaluating available capacity. This system made use of the information available in the National Intensive Care Evaluation database (www.stichting-nice.nl) for numbers of patients and the database of Care Capacity (https://www.zorg-capaciteit.nl/beddencapaciteit/) for bed capacity.

The Amsterdam university medical center used a tool "**icu-covid-sim"** to monitor the inflow of patients in ICU; the tool can inform decisions about how many COVID-19 patients can be handled.[104, 272]

Appendix 3.5.8. Evaluations

The aforementioned surge capacity plan of LNAZ[240] was based on the lessons learned in the first wave. According to them, the main problems were among others suboptimal systems to detect new COVID-19 cases in an early phase and to monitor hospital bed availability and occupancy, insufficient personnel to staff the required extra ICU beds, dispersion of patients across the country that requires a large amount of extra transport capacity and needs to be well coordinated, and transfer of patients abroad that has a large impact on patient and family.

The LNAZ[241] also evaluated the cooperation with Germany regarding the transfer of patients and stated that more attention and support is needed for patients and family. Hereto, Dutch healthcare professionals need actual insight in the clinical status of the patients in order to inform properly the family and to prepare eventual return to the Netherlands. Also attention is needed for language and culture barriers between the two countries.

An evaluation by the Dutch Healthcare Inspectorate revealed that more attention should be paid to the communication around automated sharing of capacity data. The Inspectorate concluded that it was difficult to obtain an overview of availability and occupancy of beds and this hindered adequate dispersion or patients over the country. It also recommended that nursing homes should be integrated in care networks and that hospitals, primary care and residential care settings should better cooperate. Finally, it recommended to better integrate nurses in the hospital crisis management.[271, 273]

The Ministry of Health[274, 275] planned two ways of evaluation, on the one hand a formal evaluation and on the other hand "lessons learned"[276] via interviews with care field representatives. The formal evaluation will be carried out by the "Onderzoeksraad voor Veiligheid" in which it will look at pandemic preparedness, crisis governance, government measures and implementation and effects of them.[277]

From the field interviews[278], a main lesson learned concerned the structure and governance of the crisis organisation: procedures for cooperation between regional and national levels should better be described, including each mandate. Here as well, it was found that the monitor system on hospital bed availability was not well performing and should be optimised for an eventual second wave; the report pleas that necessary data should be entered only once at the source. And many participants stated the ICU capacity in the Netherlands is too low and should structurally be extended. Also it was found that elective procedures were postponed/cancelled to a too great extent and this should absolutely be avoided in case of a second wave. The report recommends further to extend the use of digital care and to pay much more attention to the quality of care to be delivered in case of a second wave.

Finally, several studies have been performed (or are ongoing) on the "collateral damage" and indirect effects caused by the COVID-19 crisis. For example the study[279, 280] of the RIVM lists all types of surveys that have been performed by professional and patient organisations and found among others that much specialised care for non-COVID-19 patients was postponed and that much less cancer diagnoses were made. A same pattern was found in cardiology patients in a study of the NZa.[281] A study of the Dutch Federation of Cancer patient organisations NFK[282] among 5 300 patients with cancer found that many of them were seriously worried about the postponing of their therapy.

REFERENCES

1. Gerkens S, Rondia K. COVID-19 Health System Response Monitor for Belgium. WHO Regional Office for Europe, the European Commission and the European Observatory on Health Systems and Policies; 2020. Available from: https://www.covid19healthsystem.org/countries/belgium/countrypage.aspx
2. World Health Organization. International Health Regulations (2005), Third edition. 2016. Available from: https://apps.who.int/iris/bitstream/handle/10665/246107/9789241580496-eng.pdf;jsessionid=FB1C0B99734B478E926DD5A4CC9FB0E5?sequence=1
3. FOD Volksgezondheid, Veiligheid van de Voedselketen en Leefmilieu. Organisatie van het Covid-crisisbeheer voor het onderdeel Volksgezondheid. 2020.
4. Koninklijk besluit van 23 oktober 1964 tot bepaling van de normen die door de ziekenhuizen en hun diensten moeten worden nageleefd, B.S. 7 november 1964.
5. FOD Volksgezondheid, Veiligheid van de Voedselketen en Leefmilieu. Ziekenhuisnoodplan. 2016. Available from: https://www.health.belgium.be/sites/default/files/uploads/fields/fpshealth_theme_file/deel_1_0.pdf
6. Protocolakkoord gesloten tussen de federale regering en de overheden bedoeld in art. 128, 130, 135 en 138 van de Grondwet, over de ziekenhuisnoodplanning, B.S. 20 januari 2017.
7. World Health Organization. Strengthening the health systems response to COVID-19. Creating surge capacity for acute and intensive care. Copenhagen: WHO Regional Office for Europe; 2020.
8. FOD Volksgezondheid, Veiligheid van de Voedselketen en Leefmilieu. Interministeriële conferentie volksgezondheid [Web page]. Available from:

https://overlegorganen.gezondheid.belgie.be/nl/advies-en-overlegorgaan/interministeriele-conferentie/interministeriele-conferentie-volksgezondheid

9. Koninklijk besluit van 30 april 2020 betreffende een correcte en tijdige informatiestroom over de aantallen COVID−19-patiënten, de behandelcapaciteit in ziekenhuizen en voorraden aan persoonlijk beschermingsmateriaal, B.S. 6 mei 2020.

10. Sciensano. COVID-19-Surveillance veelgestelde vragen [Web page]. Available from: https://covid-19.sciensano.be/sites/default/files/Covid19/COVID-19_FAQ_NL_final.pdf

11. Van Goethem N, Vilain A, Wyndham-Thomas C, Deblonde J, Bossuyt N, Lernout T, et al. Rapid establishment of a national surveillance of COVID-19 hospitalizations in Belgium. Archives of Public Health. 2020;78(121).

12. Van Beckhoven D, Duysburgh E, Montourcy M, De Rouck M, Vilain A, Catteau L, et al. Belangrijkste punten van de surveillance van ziekenhuispatiënten met een COVID-19-infectie: Resultaten tot en met 14 juni 2020. Brussel: Sciensano; 2020. Available from: https://covid-19.sciensano.be/sites/default/files/Covid19/COVID-19_BRIEF_HOSPITAL_REPORT_NL.pdf

13. Faes C, Abrams S, Van Beckhoven D, Meyfroidt G, Vlieghe E, Hens N. Time between Symptom Onset, Hospitalisation and Recovery or Death: a Statistical Analysis of Different Time-Delay Distributions in Belgian COVID-19 Patients. medRxiv. 2020:2020.07.18.20156307.

14. European Centre for Disease Prevention and Control. Best practice recommendations for conducting after-action reviews to enhance public health preparedness. Stockholm; 2018.

15. European Centre for Disease Prevention and Control. Conducting in-action and after-action reviews of the public health response to COVID-19. Stockholm; 2020.

16. World Health Organization. Guidance for after action review (AAR). Geneva; 2019.

17. Kohn L, Christiaens W. The use of Qualitative Research Methods in KCE studies. Brussels: Belgian Healthcare Knowledge Centre (KCE); 2012. Method. Brussels: Belgian Health Care Knowledge Centre (KCE) D/2012/10.273/68

18. Belgisch Raadgevend Comité voor Bio-ethiek. Advies nr. 48 van 30 maart 2009 betreffende het Belgisch operationeel plan influenzapandemie. Vraag om advies van 20 maart 2008, van mevr. L. Onkelinx, Minister van Sociale zaken en Volksgezondheid, betreffende het operationeel plan influenzapandemie. 2009. Available from: https://www.health.belgium.be/sites/default/files/uploads/fields/fpshealth_theme_file/advies_48_pandemie.pdf

19. Crisiscentrum - Centre de crise. Mise en place d'un business continuity planning - Préparation à l'émergence d'une pandémie (Version originale : 2008; Mise à jour : mars 2020). 2008. Available from: https://centredecrise.be/sites/default/files/bcp_checklist_fr_2020_2.pdf

20. Interministerieel Commissariaat Influenza. Belgisch noodplan voor een grieppandemie. 2006.

21. Brimioulle S, Colpaert K, Decruyenaere J. Het MICA project. 2017. Available from: https://overlegorganen.gezondheid.belgie.be/sites/default/files/documents/het_mica_project_-_nl_2018.pdf

22. MICA. Wat is het MICA-project – Monitoring Intensieve zorgactiviteiten? [Web page]. 2020 [cited 28/10/2020]. Available from: https://www.micaproject.be/nl/the-project/

23. FOD Volksgezondheid, Veiligheid van de Voedselketen en Leefmilieu. P4P-indicatorenset 2020: Pay for Performance programma voor algemene ziekenhuizen. Brussel: 2020. Available

from: https://www.health.belgium.be/sites/default/files/programma_p4p_2020_def.pdf

24. VBS. Lijst van urgentiegraden per specialisme [Web page]. 2020 [cited 28/10/2020]. Available from: https://www.vbs-gbs.org/index.php?id=covid-19

25. RIZIV. COVID-19 - We willen de impact op de RIZIV-uitgaven kennen en houden nauwgezet de vinger aan de pols. 2020. Available from: https://www.riziv.fgov.be/SiteCollectionDocuments/bijlage_conclusies_rapport_monitoring_juli20.pdf

26. RIZIV. Monitoring COVID-19. 2020. Available from: https://www.riziv.fgov.be/SiteCollectionDocuments/monitoring_rapport_covid19-september.pdf

27. Versailles M-P, De Wolf F. Statistiques COVID19 - Admissions Hôpitaux. 2020. Available from: https://www.ima-aim.be/IMG/pdf/ima-covid19-admissions_hopitaux-20201011.pdf

28. Belgisch Kankerregister. Door coronacrisis sterke daling van de nieuwe kankerdiagnoses in april [Web page]. 2020 [cited 29/10/2020].

