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de Rooij, Doret; Janse, Jacobine; Raab, Jörg; Timen, Aura

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Getting ready to act: theorising a stepwise transition into crisis response at points of entry based on interviews with COVID-19 responders and a military preparedness framework

Doret de Rooij [ORCID] ,[1,2] Jacobine Janse,[2,3] Jörg Raab,[4] Aura Timen,[2,5] for the EU Healthy Gateways Joint Action consortium

For numbered affiliations see end of article.

Correspondence to
Doret de Rooij;
doret.de.rooij@rivm.nl

ABSTRACT

Introduction Points of entry (POE) have an important role in timely national response to infectious diseases threats. However, a guiding framework is lacking for the transition from generic preparedness into optimally specified response for an imminent infectious disease threat, a step called 'operational readiness'.

Objective We aim to contribute to the conceptual closure of this preparedness–response gap for infectious disease control at POE by providing content to the operational readiness concept.

Design We first explored the NATO Combat Readiness (NCR) concept for its applicability on infectious disease control at POE, as the military discipline faces the same need of being flexible in preparing for unknown threats. Concepts of the NCR that support the transition into response to a specific threat were integrated into the operational readiness concept. To explore the added value of the concept in practice, we conducted and analysed semistructured interviews of professionals at European POE (n=24) responsible for the early COVID-19 response.

Results Based on the NCR, operational readiness builds on the fact that activating the response capabilities and capacities to a specific threat requires time. For professionals at POE, the transition from generic preparedness into the COVID-19 response led to challenges in specifying response plans, dealing with an overload of information, while experiencing shortages of public health staff. These challenges could be covered within operational readiness by defining the time and the specific staging needed to upgrade response capabilities and capacities.

Discussion We conclude that a guiding framework for operational readiness seems appropriate in relation to the many activities and challenges POE have had to face during the COVID-19 response. Operational readiness is mainly defined by the time dimension required to deploy the response to a specific threat. However, integrating this conceptual framework into practice requires structural and sustainable investments in outbreak preparedness.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ We use empirical data on the COVID-19 response at points of entry (POE) to theoretically contribute to the preparedness in these settings for next impactful infectious disease threats.
⇒ A military framework provides a new and comprehensive inspiration to dealing with unknown threats in public health.
⇒ Sampling interviewees via the network of Europe's joint action on POE preparedness provided access to many POE, at the same time leaving a potential bias by selecting POE that are internationally active and eager to enhance.
⇒ For the generation of interview data, potential bias follows from non-response—especially for data collection during crisis—, and interviews in non-native language in a long-distance setting.

INTRODUCTION

Public health (PH) authorities have the specific task to early identify and respond to infectious disease threats crossing their country's borders, such as at airports, ports and ground crossings. Since 2007, the International Health Regulations (IHR) require countries to designate so-called points of entry (POE) to have capacities to respond to PH risks. Despite increasing efforts to guide preparedness at POE[1–4] and despite international regulations aiming to safeguard the capacity for an international response,[5 6] POE had difficulty to respond timely and effectively to internationally spreading diseases in the past.[7–10]

Responding effectively to emerging infectious disease threats at POE is difficult, as their occurrence is mostly unpredictable and scarce. The probability that a single POE has to deal with a serious event is generally low. The implication is a continuous investment

in both response capabilities—expected achievements[11]—and capacities—required resources such as trained staff, infrastructure, goods and procedures[11]—for events that may not happen soon. Furthermore, each infectious disease threat has unique specificities resulting from among others its specific geographic and social contexts, timing and pathogen characteristics.[12] This uniqueness results in the need to prepare generically, but to allow for flexibility in the response to a specific threat.

The sequence of preparedness and response activities (including lessons learnt) constitutes the emergency management cycle (EMC).[13] Several theories and guidelines subsequently state what steps in the EMC entail,[13–15] but the practical adjustment of plans to the specific situation at hand remains implicit. As a result, the transition from a generic state of preparedness into a specific response situation each time depends on the expertise, insights and initiatives of the professionals involved but is not structurally supported by a guiding framework. This is problematic as a late transition may result in response operations starting hastily, inflexibly and late, instead of timely and appropriately. This lack of concrete steps to transit from generic preparedness into a specific response situation can be called the preparedness–response gap.