29. Belgisch Kankerregister. COVID-19. Naar schatting 5000 verwachte kankerdiagnoses nog niet gesteld [Web page]. 2020 [cited 22/11/2020]. Available from: http://kankerregister.org/default.aspx?PageId=204

30. Vlaams Patiëntenplatform. Wordt zorg bij personen met een chronische aandoening uitgesteld wegens het coronavirus COVID-19? Heverlee: 2020. Available from: http://vlaamspatientenplatform.be/uploads/documents/Rapport_uitgestelde_zorg.pdf

31. Avalosse H, Bruyneel L, Hens E, Kestens W, Willaert D. Intermutualistische enquête. Raadpleging op afstand. CIN-NIC; 18 september 2020. Available from: https://gcm.rmnet.be/clients/rmnet/content/medias/intermutualistisch_onderzoeksrapport-raadplegingen_op_afstand-18092020.pdf

32. Vlaams Patiëntenplatform. Hoe verloopt de heropstart van de zorg voor personen met een chronische aandoening? Heverlee: 2020. Available from: http://vlaamspatientenplatform.be/uploads/documents/Rapport_heropstart_zorg.pdf

33. Vlaams Patiëntenplatform. Resultaten derde bevraging uitgestelde zorg [Web page]. 2020 [cited 29/10/2020]. Available from: http://vlaamspatientenplatform.be/blogs/resultaten-derde-bevraging-uitgestelde-zorg-1

34. ZorgSamen. De ZorgSamen Barometer [Web page]. 2020 [cited 30/10/2020]. Available from: https://www.dezorgsamen.be/barometer/

35. Vanhaecht K. Zorgverleners zijn veerkrachtig, maar opvolging en ondersteuning zijn wenselijk. Dat blijkt uit het Barometer onderzoek bij 8350 medewerkers uit zorg & welzijn tijdens de COVID-19 pandemie. 2020.

36. Smith P, Bruyneel A. 7 infirmiers(e) sur 10 en Belgique francophone sont à risque de burnout. 2020.

37. Van den Heede K, Bruyneel L, Beeckmans D, Boon N, Bouckaert N, Cornelis J, et al. Safe nurse staffing levels in acute hospitals. Health Services Research (HSR). Brussels: Belgian Health Care Knowledge Centre (KCE); 2019 01/2020. KCE Reports 325 Available from: https://kce.fgov.be/sites/default/files/atoms/files/KCE_325_Safe_nurse_staffing_levels_Report.pdf

38. Bruyneel A, Gallan MC, Tackb J, Hondt A, Canipel S, Franck S, et al. Impact of COVID19 on nursing time in intensive care units in Belgium. Intensive and Critical Care Nursing. 2020;In Press.

39. Kroneman M, Groenewegen P, de Jong J, Paget J. The Health System Response Monitor: the Netherlands. In: van Ginneken E,

Webb E, editors. COVID-19 Health System Response Monitor: European Observatory on Health Systems and Policies; 2020.

40. Fattore G, de Belvis AG, Ricciardi W, Morsella A, Pastorino G, Poscia A, et al. The Health System Response Monitor: Italy. In: Scarpetti G, Maresso A, editors. COVID-19 Health System Response Monitor: European Observatory on Health Systems and Policies; 2020.

41. Rajan S, Curry N. The Health System Response Monitor: United Kingdom. In: Williams GA, editor. COVID-19 Health System Response Monitor: European Observatory on Health Systems and Policies; 2020.

42. Winkelmann J, Reichebner C. The Health System Response Monitor: Germany. In: Blümel M, Winkelmann J, editors. COVID-19 Health System Response Monitor: European Observatory on Health Systems and Policies; 2020.

43. Cameron E, Nuzzo J, Bell J. Global Health Index. NTI; 2019.

44. Deep Knowledge Group. States at Risk. Big Data Analysis of 100 Countries and Regions. Safety Ranking and Risk Assessment. 2020.

45. The Economist Intelligence Unit. How well have OECD countries responded to the coronavirus crisis? 2020.

46. National Audit Office. Readying the NHS and adult social care in England for COVID-19. London; 2020.

47. Grasselli G, Zangrillo A, Zanella A, Antonelli M, Cabrini L, Castelli A, et al. Baseline Characteristics and Outcomes of 1591 Patients Infected With SARS-CoV-2 Admitted to ICUs of the Lombardy Region, Italy. JAMA. 2020;323(16):1574-81.

48. Sacchetto D, Raviolo M, Beltrando C, Tommasoni N. COVID-19 surge capacity solutions: our experience of converting a concert hall into a temporary hospital for mild and moderate COVID-19 patients. Disaster Med Public Health Prep. 2020:1-10.

49. Remuzzi A, Remuzzi G. COVID-19 and Italy: what next? The Lancet. 2020;395(10231):1225-8.

50. Nacoti M, Ciocca A, Giuppone A. At the Epicenter of COVID-19 Pandemic and Humanitarian Crisis in Italy: Changing Perspectives on Preparation and Mitigation. NEJM Catalyst. 2020.

51. WHO Regional Office for Europe. An unprecedented challenge. Italy's first response to COVID-19. Copenhagen: World Health Organization, Regional Office for Europe; 2020.

52. Maier CB, Scarpetti G, Williams GA. What strategies are countries using to expand health workforce surge capacity to treat COVID-19 patients? [Web page]. COVID-19 Health System Report Monitor;2020. Available from: https://analysis.covid19healthsystem.org/index.php/2020/04/23/what-strategies-are-countries-using-to-expand-health-workforce-surge-capacity-to-treat-covid-19-patients/

53. Reed S. Resuming health services during the Covid-19 pandemic. What can the NHS learn from other countries? The Nuffield Trust; 2020.

54. Rozenblum S, Greer SL, Wismar M, Jarman H. What is the role of the military in the COVID-19 response? [Web page]. 2020. Available from: https://analysis.covid19healthsystem.org/index.php/2020/05/29/what-is-the-role-of-the-military-in-covid-19-response/

55. Williams GA, Maier CB, Scarpetti G, de Belvis AG, Fattore G, Morsella A, et al. What strategies are countries using to expand health workforce surge capacity during the COVID-19 pandemic? Eurohealth. 2020;26(2):51-7.

56. Williams GA, Scarpetti G, Bezzina A, Vincenti K, Grech K, Kowalska-Bobko I, et al. How are countries supporting their health workers during COVID-19? Eurohealth. 2020;26(2):58-62.

57. Balzhan S, Kanat A, Yessengali O. State capacity in responding to COVID-19. MPRA; 2020.

58. Stribling J, Clifton A, McGill G, de Vries K. Examining the UK Covid-19 mortality paradox: Pandemic preparedness, healthcare expenditure and the nursing workforce. Journal of Advanced Nursing. 2020;76:3218–27.

59. Allain-Dupré D, Chatry I, Michalun V, Moisio A. The territorial impact of COVID-19: Managing the crisis across levels of government. OECD; 2020.

60. Barbisch DF, Koenig KL. Understanding surge capacity: essential elements. Acad Emerg Med. 2006;13(11):1098-102.

61. European Centre for Disease Prevention and Control. Checklist for hospitals preparing for the reception and care of coronavirus 2019 (COVID-19) patients. Stockholm: ECDC; 2020.

62. Anesi GL, Lynch Y, Evans L. A Conceptual and Adaptable Approach to Hospital Preparedness for Acute Surge Events Due to Emerging Infectious Diseases. Crit Care Explor. 2020;2(4):e0110.

63. Aziz S, Arabi YM, Alhazzani W, Evans L, Citerio G, Fischkoff K, et al. Managing ICU surge during the COVID-19 crisis: rapid guidelines. Intensive Care Medicine. 2020.

64. Christen P, D'Aeth JC, Løchen A, McCabe R, Rizmie D, Schmit N, et al. Report 15: Strengthening hospital capacity for the COVID-19 pandemic. Imperial College COVID-19 Response Team; 2020.

65. Hick JL, Barbera JA, Kelen GD. Refining surge capacity: conventional, contingency, and crisis capacity. Disaster Med Public Health Prep. 2009;3(2 Suppl):S59-67.

66. Hick JL, Christian MD, Sprung CL. Chapter 2. Surge capacity and infrastructure considerations for mass critical care. Recommendations and standard operating procedures for intensive care unit and hospital preparations for an influenza epidemic or mass disaster. Intensive Care Med. 2010;36 Suppl 1:S11-20.

67. Thomas S, Sagan A, Larkin J, Cylus J, Figueras J, Karanikolos M. Strengthening health systems resilience. Key concepts and strategies. Copenhagen: WHO Regional Office for Europe 2020.

68. World Health Organization. Hospital Readiness Checklist for COVID-19. Copenhagen: World Health Organization Regional Office for Europe; 2020.

69. Hick J, Hanfling D, Wynia M, Pavia A. Duty to Plan: Health Care, Crisis Standards of Care, and Novel Coronavirus SARS-CoV-2. 2020 03/05. NAM Perspectives

70. National Academies of Sciences - Engineering and Medicine. Rapid Expert Consultation on Staffing Considerations for Crisis Standards of Care for the COVID-19 Pandemic. Washington: The National Academies Press; 2020.

71. Abir M, Nelson C, Chan EW, Al-Ibrahim H, Cutter C, Patel K, et al. Critical Care Surge Response Strategies for the 2020 COVID-19 Outbreak in the United States. Santa Monica: RAND Corporation; 2020.

72. Bader MK, Braun A, Fox C, Dwinell L, Cord J, Andersen M, et al. A California Hospital's Response to COVID-19: From a Ripple to a Tsunami Warning. Am A Crit Care Nurs. 2020.

73. Capolongo S, Gola M, Brambilla A, Morganti A, Mosca EI, Barach P. COVID-19 and Healthcare Facilities: a Decalogue of Design Strategies for Resilient Hospitals. Acta Biomed. 2020;91(9-s):50-60.

74. Einav S, Hick JL, Hanfling D, Kissoon N, Dichter JR, Devereaux AV, et al. Surge capacity principles: care of the critically ill and injured during pandemics and disasters: CHEST consensus statement. Chest. 2014;146(4 Suppl):e1S-e16S.

75. Meyer D, Bishai D, Ravi SJ, Rashid H, Mahmood SS, Toner E, et al. A checklist to improve health system resilience to infectious disease outbreaks and natural hazards. BMJ Global Health. 2020;5:e002429.

76. Margalit G, Rosen Y, Tekes-Manova D, Golan M, Benedek P, Levy Y, et al. Recommendations for nursing requirements at a field hospital, based on the Israel Defense Forces field hospital at the earthquake disaster in Turkey-August 1999. Accident and Emergency Nursing. 2002;10:2017-220.

77. Maves RC, Downar J, Dichter JR, Hick JL, Devereaux A, Geiling JA, et al. Triage of Scarce Critical Care Resources in COVID-19 An Implementation Guide for Regional Allocation: An Expert Panel Report of the Task Force for Mass Critical Care and the American College of Chest Physicians. Chest. 2020.

78. Quill TE, Holloway R. Time-limited trials near the end of life. JAMA. 2011;306(13):1483-4.

79. Christian MD, Sprung CL, King MA, Dichter JR, Kissoon N, Devereaux A, et al. Care of the Critically Ill and Injured During Pandemics and Disasters: CHEST Consensus Statement. Chest. 2014;146(4):e61S-e74S.

80. New York State Task Force on Life and the Law. New York State ventilator allocation protocol. 2015.

81. Vawter DE, Garrett JE, Gervais KG, Prehn AW, DeBruin DA, Tauer CA, et al. For the Good of Us All: Ethically Rationing Health Resources in Minnesota in a Severe Influenza Pandemic. 2010. Available from: https://www.health.state.mn.us/communities/ep/surge/crisis/ethics.pdf

82. Paganini M, Conti A, Weinstein E, Della Corte F, Ragazzoni L. Translating COVID-19 Pandemic Surge Theory to Practice in the Emergency Department: How to Expand Structure. Disaster Med Public Health Prep. 2020:1-10.

83. Ni YN, Luo J, Yu H, Liu D, Liang BM, Liang ZA. The effect of high-flow nasal cannula in reducing the mortality and the rate of endotracheal intubation when used before mechanical ventilation compared with conventional oxygen therapy and noninvasive positive pressure ventilation. A systematic review and meta-analysis. Am J Emerg Med. 2018;36(2):226-33.

84. Ou X, Hua Y, Liu J, Gong C, Zhao W. Effect of high-flow nasal cannula oxygen therapy in adults with acute hypoxemic respiratory failure: a meta-analysis of randomized controlled trials. CMAJ. 2017;189(7):e260-e7.

85. Rochwerg B, Granton D, Wang DX, Helviz Y, Einav S, Frat JP, et al. High flow nasal cannula compared with conventional oxygen therapy for acute hypoxemic respiratory failure: a systematic review and meta-analysis. Intensive Care Med. 2019;45(5):563-72.

86. Neyman G, Irvin CB. A single ventillator for multiple simulated patients to meet disaster surge. Acad Emerg Med. 2006;13(11):1246-9.

87. Paladino L, Silverberg M, Charchaflieh JG, Eason JK, Wright BJ, Palamidessi N, et al. Increasing ventilator surge capacity in disasters: ventilation of four adult-human-sized sheep on a single ventilator wih a modified circuit. Resuscitation. 2008;77(1):121-6.

88. Beitler JR, Kallet R, Kacmarek R, Branson R, Brodie D, Mittel AM, et al. Ventilator sharing protocol: dual-patient ventilation with a single mechanical ventilator for use during critical ventilator shortages. 2020. Available from: https://asprtracie.hhs.gov/technical-resources/resource/8143/ventilator-sharing-protocol-dual-patient-ventilation-with-a-single-mechanical-ventilator-for-use-during-critical-ventilator-shortages

89. American Association for Respiratory Care. Joint statement on multiple patients per ventilator. 2020. Available from: https://www.aarc.org/wp-content/uploads/2020/03/032620-COVID-19-press-release.pdf?sfns=mo

90. European Centre for Disease Prevention and Control. Guidance for health system contingency planning during widespread

transmission of SARS-CoV-2 with high impact on healthcare services. Stockholm: ECDC; 2020.

91. Harris GH, Baldisseri MR, Reynolds BR, Orsino AS, Sackrowitz R, Bishop JM. Design for Implementation of a System-Level ICU Pandemic Surge Staffing Plan. Critical Care Explorations. 2020;2(6):e0136.

92. Adelaja I, Sayma M, Walton H, McLachlan G, de Boisanger J, Bartlett-Pestell S, et al. A comprehensive hospital agile preparedness (CHAPs) tool for pandemic preparedness, based on the COVID-19 experience. Future Healthc J. 2020;7(2):165-8.

93. Sprung CL, Zimmerman JL, Christian MD, Joynt GM, Hick JL, Taylor B, et al. Recommendations for intensive care unit and hospital preparations for an influenza epidemic or mass disaster: summary report of the European Society of Intensive Care Medicine's Task Force for intensive care unit triage during an influenza epidemic or mass disaster. Intensive Care Med. 2010;36(3):428-43.

94. NHS England, NHS Improvement. Adult critical care novel coronavirus (COVID-19) staffing framework. 2020.

95. Al Mutair A, Amr A, Ambani Z, Al Salman K, Schwebius D. Nursing surge capacity strategies for management of critically III adults with COVID-19. Nurs Rep. 2020;10:23-32.

96. Kleinpell RM, Grabenkort WR, Kapu AN, Constantine R, Sicoutris C. Nurse practitioners and physician assistants in acute and critical care: a concise review of the literature and data 2008-2018. Crit Care Med. 2019;47:1442-9.

97. Halpern NA, Tan KS. United States resource availability for COVID-19. Mount Prospect: Society of Critical Care Medicine; 2020. Available from: https://www.sccm.org/getattachment/Blog/March-2020/United-States-Resource-Availability-for-COVID-19/United-States-Resource-Availability-for-COVID-19.pdf?lang=en-US

98. Kleinpell RM. ICU workforce: revisiting nurse staffing. Crit Care Med. 2014;42:1291-2.

99. Centers for Disease Control and Prevention. Return-to-work criteria [Web page]. Atlanta: Centers for Disease Control and Prevention;2020 [updated August 10, 2020]. Available from: https://www.cdc.gov/coronavirus/2019-ncov/hcp/return-to-work.html

100. Frank L, Concannon TW, Patel K. Health Care Resource Allocation Decisionmaking During a Pandemic. Santa Monica: RAND Corporation; 2020. Available from: https://www.rand.org/pubs/research_reports/RRA326-1.html

101. Centers for Disease Control and Prevention. Key Considerations for Transferring Patients to Relief Healthcare Facilities when Responding to Community Transmission of COVID-19 in the United States. Washington: CDC; 2020.