Several efforts have been made to close this preparedness–response gap providing interesting starting points, although not specifically for POE. 'Readiness' is defined in the WHO EMC as 'a statement of the capacity and capability of a relief agency or service', requiring up to 6 months to be ready for a next threat.[16] Furthermore, a small body of grey-reviewed and peer-reviewed literature in emergency preparedness describes this transition from preparedness into the response using the concepts 'operationalization' and 'operational readiness'. These concepts appoint to the need to assure a timely,[17–20] effective[17-20] and efficient[17 19 20] response infrastructure 'focused on the highest priority risks'.[20] However, how 'to operationalize' or to be 'operationally ready' largely remains unclear.[20–28] One study performed by some of this study's authors suggested a framework to specify preparedness during an evolving threat based on triggers for PH and health partners.[29]

How can we provide a guided transition from generic preparedness to specific response to support a timely and effective response by PH authorities at POE? To answer this question, we first need to study how the preparedness–response gap can be conceptually closed. PH is not the only field dealing with preparedness for unknown threats. Also, military operations deal with this challenge. Departing from a framework used in military preparations, we developed a graded definition of operational readiness to provide the required language for bridging this gap. Subsequently, to validate this concept empirically, we heuristically analysed interview data gathered in the first wave of the COVID-19 pandemic in 2020 among professionals involved at European POE.

METHODS
Conceptual framework
We use the NATO Combat Readiness (NCR) concept[30 31] (used by the NATO Response Force for military preparedness[30–32]) as a frame, as it leads us to a further division of actions in between preparedness and response. Before exploring if and how the NCR can serve PH, we would like to stress that gathering input from military concepts is not to equate PH response with military action. We merely use the input to understand how readiness is conceptualised in the military field as it faces similar organisational challenges of preparing for a variety of unknown threats.

From preparedness to response with NCR
The NCR provides two steps in between preparedness and response. These two extra steps are named 'Stand-by' and 'Deploy'.

▶ 'Stand-by' points to the status following an explicit assessment whether response capabilities and related capacities can be ready in a predefined timeframe. This timeframe indicates the time for a unit to be ready to be deployed for the task it has been equipped and trained for, from the moment of activation. For example, in a military scenario, a specific unit is tested for their capability to set up a military hospital serving 50 trauma patients within a 1-week timeframe. If it can, the unit receives the status 'Stand-by' for this capability for the duration of 1 year.

▶ 'Deploy' covers the phase in which the Stand-by capability needs to be evoked. The Deploy phase takes no longer than the predefined time. To stick to our previous example, when the military hospital is required, it is deployed in the preconfirmed 1-week timeframe, after which it is ready to serve the response. During deployment, local officers should adjust the capability to the specific situation.

Looking for similar lines of reasoning in infectious disease preparedness, we came across predefined capabilities for POE in the IHR.[5] Assessments are done to check the implementation of capacities required for these capabilities, such as during the yearly State Party Self-Assessment Annual Reporting to WHO[33] and Joint External Evaluations.[34] Also, preparedness plans include standard operating procedures that define capabilities needed in the response. However, the main difference with military practice is the missing assessment of the time needed to activate a capability. As a result, the deployment and subsequent start of the response are expected to be timely, without an explicit feasibility assessment.