102. Klein MG, Cheng CJ, Lii E, Mao K, Mesbahi H, Zhu T. COVID-19 models for hospital surge capacity planning: a systematic review. Disaster Med Public Health Prep. 2020.

103. Cardona M, Dobler CC, Koreshe E, Heyland DK, Nguyen R, Sim JPY, et al. Supporting decision-making on allocation of ICU beds and ventilators in pandemics. medRxiv. 2020.

104. Alban A, Chick SE, Dongelmans DA, Vlaar APJ, Sent D. ICU capacity management during the COVID-19 pandemic using a process simulation. Intensive Care Med. 2020:1-3.

105. Ferstad JO, Gu AJ, Lee RY, Thapa I, Shin AY, Salomon JA, et al. A model to forecast regional demand for COVID-19 related hospital beds. MedRxiv. 2020.

106. Centers for Disease Control and Prevention. COVID-19 Surge [Web page]. 2020. Available from: https://www.cdc.gov/coronavirus/2019-ncov/hcp/covidsurge.html

107. Weisman GE, Crane-Droesch A, Chivers C, Luong T, Hanish A, Levy MZ, et al. Locally Informed Simulation to Predict Hospital Capacity Needs During the COVID-19 Pandemic. Annals of Internal Medicine. 2020.

108. Hupert N, Jackson PL, Klein MG, Muckstadt JA. Cornell COVID Caseload Calculator with Capacity and Ventilators (C5V Online*) [Web page]. 2020.

109. Giannakeas V, Bhatia D, Warkintin MT, Bogoch II, Stall NM. Estimating the maximum capacity of COVID-19 cases manageable per day given a health care system's constrained resources. Annals of Internal Medicine. 2020.

110. Abir M, Nelson C, Chan EW, Al-Ibrahim H, Cutter C, Patel K, et al. RAND Critical Care Surge Response Tool: an Excel-based model for helping hospitals respond to the COVID-19 crisis. Santa Monica: RAND Corportian; 2020.

111. Adhikari BB, Fischer LS, Greening B, Jeon S, Kahn EB, Kang GJ, et al. COVID19Surge: a manual to assist state and local public health officials and hospital administrators in estimating the impact of a novel coronavirus pandemic on hospital surge capacity (Beta test version). Centers for Disease Control and Prevention, U.S. Department of Health and Human Services; 2020.

112. Mistiaen P, Leroy R, Van de Voorde C, Stordeur S, Van den Heede K. HSR Process Notes: Literature review and international comparison. Brussels: Belgian Health Care Knowledge Centre (KCE); 2016.

113. Amer F, Hammoud S, Farran B, Boncz I, Endrei D. Assessment of Countries' Preparedness and Lockdown Effectiveness in Confronting COVID-19. Disaster Med Public Health Prep. 2020:1-15.

114. OECD. Beyond Containment: Health systems responses to COVID-19 in the OECD. 2020. Available from: https://read.oecd-ilibrary.org/view/?ref=119_119689-ud5comtf84&title=Beyond_Containment:Health_systems_responses_to_COVID-19_in_the_OECD

115. Aubrecht P, Essink J, Kovac M, Vandenberghe AS. Centralized and Decentralized Responses to COVID-19 in Federal Systems: US and EU Comparisons. Political Institutions: Federalism & Sub-National Politics eJournal. 2020.

116. Cheng C, Barceló J, Hartnett AS, Kubinec R, Messerschmidt L. COVID-19 Government Response Event Dataset (CoronaNet v.1.0). Nat Hum Behav. 2020.

117. The Economist Intelligence Unit. Down but not out? Globalisation and the threat of Covid-19. 2020.

118. Kandel N, Chungong S, Omaar A, Xing J. Health security capacities in the context of COVID-19 outbreak: an analysis of International Health Regulations annual report data from 182 countries. Lancet. 2020;395(10229):1047-53.

119. Greer S, Jarman H, Rozenblum S, Wismar M. How are countries centralizing governance and at what stage are they doing it? [Web page]. 2020. Available from: https://analysis.covid19healthsystem.org/index.php/2020/04/19/how-are-countries-centralizing-governance-and-at-what-stage-are-they-doing-it/

120. Panteli D. How are countries reorganizing non-COVID-19 health care service delivery? [Web page]. WHO Europe, European Commission, European Observatory on Health Systems and Policies; 2020. Available from: https://analysis.covid19healthsystem.org/index.php/2020/05/06/how-are-countries-reorganizing-non-covid-19-health-care-service-delivery/

121. Winkelmann J, Scarpetti G, Hernandez-Quevedo C, van Ginneken E. How do the worst-hit regions manage COVID-19 patients when they have no spare capacity left? [Web page]. 2020. Available from: https://analysis.covid19healthsystem.org/index.php/2020/04/24/ho

w-do-the-worst-hit-regions-manage-covid-19-patients-when-they-have-no-spare-capacity-left/

122. Verelst F, Kuylen E, Beutels P. Indications for healthcare surge capacity in European countries facing an exponential increase in coronavirus disease (COVID-19) cases, March 2020. Euro Surveill. 2020;25(13).

123. Dong E, Du H, Gardner L. An interactive web-based dashboard to track COVID-19 in real time. The Lancet Infectious Diseases. 2020;20(5):533-4.

124. Kinross P, Suetens C, Gomes Dias J, Alexakis L, Wijermans A, Colzani E, et al. Rapidly increasing cumulative incidence of coronavirus disease (COVID-19) in the European Union/European Economic Area and the United Kingdom, 1 January to 15 March 2020. Euro Surveill. 2020;25(11).

125. NHS England, NHS Improvement. Secondary care: document of preparedness. 2020.

126. Coronavirus Act 2020, 25 March 2020. Available from: https://www.legislation.gov.uk/ukpga/2020/7/contents/enacted/data.htm

127. Government Office for Science, Scientific Advisory Group for Emergencies. Coronavirus (COVID-19): scientific evidence supporting the UK government response. 2020. Available from: https://www.gov.uk/government/news/coronavirus-covid-19-scientific-evidence-supporting-the-uk-government-response

128. Freedman L. Strategy for a Pandemic: The UK and COVID-19. Survival. 2020;62(3):25-76.

129. Department of Health & Social Care. Coronavirus: action plan - A guide to what you can expect across the UK. 2020. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/869827/Coronavirus_action_plan_-_a_guide_to_what_you_can_expect_across_the_UK.pdf

130. Department of Health & Social Care. Policy paper. Coronavirus action plan: a guide to what you can expect across the UK. 2020.

131. Emergency and Health Protection Directorate. Coronavirus: action plan. A guide to what you can expect across the UK. 2020.

132. Department of Health and Social Care, The Rt Hon Matt Hancock MP. Coronavirus action plan: Health Secretary's statement to Parliament. 2020. Available from: https://www.gov.uk/government/speeches/coronavirus-action-plan-health-secretarys-statement-to-parliament

133. NHS England, NHS Improvement. Next steps on NSH response to COVID-19. 17 March 2020. Available from: https://www.england.nhs.uk/coronavirus/wp-content/uploads/sites/52/2020/03/20200317-NHS-COVID-letter-FINAL.pdf

134. DH Pandemic Influenza Preparedness Team. UK Influenza Pandemic Preparedness Strategy 2011 London; 2011.

135. NHS England. Incident Response Plan (National). 2017.

136. NHS England, NHS Improvement. Operational Pressures Escalation Levels Framework. 2018.

137. Dunn P, Allen L, Cameron G, Alderwick H. COVID-19 policy tracker. A timeline of national policy and health system responses to COVID-19 in England [Web page]. The Health Foundation;2020. Available from: https://www.health.org.uk/news-and-comment/charts-and-infographics/covid-19-policy-tracker

138. Nursing and Midwifery Council. Joint statement on expanding the nursing and midwifery workforce in the Covid-19 pandemic. 2 April 2020. Available from: https://www.nmc.org.uk/news/news-and-updates/joint-statement-on-expanding-the-nursing-and-midwifery-workforce-in-the-covid-19-pandemic/

139. NHS. Operating framework for urgent and planned services in hospital settings during COVID-19. 2020.

140. NHS. Coronavirus: principles for increasing the nursing workforce in response to exceptional increased demand in adult critical care. 2020.