A definition
Using the military concepts 'stand-by and deploy', we give content to 'operational readiness' in infectious disease control. Operational readiness entails predefining the timeframe in which the activation and specification of required response capabilities and capacities can take place. For operational readiness, both preparedness activities and a proactive initiation of the response are needed.
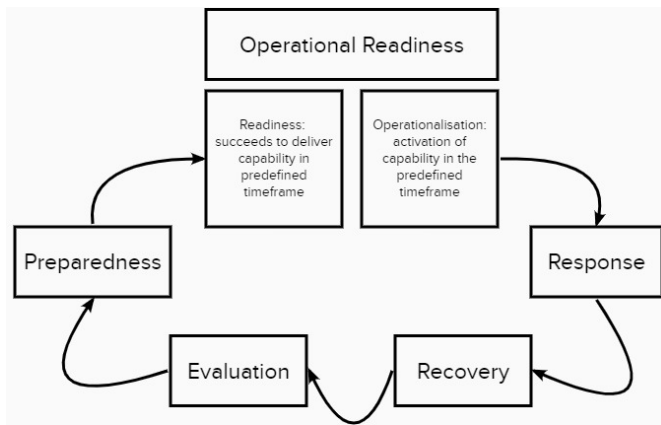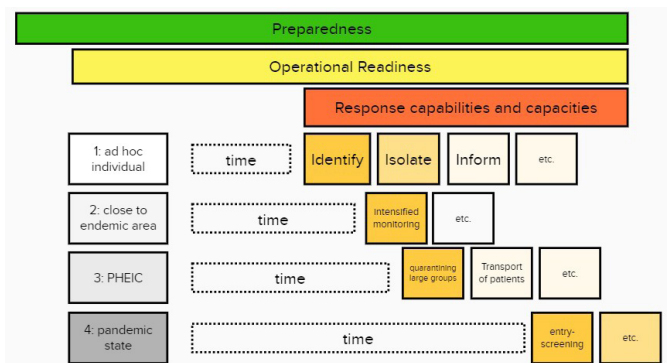
Figure 1 Operational readiness integrated in the emergency management cycle.

Figure 2 Readiness range for response capabilities based on scenarios and time. 1, 2, 3, 4 refer to the type of threat for which different response capabilities may be necessary. 1=incidental occurrence of imported cases at point of entry (POE); 2=cases prevalent in nearby geographic region; 3=Public Health Emergency of International Concern (PHEIC) as defined in the International Health Regulations; 4=a pandemic state.

It is during preparedness that the timeframes for capabilities and connected capacities should be defined. Readiness ('Stand-by' in military terminology) in this sense refers to the ability to activate response capabilities in the predefined timeframe. Operationalisation ('Deploy' in military terminology) refers to the actual activation and specification in reaction to a threat. Figure 1 states the definitions of readiness and operationalisation as used in this study.

Readiness range
Refraining from considering the time needed for activation of the response, one assumes a binary—thus sudden—transition from preparedness to response. The NCR creates a transition from preparedness into the response that is gradual instead of binary. Because of the clear notion what time it takes to deliver a certain capability, one has to plan ahead of the response. In this way, a so-called 'readiness range' is created where different layers of capabilities and related capacities are strategically planned over time. An application could be done to the capability to protect staff from a contagious source when dealing with suspected cases. The first layer of capacity would require sufficient protective equipment being available within minutes to hours. Stocks of this capacity should be sufficient until new protective equipment can be delivered (second layer) or produced (third layer). Figure 2 shows a hypothetical example of a readiness range for infectious disease response divided for different threat levels.

Adopting this readiness range into infectious disease control would imply defining many different sets of capabilities and related capacities in different time perspectives. The planning of capacities should support capabilities, and capabilities need to be attached to different scenarios. An example of an already implemented readiness range is the distinction made in the IHR between capabilities needed 'at all times' and during a 'Public Health Emergency of International Concern'.[5] However, these capabilities are not linked in time.

The case: challenges at European POE
We empirically studied the activities, challenges and lessons during the evolving COVID-19 response at POE, in the period in which—according to the above presented operational readiness concept—operationalisation of the response is needed. We aimed first to learn whether the preparedness–response gap was visible and what activities were done to close it in practice. Second, we aimed to see to what extent the two dimensions of operational readiness (the time dimension and a layered response) are visible.

Design
Participants of interest were PH professionals and crisis responders working locally or nationally for European POE, and who were involved with the COVID-19 response tasks. Participants were invited via country representatives in the EU Healthy Gateways (EU-HG) network,[4] the network that cooperatively aims to improve preparedness and response at POE in Europe. Participants were invited either directly or via snowball reference. We aimed for interviewees at national and local levels in all countries to triangulate the data. Also, we aimed for equal geographical representation. Final limits of the sample were based on saturation of the data and the timeframe within which the discussed situations at POE could be considered comparable. Because two authors (DdR and AT) were also in a broader sense active in EU-HG, interviews were as much as possible conducted with or by a second researcher in PH but outside this network (no author). For each interview, reflective memos were written to reflect on the relational and communicational characteristics, and these potential effects on the content of the interview.

We interviewed 30 participants in 24 interviews from 11 different European countries. Five interviews had a national perspective, and 19 had a regional or local perspective. Fifteen interviews elaborated on experiences

from airports, 11 from ports and four from ground crossings. All national interviews, and 12 other interviews, covered more than one type of POE. Interviews took place in June, July and August 2020. In the interviews, participants were asked to describe the activities, problems, solutions and lessons learnt regarding the preparedness and response in two distinct phases of the COVID-19 threat: the early phase in spring 2020 leading to the declaration of the pandemic, and the summer 2020 when travel restarted. The study plan including the interview guides can be found in online supplemental file 1. We cohered to the Dutch National Scientific Integrity Guidelines[35] and ethical requirements for conducting and reporting qualitative research[36] (online supplemental file 2). All participants signed for informed consent.

Interviews were recorded, fully transcribed and anonymised regarding person names, job titles and geographic locations before analysis in MAXQDA.[37] Audio files and transcripts were stored in password-locked files in locked digital maps. We coded deductively all activities in the interview data using codes for different periods of the pandemic (before, first wave, restarting summer travel), EMC phases (preparedness, readiness, response, recovery) and organisational entities that the activities related to (structure, capability, capacity). We furthermore coded experiences (negative, positive, lessons learnt, needs), and any expressions on the two dimensions of operational readiness: the time dimension and the readiness range. We analysed the data inductively, per code and by combining codes for the different EMC phases with organisational units, experiences and operational readiness dimension. Analyses and findings were discussed among at least two of the authors.

Patient and public involvement
Patients or the public were not involved in this study. The aggregated results of the interviews were shared per email with the study participants.

RESULTS
Activities during the evolving pandemic
During the start of the COVID-19 outbreak in Wuhan, China, and its rapid global spread, the participants recalled many activities that had to be done. These activities were partly focused on early response measures, but also to transit from a state of generic preparedness to the COVID-19 response. An overview of the activities, challenges and facilitators is provided in table 1. An overview of the challenges and solutions attributed to these activities can be found in online supplemental file 3.

The applicability of plans and guidelines
Some POE were able to adjust their plans early and effectively. Helpful in adjusting plans were a well-prepared existing plan developed in cooperation with POE partners,

Table 1 Activities performed at European points of entry during the evolving COVID-19 pandemic

Activity themes	Specified activities
Applicability of plans and guidelines	▶ Adjusting generic plans or plans focused on other specific diseases into plans specific for dealing with SARS-CoV-2. ▶ Writing new plans and scenarios.
Capacity of space, material and staff	▶ Safeguarding sufficient PPE and disinfectants. ▶ Managing staff levels for PH and transport sector activities. ▶ Setting up entirely new ground crossings between EU Schengen countries.
The network and organisational structure	▶ Reactivating the response network. ▶ Updating contact information of partners at the POE. ▶ Organising more frequent meetings among partners involved at the POE. ▶ Organising larger meetings and meeting in more flexible compositions depending on the issues at hand. ▶ Formation of new relations with national authorities. ▶ Formation of more intense contact between port and airport authorities while organising crew changes. ▶ Upscaling the level of decision-making within organisations. ▶ Prioritising tasks within the organisation, putting aside less urgent work. ▶ Reorganisations of structure due to information overload or changing staff levels. ▶ Continuously informing stakeholders involved.
Early response	▶ Increased monitoring on board of conveyances. ▶ Continuous risk assessment based on monitoring results and signals via other media. ▶ Inform partners and public on hygienic behaviour. ▶ Inform partners on the importance of continuation of travel and trade. ▶ Starting risk communication to the public.
Other	▶ A lack of activity regarding POE compared with the other areas in a PH region.

PH, public health; POE, point(s) of entry; PPE, personal protective equipment.

and legal space to adjust plans for implementation of new measures. Other POE had plans and guidelines that did not fit the actual situation (online supplemental file 4—Quote book: Quote 1 and Quote 2, further referred to as 'Q[number]'). As a result, some POE worked with plans developed on a day-to-day basis, or remained adjusting and adding scenarios up to months within the crisis. The rewriting of plans was done by PH authorities from local or higher levels in cooperation with different sectors, such as the POE owners, conveyance companies and safety and security partners.