141. NHS England. Clinical guide for the management of surge during the coronavirus pandemic: rapid learning. 2020.

142. NHS England, NHS Improvement. COVID-19: Deploying our people safely. 2020.

143. Department of Health & Social Care. What the Coronavirus Bill will do. 26 March 2020. Available from: https://www.gov.uk/government/publications/coronavirus-bill-what-it-will-do/what-the-coronavirus-bill-will-do

144. Home Office, UK Visas and Immigration, The Rt Hon Priti Patel MP. NHS frontline workers visas extended so they can focus on fighting coronavirus. 31 March 2020. Available from: https://www.gov.uk/government/news/nhs-frontline-workers-visas-extended-so-they-can-focus-on-fighting-coronavirus

145. McCabe R, Schmit N, Christen P, D'Aeth JC, Lochen A, Rizmie D, et al. Report 27 Adapting hospital capacity to meet changing demands during the COVID-19 pandemic. Imperial College COVID-19 response team; 2020.

146. NHS England, NHS Improvement. Novel coronavirus (COVID19) standard operating procedure. Design note: COVID-19 ward for intubated patients. 2020.

147. Slater J. Are the Nightingale hospitals being used – how many are there? Metro. 9 October 2020. Available from: https://metro.co.uk/2020/10/09/are-the-nightingale-hospitals-being-used-how-many-built-13395246/

148. Pett E, Leung HL, Taylor E, Chong MSF, Hla TTW, Sartori G, et al. Critical care transfers and COVID-19: managing capacity challenges through critical care networks. Preprints 2020.

149. Czapran A, Steel M, Barrett NA. Extra-corporeal membrane oxygenation for severe respiratory failure in the UK. Journal of the Intensive Care Society. 2020;21(3):247-55.

150. NHS England, NHS Improvement. Novel coronavirus (COVID19) standard operating procedure. Resource shortage, escalation and National Loan Programme for COVID-19 in England. 2020.

151. Department of Health & Social Care. Coronavirus (COVID-19): notice under regulation 3(4) of the Health Service (Control of Patient Information) Regulations 2002 – general. 2020. Available from: https://www.gov.uk/government/publications/coronavirus-covid-19-notification-of-data-controllers-to-share-information/coronavirus-covid-19-notice-under-regulation-34-of-the-health-service-control-of-patient-information-regulations-2002-general

152. Ewbank L, Thompson J, McKenna H, Anandaciva S. NHS hospital bed numbers: past, present, future [Web page]. King's Fund;2020.

153. Public Health England. COVID-19 Hospitalisation in England Surveillance System (CHESS) – daily reporting. 2020.

154. NHS England, Arden & GEM. Covid-19 Patient Notification System (CPNS) User Guide. 2020. Available from: https://www.england.nhs.uk/statistics/wp-content/uploads/sites/2/2020/09/CPNS-User-Guide-20200831.pdf

155. Intensive Care National Audit & Research Centre. ICNARC report on COVID-19 in critical care: England, Wales and Northern Ireland. 16 October 2020. London: ICNARC; 2020.

156. Intensive Care National Audit & Research Centre. ICNARC report on COVID-19 in critical care London; 2020.

157. Public Health England. Sources of COVID-19 surveillance systems. 2020. Available from: https://www.gov.uk/government/publications/national-covid-19-surveillance-reports/sources-of-covid-19-systems

158. Johns S. J-IDEA launches coronavirus pandemic hospital planning tool [Web page]. Imperial College London;2020. Available from: https://www.imperial.ac.uk/news/197353/j-idea-launches-coronavirus-pandemic-hospital-planning/

159. McCabe R, Schmit N, Christen P, D'Aeth JC, Løchen A, Rizmie D, et al. Adapting hospital capacity to meet changing demands during the COVID-19 pandemic. BMC Medicine. 2020;18(1):329.

160. NHS. NHS roadmap to safely bring back routine operations. 2020. Available from: https://www.england.nhs.uk/2020/05/nhs-roadmap/

161. Royal College of Anaesthetists, Association of Anaesthetists, Intensive Care Society, Faculty of Intensive Care Medicine. Restarting planned surgery in the context of the COVID-19 pandemic. 2020.

162. Royal College of Surgeons of England. Recovery of surgical services during and after COVID-19. London; 2020.

163. Academy of Medical Royal Colleges. Principles for reintroducing healthcare services. 2020.

164. National Audit Office. Overview of the UK government's response to the COVID-19 pandemic. 2020.

165. National Audit Office. Investigation into how government increased the number of ventilators available to the NHS in response to COVID-19 London; 2020.

166. National Audit Office. Supplying the NHS and adult social care sector with personal protective equipment (PPE). 2020.

167. Gesetz über den Zivilschutz und die Katastrophenhilfe des Bundes (Zivilschutz- und Katastrophenhilfegesetz - ZSKG), 25 März 1997. Available from: http://www.lexsoft.de/cgi-bin/lexsoft/justizportal_nrw.cgi?xid=139684,1

168. Siewert M, Wurster S, Messerschmidt L, Cheng C, Buthe T. German Miracle? Crisis Management During the COVID-19 Pandemic in a Multi-Level In: Magna I, Burni A, editors. PEX Special Report: Coronavirus Outbreak, Presidents' Responses, and Institutional Consequences 2020. Available from: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3637013

169. Die Bundesregierung. Hospitals and medical practices to be strengthened. 2020. Available from: https://www.bundesregierung.de/breg-de/themen/coronavirus/covid19-krankenhaus-gesetz-1735060

170. Robert Koch-Institut. Ergänzung zum Nationalen Pandemieplan – COVID-19 – neuartige Coronaviruserkrankung. Berlin; 2020.

171. Bundesamt für Bevölkerungsschutz und Katastrophenhilfe. Handbuch Krankenhausalarmund -einsatzplanung (KAEP). Vorab-Teilveröffentlichung anlässlich der COVID-19-Pandemie Bonn; 2020.

172. Verordnung zur Aufrechterhaltung und Sicherung intensivmedizinischer Krankenhauskapazitäten (DIVI IntensivRegister-Verordnung), 8 April 2020. Available from: https://www.bundesgesundheitsministerium.de/fileadmin/Dateien/3_Downloads/Gesetze_und_Verordnungen/GuV/D/BAnz_AT_09.04.2020_DIVI.pdf

173. Die Bundesregierung. Verordnung zur Abweichung von der Approbationsordnung für Ärzte bei einer epidemischen Lage von nationaler Tragweite tritt am 1. April in Kraft. 2020. Available from: https://www.bundesgesundheitsministerium.de/abweichung-approbationsordnung.html

174. Verordnung zur Abweichung von der Approbationsordnung für Ärzte bei einer epidemischen Lage von nationaler Tragweite, 30 März 2020. Available from: https://www.bundesgesundheitsministerium.de/fileadmin/Dateien/3_Downloads/Gesetze_und_Verordnungen/GuV/A/VO_Abweichung_von_AEApprO.pdf

175. Wurmb T, Scholtes K, Kolibay F, Franke A, Kowalzik B. Empfehlung der Deutschen Arbeitsgemeinschaft Krankenhaus-Einsatzplanung

e.V. zum Management der SARS-CoV 2 Pandemie an Krankenhäusern. Massenanfall kritisch kranker Patienten, "mass critical care“ im Krankenhaus am Beispiel der SARS-CoV-2 Pandemie. Deutschen Arbeitsgemeinschaft Krankenhaus DAKEP; 2020.

176. Wurmb T, Scholtes K, Kolibay F, Schorscher N, Ertl G, Ernestus RI, et al. Hospital preparedness for mass critical care during SARS-CoV-2 pandemic. Crit Care. 2020;24(1):386.

177. Deutsche Städte- und Gemeindebund. Der Chef des Bundeskanzleramtes und die Chefinnen und Chefs der Staats- und Senatskanzleien der Länder haben sich am 17. März 2020 auf nachstehendes Grobkonzept Infrastruktur Krankenhaus verständigt. 2020.

178. Robert Koch-Institut. Mögliche Maßnahmen zum Ressourcen-schonenden Einsatz von MundNasen-Schutz (MNS) und FFP-Masken in Einrichtungen des Gesundheitswesens bei Lieferengpässen im Zusammenhang mit der neuartigen Coronavirus-Erkrankung COVID-19. 2020. Available from: https://www.rki.de/DE/Content/InfAZ/N/Neuartiges_Coronavirus/Ressourcen_schonen_Masken.pdf?__blob=publicationFile

179. Verordnung zur Erhöhung der Bevorratung mit Arzneimitteln zur intensivmedizinischen Versorgung (ITS-Arzneimittelbevorratungsverordnung – ITSABV), 7 Juli 2020. Available from: https://www.bundesgesundheitsministerium.de/fileadmin/Dateien/3_Downloads/Gesetze_und_Verordnungen/GuV/I/ITSABV_BAnz_AT_08.07.2020_V1.pdf

180. Geinitz K. RKI entwickelt Echtzeit-Überblick für Intensivbetten. Frankfurter Algemeine 2020.

181. Cwojdzinski D, Sander D, Solarek A, Peich MP. Checkliste für Krankenhäuser zur Vorbereitung und Überprüfung der Maßnahmen in einer Pandemie. Version 2.0. 2020.