By the beginning of the summer, many ports still missed plans for the restart of cruise ship sailing (Q3). These missing plans were accompanied by a feeling of fear for dealing with these large numbers in case of an outbreak (Q4). Many also missed the knowledge to handle these outbreaks (Q5). Another remaining challenge in writing good plans was the lack of a common strategy among European countries.

Capacity of space, material and staff

A major set of activities centred around safeguarding capacities. Personal protective equipment (PPE) and disinfectants were limited available for some, while others had purchased these early enough in sufficient quantity.

The largest challenge in the beginning (Q6), which still remained in the summer (Q7), was the lack of trained PH staff. After COVID-19 had appeared in Europe, professionals worked day and night to set up screenings at POE and to perform contact tracing due to insufficient numbers of staff. In the summer, this problem is so severe that several participants mentioned the capacity of the PH system being at stake (Q8, Q9). Solutions were sought in involving staff from the military, the WHO country office or from closed down sectors. The invention of the digital passenger locator form is a technical solution that could avert a high burden on PH professionals. Contrary to the lack of PH staff, professionals at POE in the transport sector, such as from the airport management, from the airlines, cruise liners and crew on board, were often overnumbered due to the decrease in travel.

Another major activity was the set-up of entirely new ground crossings between EU Schengen countries. Among all POE types, partial or full closed down (Q10) appeared due to a lack of staff or equipment. First, capacity had to be safeguarded or reorganised before reopening gradually.

The network and organisational structure

The activation of the response network at and around POE was a major activity during the evolving COVID-19 pandemic. POE partners initiated intersectoral meetings and enhanced their frequency and composition. Some POE had to refresh their relations, especially with national authorities (Q11). Levels of decision-making were sometimes laid on higher working levels. With the upscaling of the level of decision-making, some POE lacked structures

to serve political decisions, leading to figurative use of structures (Q12).

Sometimes, national decisions were over-ruled by international demands. For example, test policies for crew's destination differed from the policies at the POE of departure. Still, the demands of the destination of arrival had to be accepted due to interest of ongoing travel and trade (Q13). POE sometimes felt caught in between demands from national authorities and the international guidelines (Q14). Adding up to this problem was the lack of cooperation in Europe (Q15). At the organisational level, crisis tasks had to be prioritised over regular ongoing work. Also, the COVID-19 situation kept changing fast, overwhelming PH authorities with new rules, information (Q16) and questions from partners and the public. As a result, their offices had to reorganise their organisations amidst the evolving crisis (Q17).

Several POE described a quite smooth run-up to the crisis. Sometimes because of good preparedness (Q18, Q19), because the crisis had affected them less than others or because of an effective organisation (Q20). Facilitators for effective organisation at POE level are to know each other, to be able to reach each other easily (Q21), also in informal ways, to acknowledge each other's role (Q22), trustworthy behaviour, sticking to one's word, frequent meetings (Q23) and a pre-existing crisis organisation to build on (Q20). Also, someone of the PH authority located physically at the POE is considered paramount, as is someone acting as a leader (Q24). On a national level, the exchange among POE and support from higher working levels are considered helpful.

In the summer of 2020, remaining challenges are the unclarity in the organisation of and responsibility for dealing with large groups of stranded travellers, such as those from cruise ships or from several planes.

Early response

The activities focused on adjusting to what may be upcoming overlaps with an early response. Increased monitoring on board of conveyances starts as travellers returning from an increasing number of risk areas. An ongoing risk assessment was done based on continuous signals via formal surveillance networks and media. PH authorities started informing partners and the public on potential symptoms and hygienic behaviour.

Challenges in the early response seem related to challenges in capacity and the organisation of the response, as PH authorities are overwhelmed with new information and questions from POE partners and the public. They needed to provide adequate risk communication in a situation in which much is uncertain. Amidst uncertainty, major decisions need to be made with large societal and economic impact. Facilitators in the early response are the use of a clear and strict case definition, clear notification lines among partners and early implementation of strict measures for which an effect is expected.