182. Kanz KG, Bogner-Flatz V, Daunderer M, Dommasch M, Hinzmann D, Städtler M, et al. COVID-19-Ratio zur aktuellen Abschätzung der intensivmedizinischen Belastungsgrenze. Notf Rett Med. 2020:1-3.

183. Stang A, Stang M, Jöckel KH. Geschätzte Nutzung von Intensivbetten aufgrund von COVID-19 in Deutschland im zeitlichen Verlauf. Deutsches Ärzteblatt. 2020;117(19).

184. Schmitt J, Lange T, Forkert C, Rößler M, Walther F, Knapp A, et al. Das DISPENSE-Tool: Dresdner Informations- und Prognosetool für Bettenauslastung in Sachsen. Deutscher Kongress für Versorgungsforschung (DKVF). 2020.

185. Universitätsklinikum Carl Gustav Carus Dresden. DISPENSE: COVID-19: Dresdner Informations- und Prognosetool für Erkrankungsverlauf und Bettenauslastung in Sachsen. 2020. Available from: https://www.uniklinikum-dresden.de/de/das-klinikum/universitaetscentren/zegv/projekte/dispense

186. Beyerlein A, Nagel C, Fischer B, Gleich S, Schmidt S. Management der Intensivbettenkapazitäten der Landeshauptstadt München im Rahmen der COVID-19-Pandemie 2020 durch statistische Simulationen. Deutscher Kongress für Versorgungsforschung (DKVF). 2020.

187. Bundesministerium fur Gesundheit. Ein neuer Alltag auch für den Klinikbetrieb in Deutschland. 2020.

188. Webb E, Hernández-Quevedo C, Scarpetti G, Edwards N. How have countries restarted more routine hospital activities during the COVID-19 pandemic [Web page]. WHO Europe, European Commission, European Observatory on Health Systems and Policies; 2020 [cited 09/08//2020]. Available from: https://analysis.covid19healthsystem.org/index.php/2020/09/07/how-have-countries-restarted-more-routine-hospital-activities-during-the-covid-19-pandemic/

189. Gemeinsames Statement von DGCH, DGAI, BDC und BDA zur Wiederaufnahme von elektiven Operationen in deutschen

Krankenhäusern. 29 April 2020. Available from: https://www.dgch.de/fileadmin/media/pdf/servicemeldungen/2020-04-27_DGCH_DGAI_Stellungnahme_V2_2.pdf

190. Flemming S, Hankir M, Ernestus RI, Seyfried F, Germer CT, Meybohm P, et al. Surgery in times of COVID-19-recommendations for hospital and patient management. Langenbeck's archives of surgery. 2020;405(3):359-64.

191. Deutsche Krankenhausgesellschaft. Lehren aus der Pandemie für gute Krankenhauspolitik. Positionspapier der Deutschen Krankenhausgesellschaft. 2020.

192. Leopoldina German National Academy of Sciences. Coronavirus Pandemic: Medical Care and Patient-Oriented Research in an Adaptive Healthcare System. 4th Ad-hoc-Statement, 27 May 2020. Leopoldina; 2020.

193. Piwernetz K, Neugebauer E. Nach Corona ist vor Corona – Evaluation eines regelbasierten Gesundheitssystems. Deutscher Kongress für Versorgungsforschung (DKVF). 2020.

194. Garattini L, Zanetti M, Freemantle N. The Italian NHS: What Lessons to Draw from COVID-19? Applied health economics and health policy. 2020;18(4):463-6.

195. Grasselli G, Pesenti A, Cecconi M. Critical Care Utilization for the COVID-19 Outbreak in Lombardy, Italy: Early Experience and Forecast During an Emergency Response. JAMA. 2020;323(16):1545-6.

196. Decreto del Capo Dipartimento n. 371 del 5 febbraio 2020. Istituzione del Comitato scientifico, 5 febbraio 2020. Available from: http://www.protezionecivile.gov.it/documents/20182/989700/Decreto+CD+371+del+5+febbraio+2020/d49f1368-090f-431f-9b94-1610715a562b

197. Ministero della Salute. Linee di indirizzo assistenziali del paziente critico affetto da COVID-19. 29 February 2020. Available from: https://www.trovanorme.salute.gov.it/norme/renderNormsanPdf?anno=2020&codLeg=73530&parte=1%20&serie=null

198. Ministero della Salute. Linee di indirizzo per la rimodulazione dell'attività programmata differibile corso di emergenza da COVID-19. 16 March 2020. Available from: http://www.salute.gov.it/imgs/C_17_pagineAree_5373_6_file.pdf

199. Ministero della Salute. Aggiornamento delle linee di indirizzo organizzative dei servizi ospedalieri e territoriali in corso di emergenza COVID-19. 25 March 2020. Available from: https://www.trovanorme.salute.gov.it/norme/renderNormsanPdf?anno=2020&codLeg=73751&parte=1%20&serie=null

200. Ministero della Salute. Linee di indirizzo organizzative per il potenziamento della rete ospedaliera per emergenza COVID-19. 29 May 2020. Available from: https://www.trovanorme.salute.gov.it/norme/renderNormsanPdf?anno=2020&codLeg=74348&parte=1%20&serie=null

201. Carenzo L, Costantini E, Greco M, Barra FL, Rendiniello V, Mainetti M, et al. Hospital surge capacity in a tertiary emergency referral centre during the COVID-19 outbreak in Italy. Anaesthesia. 2020;75(7):928-34.

202. Faccincani R, Pascucci F, Lennquist S. How to surge to face SARS-CoV-2 outbreak. Lessons learned from Lumbardy, Italy. Disaster medicine and public health preparedness. 2020:1-7.

203. Kurihara H, Bisagni P, Faccincani R, Zago M. COVID-19 outbreak in Northern Italy: Viewpoint of the Milan area surgical community. Journal of Trauma and Acute Care Surgery. 2020;88(6):719-24.

204. Fransvea P, Sganga G, Cozza V, Di Grezia M, Fico V, Tirelli F, et al. Set up of a dedicated COVID-19 surgical pathway and operating room for surgical emergencies. Journal of Trauma and Acute Care Surgery. 2020;89(4):e97-e100.

205. Chisci E, Masciello F, Michelagnoli S. The Italian USL Toscana Centro model of a vascular hub responding to the COVID-19 emergency. J Vasc Surg. 2020;72(1):8-11.

206. Gagliano A, Villani PG, Co FM, Manelli A, Paglia S, Bisagni PAG, et al. COVID-19 Epidemic in the Middle Province of Northern Italy: Impact, Logistics, and Strategy in the First Line Hospital. Disaster Med Public Health Prep. 2020:1-5.

207. Cammarota G, Ragazzoni L, Capuzzi F, Pulvirenti S, De Vita N, Santangelo E, et al. Critical Care Surge Capacity to Respond to the COVID-19 Pandemic in Italy: A Rapid and Affordable Solution in the Novara Hospital. Prehosp Disaster Med. 2020:1-3.

208. Ministero della Salute. Incremento disponibilità posti letto del Servizio Sanitario Nazionale e ulteriori indicazioni relative alla gestione dell'emergenza COVID-19. 1 March 2020. Available from: https://www.trovanorme.salute.gov.it/norme/renderNormsanPdf?anno=2020&codLeg=73528&parte=1%20&serie=null

209. OCDPC n. 654. Ulteriori interventi urgenti di protezione civile in relazione all'emergenza relativa al rischio sanitario connesso all'insorgenza di patologie derivanti da agenti virali trasmissibili, 20 marzo 2020. Available from: http://www.protezionecivile.gov.it/documents/20182/989700/Ocdpc+654+20+marzo+2020/c1cb3204-4fc2-40df-9da3-c39f2177328d

210. OCDPC n. 656. Ulteriori interventi urgenti di protezione civile in relazione all'emergenza relativa al rischio sanitario connesso all'insorgenza di patologie derivanti da agenti virali trasmissibili, 26 marzo 2020. Available from: http://www.protezionecivile.gov.it/amministrazione-trasparente/provvedimenti/dettaglio/-/asset_publisher/default/content/ocdpc-n-656-del-26-marzo-2020-ulteriori-interventi-urgenti-di-protezione-civile-in-relazione-all-emergenza-relativa-al-rischio-sanitario-connesso-all-

211. Decreto-Legge n. 14. Disposizioni urgenti per il potenziamento del Servizio sanitario nazionale in relazione all'emergenza COVID-19, 9 marzo 2020. Available from: https://www.gazzettaufficiale.it/eli/id/2020/03/09/20G00030/sg

212. Le unità speciali di medici create per il coronavirus. Il Post. 2 May 2020. Available from: https://www.ilpost.it/2020/05/02/usca-unita-speciali-continuita-assistenziale-covid/

213. Decreto-Legge n.18. Misure di potenziamento del Servizio sanitario nazionale e di sostegno economico per famiglie, lavoratori e imprese connesse all'emergenza epidemiologica da COVID-19, 17 marzo 2020. Available from: https://www.engage.hoganlovells.com/knowledgeservices/attachment_dw.action?attkey=FRbANEucS95NMLRN47z%2BeeOgEFCt8EGQJsWJiCH2WAW9VPocuwTPKnmpBQ%2Fp94PM&nav=FRbANEucS95NMLRN47z%2BeeOgEFCt8EGQbuwypnpZjc4%3D&attdocparam=pB7HEsg%2FZ312Bk8OIuOIH1c%2BY4beLEAe8zSAQ%2FUX4hY%3D&fromContentView=1

214. OCDPC n. 644. Ulteriori interventi urgenti di protezione civile in relazione all'emergenza relativa al rischio sanitario connesso all'insorgenza di patologie derivanti da agenti virali trasmissibili, 4 marzo 2020. Available from: http://www.protezionecivile.gov.it/amministrazione-trasparente/provvedimenti/dettaglio/-/asset_publisher/default/content/ocdpc-n-644-del-4-marzo-2020-ulteriori-interventi-urgenti-di-protezione-civile-in-relazione-all-emergenza-relativa-al-rischio-sanitario-connesso-all-i

215. Ministero della Salute. Covid-19, Protezione civile attiva la CROSS: "Nessuna regione è sola". 2020. Available from: http://www.salute.gov.it/portale/nuovocoronavirus/dettaglioVideoNuovoCoronavirus.jsp?lingua=italiano&menu=multimedia&p=video&id=2057

216. Vergano M, Bertolini G, Giannini A, Gristina G, Livigni S, Mistraletti G, et al. Clinical Ethics Recommendations for the Allocation of Intensive Care Treatments in exceptional, resource-limited circumstances. SIAARTI; 2020.

217. Vergano M, Bertolini G, Giannini A, Gristina GR, Livigni S, Mistraletti G, et al. Clinical ethics recommendations for the allocation of intensive care treatments in exceptional, resource-limited circumstances: the Italian perspective during the COVID-19 epidemic. Critical Care. 2020;24(1):165.

218. Craxì L, Vergano M, Savulescu J, Wilkinson D. Rationing in a Pandemic: Lessons from Italy. Asian Bioethics Review. 2020;12(3):325-30.

219. Rosenbaum L. Facing Covid-19 in Italy — Ethics, Logistics, and Therapeutics on the Epidemic's Front Line. New England Journal of Medicine. 2020;382(20):1873-5.

220. Ministero della Salute. Linee di indirizzo per la progressiva riattivazione delle attività programmate considerate differibili in corso di emergenza da COVID-19. 1 June 2020. Available from: https://www.trovanorme.salute.gov.it/norme/renderNormsanPdf?anno=2020&codLeg=74374&parte=1%20&serie=null

221. Tonetti T, Zanella A, Pizzilli G, Irvin Babcock C, Venturi S, Nava S, et al. One ventilator for two patients: feasibility and considerations of a last resort solution in case of equipment shortage. Thorax. 2020;75(6):517-9.

222. Italian Civil Protection Department, Morettini M, Sbrollini A, Marcantoni I, Burattini L. COVID-19 in Italy: Dataset of the Italian Civil Protection Department. Data in Brief. 2020;30(June 2020):105526.

223. Istituto Superiore di Sanità. Sistema di sorveglianza integrata COVID-19. 2020. Available from: https://www.epicentro.iss.it/coronavirus/sars-cov-2-sorveglianza

224. Lazzerini M, Putoto G. COVID-19 in Italy: momentous decisions and many uncertainties. The Lancet Global Health. 2020;8(5):e641-e2.

225. Bollon J, Paganini M, Nava CR, De Vita N, Vaschetto R, Ragazzoni L, et al. Predicted Effects of Stopping COVID-19 Lockdown on Italian Hospital Demand. Disaster Med Public Health Prep. 2020:1-5.

226. Rodriguez Llanes JM, Castro Delgado R, Pedersen MG, Arcos Gonzalez P, Meneghini M. Confronting COVID-19: Surging critical care capacity in Italy. medRxiv. 2020:2020.04.01.20050237.

227. Berta P, Paruolo P, Verzillo S, Lovaglio PG. A bivariate prediction approach for adapting the health care system response to the spread of COVID-19. PLoS One. 2020;15(10):e0240150.

228. Sebastiani G, Massa M, Riboli E. Covid-19 epidemic in Italy: evolution, projections and impact of government measures. Eur J Epidemiol. 2020;35(4):341-5.

229. Ministero della Salute. Piano nazionale di governo delle liste di attesa per il triennio 2019-2021. 2020. Available from: http://www.salute.gov.it/portale/listeAttesa/dettaglioPubblicazioniListeAttesa.jsp?lingua=italiano&id=2824

230. Cosentino N, Assanelli E, Merlino L, Mazza M, Bartorelli AL, Marenzi G. An in-hospital pathway for acute coronary syndrome patients during the COVID-19 outbreak: initial experience under real-world suboptimal conditions. Canadian Journal of Cardiology. 2020;36(6):961-4.

231. ALTEMS. Analisi dei modelli organizzativi di risposta al Covid-19. 2020. Instant REPORT#13 Available from: https://altems.unicatt.it/altems-instant%20report%2013.pdf

232. Gigio LA, Citino L, Depalo D, Francese M, Petrella A. Contrastare l'emergenza. L'espansione della capacità produttiva del sistema sanitario Italiano: progressi conseguiti. Roma: Banca d'Italia; 2020.

233. Armocida B, Formenti B, Ussai S, Palestra F, Missoni E. The Italian health system and the COVID-19 challenge. The Lancet Public Health. 2020;5(5):e253.

234. RIVM. Outbreak Management Team (OMT). 2020. Available from: https://www.rivm.nl/coronavirus-covid-19/omt

235. Komen we met alleen medische experts door de coronacrisis? De Volkskrant. 22 April 2020. Available from: https://www.volkskrant.nl/nieuws-achtergrond/komen-we-met-alleen-medische-experts-door-de-coronacrisis~b1996436/

236. RIVM. Landelijke Coördinatie Infectieziektebestrijding. Generiek draaiboek. Available from: https://lci.rivm.nl/draaiboeken/generiek-draaiboek

237. Nederlandse Vereniging voor Intensive Care, Federatie Medisch Specialisten. Draaiboek Pandemie (Deel 1 versie 2.0). 2020.

238. CABU kernteam. Concept - Kaderstelling COVID-19 Acute Beademings Unit (CABU). Den Haag; 2020.

239. CABU kernteam. 1e versie Draaiboek COVID-19 Acute Beademings Unit (CABU). Den Haag; 2020.

240. LNAZ. Opschalingsplan COVID-19. Landelijk Netwerk Acute Zorg; 2020.

241. LNAZ. Handboek gebruik Duitse capaciteit. Samenwerking Duitsland -Nederland. Landelijk Netwerk Acute Zorg; 2020.

242. LNAZ. Handreiking opleiding bij Opschalingsplan COVID-19. 2020.

243. Baltesen F. VWS bezig met reddingsplan zorg: 'Niemand failliet'. Skipr. 27 March 2020. Available from: https://www.skipr.nl/nieuws/vws-bezig-met-reddingsplan-zorg-niemand-failliet/

244. Pronk T. Medisch Contact koppelt zorgpersoneel aan vacatures voor covid-19. 16 March 2020. Available from: https://www.gezondheidszorgbanen.nl/blog/1757/medisch-contact-koppelt-zorgpersoneel-aan-vacatures-voor-covid-19

245. Koninklijke Nederlandsche Maatschappij tot bevordering der Geneeskunst (KNMG). Minister bevestigt versoepeling BIG-regels voor inzet zorgpersoneel in noodsituaties. 19 March 2020. Available from: https://www.knmg.nl/actualiteitopinie/nieuws/nieuwsbericht-corona/minister-bevestigt-versoepeling-big-regels-voor-inzetzorgpersoneel-in-noodsituaties.htm

246. Nederlandse Vereniging voor Intensive Care. Uitbreiding IC-capaciteit. 2020.

247. Gerling M. Meer IC-bedden voor coronapatiënten in Calamiteitenhospitaal UMC Utrecht. AD. 7 April 2020. Available from: https://www.ad.nl/utrecht/meer-ic-bedden-voor-coronapatienten-in-calamiteitenhospitaal-umc-utrecht~aed82e69/

248. Korteweg N. Coronapatiënt is thuis beter af dan in het ziekenhuis. NRC. 1 April 2020. Available from: https://www.nrc.nl/nieuws/2020/04/01/in-dit-coronazorgcentrum-mag-je-een-mantelzorger-meenemen-a3995619