In the period towards the restart of summer travel, the majority of challenges can be described as the need to be

flexible. Both the pandemic situation and the PH policies kept changing, resulting in continuous adjustments in the response. These fast changes challenged clear communication, especially to non-PH partners and the public, and led to tiredness among professionals and a lack of commitment among the public. POE dealt, for example, with passengers hiding symptoms or providing false information.

The time dimension
Participants had different notions of when the transit from preparedness to response to COVID-19 should start. Some named the end of December 2019, a majority stated the end of January or beginning of February and some referred to late March or April 2020. The start of the crisis was based on signals of first occurrence of the disease in China, calls from the WHO to prepare or with the identification of first cases in the country. Only a few respondents explicitly mentioned the time needed to adjust the response, in this way acknowledging this transition. A PH nurse in a port stated that 'it all depends on taking it seriously. […] What we could prepare in January enabled us not to become overwhelmed in March' (Q25). Early adaptation was named as an important facilitator of an effective response. Examples of this early adaptation include the early purchase of PPE (Q26), implementation of measures, awareness creation and adaptations of response plans (Q27).

A readiness range
We found examples of various capacity and capability layers used in different scenarios. One concrete example is expressed by participants working for new ground crossings between two Schengen countries. As expressed by one participant, 'basically we decided to do full close and then slowly release the services step by step' (Q10). By a full closure, they bought time, in this case 1 week, to finish preparations and relieve operations to the extent they could manage. Further implicit notions can be found during the restart of travel and trade in the summer of 2020 period. 'We have sufficient personnel till the end of August 2020. For the period after, we are now trying to find extra staff for the new Covid Team that could be deployed at the airport' (Q28). At the same airport, different future scenarios including the needs in these scenarios were being worked out. This was considered challenging as until that time reality had evolved according to the worst scenario, or worse. 'The pandemic kept surprising every time' (Q29). Lastly, the digital passenger locator form that has been developed in several countries for the sake of contact tracing during travel provides extra capacity developed over time.

DISCUSSION
The evolving COVID-19 crisis is characterised by many activities and correlated challenges at European POE, supporting the idea that 'operational readiness'—the

transition into the response to infectious disease threat—requires to be acknowledged as a distinctive and well-defined phase in the EMC. We applied the NCR, which is used in military preparations, to PH response and identified two dimensions of operational readiness: the time needed to activate capabilities, and a layered approach to the start of the response. Following from our results, activities during operational readiness in the first phase of the COVID-19 pandemic at European POE entail: a more intense cooperation in crisis tasks across sectors and working levels, an increased flow of information exchange with partners and the public and an effective start of the PH response. In this section, we formulate opportunities for future development of the operational readiness concept and reflect on our methodologies. First, we start elaborating on three of our most important policy recommendations.

Policy recommendations
Recommendation 1: a broader set of response capabilities and surge capacity should be developed aimed at the process of operationalisation
Despite the extensive attention for response capabilities at POE prior to the COVID-19 pandemic,[5 38] this study's results show that professionals considered it challenging to apply them to the specific COVID-19 situation. It was challenging to update plans ad hoc, to safeguard capacity amidst global scarcity, to integrate the input from different working levels amidst wide uncertainty about the future and to inform the public and partners about the response on an unprecedented scale. These challenges all entail activities that belong to the phase of 'getting ready', for which also capability should be developed. By investing in networking, cooperation, digital upscaling and crisis-organising skills and capabilities in between crises, we can optimise the use of support expertise of PH professionals during crises. At the same time, we have to ensure a sufficient buffer capacity to tackle the challenge by safeguarding sufficient numbers of trained staff at all times. When developing preparedness scenarios, these should include surge capacity strategies.

Recommendation 2: integrate time to operationalise infectious disease response
The readiness range—as adopted from military practice—does not guarantee preparedness for unknown threats in the future, but it ensures a predefined timeframe needed to get ready to act. As a result, it is a feasible tool for planning. As the types of threat might vary endlessly, it is impossible to have all capacity and capability ready at all times. At the same time, as a first set of capabilities can be evoked very fast to provide early response, the activation of extra capacity or capabilities needs to start.

Starting early is one of the facilitators for a smooth transit of the response, but this study's results show that timing is only acknowledged by few professionals. A recent prospective study by van den Oord et al[39] studied different networks in the port of Antwerp during the first months

of the COVID-19 pandemic. They point out that getting ready for the port required about 6 weeks, compared with the 2 weeks that these researchers had expected it to take. The timeframes for different response capabilities should carefully be decided on both serving the speed of response and the practicalities of operations. From a tactical perspective, the time in which specific capabilities are required can be defined. From an operations perspective, the feasibility of implementation within this suggested timeframe should be thought through.

Integrating this time dimension implies dedicated preparedness actions for readiness. First of all, scenarios should be worked out for which extensive capability and capacity planning should be done. Scenarios can entail what is known and should include unprecedented threats based on expertise and worse case scenarios. Second, good relations and smooth cooperation among partners involved in the response are paramount. These should best be built in the time between crises, as is again brought forward in this study. Third, the 'timing' of readiness, as is the start of the operationalisation, could be further supported. Our results show that different POE reacted differently to signals of the evolving pandemic. Suggestions for predefined 'triggers' to start operationalisation of the response are discussed in de Rooij *et al*[29] for the clinical response.

Recommendation 3: local and flexible options for action should be facilitated to react to the unknown

The next crisis will never materialise exactly in the way the scenarios prepared for. It is therefore essential that the approach remains flexible. Although the operational readiness supports to plan in time the potentially required capacities and capabilities, these will not fit the situation at hand at once. Local and flexible options for action are required to fit what is demanded by the local circumstances. Easy and frequent exchange among POE partners and local leadership are two important facilitators for flexibility named in the interviews. Another common concept in military practice is that the 'what' and 'why' are outlined on a tactical level, but the 'how' remains up to the operational forces to sort out.[40] In this way, situational factors can be integrated during the activation of the response. Conditions for the implementation by local workforces—referring back to the required capabilities and capacity—are the availability of sufficient numbers of skilled people, with strong feeling of shared responsibility and trust in the organisation; and the full support of their superiors regarding their operational decisions and the required capacities. To educate the PH professional also as a crisis responder is in this way an important lesson for PH education.

What then exactly is the tactical and operational level, one could ask. For the local POE, often regional or national governments and PH authorities formulate the PH measures and in this case would be called tactical, while the PH authority and travel partners would often cooperate in the operationalisation of these measures.

Both the tactical and operational levels, however, should also be seen in a European or even broader international context. As mentioned by several professionals during the interviews, it is frustrating to work day and night protecting the health of the country when actions are ineffective because untuned with other POE in Europe. The pandemic has shown that an EU/Schengen area with no corresponding European-level PH strategy is undoable.

Opportunities and threats

Although we clearly conclude on the need to integrate a predefined operational readiness step in the EMC, we should be careful not to expect magic from it. It is one step further in the pandemic preparedness to bridge the gap to specific response. However, even with a well-elaborated operational readiness framework, it is unclear to what extent scenarios should be thought through in their scale and unique characteristics. During the COVID-19 pandemic, it became clear that ports indeed should be ready to deal with outbreaks on the largest cruise ships. But should they also be prepared for two at the same time? Uncertainty on what will happen remains, always requiring ad hoc coordination and improvisation.

Taleb[41] even argues that the more sophisticated and complex a system and its preparedness for crises is, the more devastating the next crisis will be as it will always occur at a point where you are not paying attention. The easy conclusion is that it may be impossible to define and organise response capabilities and related capacity for all these threats. Given this critical note, how can the concept of operational readiness be used? First, the concept can stimulate the way of thinking about threats and timely response amidst sufficient capacity by, first of all, providing the language to do so. Second, referring back to the travel sector and setting, we will continue to be confronted with infectious disease introductions, since travel volumes will further grow in the future[42] and the risk of the occurrence of new viruses will remain high.[43] We state that thinking about and developing scenarios on capacity requirements using the framework of operational readiness is therefore necessary.