249. Rijndam Revalidatie opent 'post-ic afdeling' voor coronapatiënten. Skipr. 8 April 2020. Available from: https://www.skipr.nl/nieuws/rijndam-revalidatie-opent-post-ic-afdeling-voor-coronapatienten/

250. Merem. Merem opent unieke post COVID-19 revalidatie afdeling. 2020. Available from: https://www.merem.nl/nieuws/merem-opent-unieke-post-covid-19-revalidatie-afdeling.htm

251. Coronapatiënt sneller uit ziekenhuis door thuismeetapparatuur. Skipr. 7 April 2020. Available from: https://www.skipr.nl/nieuws/coronapatient-sneller-uit-ziekenhuis-door-thuismeetapparatuur/?daily=1

252. Baltesen F. Huisartsen en ziekenhuizen gaan aantal doorverwijzingen beperken. Zorgvisie; 2 June 2020. Available from: https://www.zorgvisie.nl/huisartsen-en-ziekenhuizen-gaan-aantal-doorverwijzingen-beperken/

253. Federatie Medisch Specialisten, Koninklijke Nederlandsche Maatschappij tot bevordering der Geneeskunst (KNMG). Draaiboek Triage op basis van niet-medische overwegingen voor IC-opname ten tijde van fase 3 in de COVID-19 pandemie. Criteria voor fase 3 stap C aansluitend op het NVIC Draaiboek Pandemie. 2020.

254. Federatie Medisch specialisten. LEIDRAAD Triage thuisbehandeling versus verwijzen naar het ziekenhuis bij oudere patiënt met (verdenking op) COVID-19. 2020. Available from: https://www.nhg.org/sites/default/files/content/nhg_org/uploads/20200327_fms_leidraad_triage_thuisbehandeling_verwijzen_oudere_verdenking_covid19.pdf

255. van den Brink R. Honderdduizenden Chinese mondmaskers teruggeroepen uit Nederlandse ziekenhuizen. NOS. 28 March 2020. Available from: https://nos.nl/artikel/2328673-honderdduizenden-chinese-mondmaskers-teruggeroepen-uit-nederlandse-ziekenhuizen.html

256. Rijksoverheid. Landelijk Consortium Hulpmiddelen. 2020. Available from: https://www.rijksoverheid.nl/ministeries/ministerie-van-volksgezondheid-welzijn-en-sport/tijdelijke-crisisstructuur/landelijk-consortium-hulpmiddelen

257. Rijksoverheid. Nieuw verdeelmodel beschermingsmiddelen [Web page].14 april 2020. Available from: https://www.rijksoverheid.nl/onderwerpen/coronavirus-covid-19/nieuws/2020/04/11/zorgpartijen-akkoord-met-nieuw-verdeelmodel-beschermingsmiddelen

258. Rijksoverheid. Factsheet 'Wanneer is welk persoonlijk beschermingsmiddel nodig in de zorg' [Web page].19 mei 2020.

259. Nederlandse Federatie van Universitair Medische Centra (NFU). Landelijk coördinatiecentrum geneesmiddelen voor coronapatiënten IC. 2020. Available from: https://www.nfu.nl/actueel/landelijk-cooerdinatiecentrum-geneesmiddelen-voor-coronapatienten-ic

260. Apparatuur voor 100 extra IC-bedden geleverd. NOS. 28 March 2020. Available from: https://nos.nl/artikel/2328651-apparatuur-voor-100-extra-ic-bedden-geleverd.html

261. de Vries H, Verdaasdonk R, de Jongh F, Vriens M, Doorduin J, Heunks L. Splitsen van Beademingsmachines. Het beademen van meerdere patiënten met één beademingsmachine in crisis situatie. Nederlandse Vereniging voor Intensive Care; 2020.

262. van de Klundert M. Waar is nog een ziekenhuisbed vrij? Nieuw systeem moet direct antwoord geven. NOS. 30 March 2020. Available from: https://nos.nl/artikel/2328856-waar-is-nog-een-ziekenhuisbed-vrij-nieuw-systeem-moet-direct-antwoord-geven.html

263. Landelijke coördinatie van IC-bedden is nodig, om chaos te bestrijden. NRC. 31 March 2020. Available from: https://www.nrc.nl/nieuws/2020/03/31/landelijke-coordinatie-van-ic-bedden-is-nodig-om-chaos-te-bestrijden-a3995516

264. Ministerie meldde maandenlang veel te weinig opnames coronapatiënten. Nu. 14 October 2020. Available from: https://www.nu.nl/coronavirus/6083846/ministerie-meldde-maandenlang-veel-te-weinig-opnames-coronapatienten.html

265. Nederlandse Zorgautoriteit. NZa maakt afspraken over opschalen reguliere zorg via ROAZ. 8 May 2020. Available from: https://www.nza.nl/actueel/nieuws/2020/05/08/nza-maakt-afspraken-over-opschalen-reguliere-zorg-via-roaz

266. Nederlandse Zorgautoriteit. Urgentielijst medisch-specialistische zorg. Versie 1. Diemen; 2020.

267. Nederlandse Zorgautoriteit. Urgentielijst medisch-specialistische zorg. Available from: https://puc.overheid.nl/nza/doc/PUC_306624_22/1/

268. Nederlandse Zorgautoriteit. Urgentielijst medisch-specialistische zorg. 29 May 2020. Available from: https://puc.overheid.nl/PUC/Handlers/DownloadDocument.ashx?identifier=PUC_306625_22&versienummer=1

269. Nederlandse Zorgautoriteit. Opstart reguliere ziekenhuiszorg komt op gang. 17 April 2020. Available from: https://www.nza.nl/actueel/nieuws/2020/04/17/opstart-reguliere-ziekenhuiszorg-komt-op-gang

270. Federatie Medisch Specialisten. Handreiking voor keuzes bij het op-/afschalen van reguliere poliklinische non-COVID zorg ten tijde van schaarste in de COVID-19 pandemie. 2020.

271. Inspectie Gezondheidszorg en Jeugd. Sectorrapportagemedisch specialistische zorg. Ziekenhuizen, particuliere klinieken, revalidatieklinieken en abortusklinieken. Den Haag; 2020.

272. Alban A, Chick SE, Dongelmans DA, van der Sluijs AF, Wiersinga WJ, Vlaar APJ, et al. ICU Capacity Management During the COVID-19 Pandemic Using a Stochastic Process Simulation. INSEAD Working Paper. 2020;20.

273. Verenso. Position paper ActiZ, V&VN, Verenso en Zorgthuisnl – geleerde lessen langdurige zorg Covid-19 (zowel verpleeghuiszorg, kleinschalige woonvoorziening als wijkverpleging). 2020.

274. de Jonge H. Brief van de minister van Volksgezondheid, Welzijn en Sport aan de Voorzitter van de Tweede Kamer der Staten-Generaal. 2020. Available from: https://zoek.officielebekendmakingen.nl/kst-939672

275. de Jonge H. Brief van de minister van Volksgezondheid, Welzijn en Sport aan de Voorzitter van de Tweede Kamer der Staten-Generaal. Lessen verpleeghuizen met het oog op een eventuele tweede golf. Den Haag: Ministerie van Volksgezondheid, Welzijn en Sport; 2020. Available from: https://zoek.officielebekendmakingen.nl/kst-939672

276. Rijksoverheid. Documenten lessons learned corona. 31 August 2020. Available from: https://www.rijksoverheid.nl/documenten/publicaties/2020/08/31/documenten-lessons-learned-corona

277. Onderzoeksraad voor Veiligheid. Aanpak Coronacrisis. 2020. Available from: https://www.onderzoeksraad.nl/nl/page/16666/aanpak-coronacrisis

278. Ministerie van Volksgezondheid Welzijn en Sport. Samenvatting geleerde lessen op basis van de inbreng van V&VN, LHV, FMS, NFU, NVZ, ROAZ Zuid-West Nederland. 2020.

279. RIVM. Onderzoek indirecte effecten COVID-19 op zorg en gezondheid. 19 October 2020. Available from: https://www.rivm.nl/coronavirus-covid-19/onderzoek/indirecte-effecten-zorg-gezondheid

280. van den Brink C, van den Ende C, Eeuwijk J, Deuning C, Giesbers H, van Gestel I, et al. Kort-cyclische rapportage indirecte effecten COVID-19 op zorg en gezondheid. Vierde rapportage. Bilthoven: RIVM; 2020.

281. Nederlandse Zorgautoriteit. Gevolgen van de coronacrisis voor hart- en vaatziekten. 2020.

282. Nederlandse Federatie van Kankerpatiëntenorganisaties. De gevolgen van de coronacrisis voor kankerpatiënten: wat is jouw ervaring? Utrecht; 2020.