When further testing and developing operational readiness, several opportunities lay ahead. The operational readiness should be tested on subsequent waves in the COVID-19 pandemic or other large-scale outbreaks, and a thorough feedback from practice would be useful. In particular, those responsible for the implementation of the IHR could have fruitful suggestions on how this framework may affect their work in the future. Also, although a scoping review in the publicly available peer-reviewed and grey literature on readiness and operational readiness did not lead to a comprehensive model as used in military science, it is well thinkable that emergency preparedness practices in large emergency relief organisations, has experiences on readiness practices that add up to this framework. An important indication can be seen from WHO, who recently integrated readiness in their EMC.[13]

Methodological considerations

The current framework has been developed based on data gathered in an EU-funded European network of countries and their POE. However, sampling in the network may have led to selection bias and bias through non-response. Another limitation may follow from potential interpretation bias due to interviews in a non-native language for most interviewees and in a long-distance setting. We also wish to acknowledge different characteristics among POE and the national systems in which they are embedded which may affect differences in operations and therefore findings over the interviews. However, next to that, we did not aim to compare different countries, these differences at POE do not necessarily reflect country performance. Furthermore, we stress that the concepts developed in this study are generic. Specific operationalisation of the concepts needs to be done locally and in accordance with specific scenarios. And lastly, the first wave of the COVID-19 pandemic was used as a single source of information to use for a generic framework. The data, however, were collected during a crisis relevant for the framework developed, which may be seen as an important strength.

CONCLUSION

This study has shown activities and their corresponding phases in the transition from a generic state of preparedness into a specific response situation at European POE, based on the COVID-19 first wave. Attempting to further close the preparedness–response gap, we suggest integrating an operational readiness step which acknowledges the time needed for this transition and a stepwise operationalisation of response capabilities. We consider it essential to support this operational readiness phase that will precede any next response situation in the future. Although this case highlighted a European perspective and focus on COVID-19, we strongly believe in its valuable input for the scientific debate on preparedness for and response to next outbreaks involving POE and subsequent implementation in practice.

Author affiliations
[1]National Coordination Centre for Communicable Disease Control, National Institute for Public Health and the Environment, Bilthoven, The Netherlands
[2]Athena Institute, VU University Amsterdam, Amsterdam, The Netherlands
[3]Department of Military Management Studies, Netherlands Defence Academy, Breda, The Netherlands
[4]Department of Organization Studies, School of Social and Behavioral Sciences, Tilburg University, Tilburg, The Netherlands
[5]Department of Primary and Community Care, Radboud University Medical Center, Nijmegen, The Netherlands

ORCID iD
Doret de Rooij http://orcid.org/0000-0002-1922-6021

REFERENCES

1. World Health Organization. *Guide for public health emergency contingency planning at designated points of entry*. World Health Organization, 2012.
2. EU SHIPSAN. SHIPSAN ACT: the impact on maritime transport of health threats due to biological, chemical and radiological agents, including communicable diseases. n.d. Available: http://www.shipsan.eu/
3. European Union AIRSAN project. AIRSAN 2013-2015. 2013. Available: https://www.airsan.eu/
4. European Union Healthy Gateways Joint Action. EU healthy gateways joint action preparedness and action at POE (ports, airports, ground crossings). 2018. Available: https://www.healthygateways.eu/
5. World Health Organization. *International health regulations 2005*. World Health Organization, 2008.
6. European commission Eurostat. Decision no 1082/2013/EU of the european parliament and of the council of 22 october 2013 on serious cross-border threats to health and repealing decision no 2119/98/EC (text with EEA relevance). official journal of the european union 5.11.2013:L293. n.d. Available: http://data.europa.eu/eli/dec/2013/1082/2013-11-05
7. Budd L, Warren A, Bell M. Safeguarding public health at UK airports: an examination of current health security practices. *Transportation Planning and Technology* 2011;34:19–33.
8. Bell BP, Damon IK, Jernigan DB, *et al*. Overview, control strategies, and lessons learned in the CDC response to the 2014-2016 Ebola epidemic. *MMWR Suppl* 2016;65:4–11.
9. Fanoy E, Ummels AE, Schokkenbroek V, *et al*. Outbreak of COVID-19 on an industrial SHIP. *Int Marit Health* 2021;72:87–92.

10 O'Connor C, O'Connell N, Burke E, *et al*. Bordering on crisis: A qualitative analysis of focus group, social media, and news media perspectives on the republic of ireland-northern ireland border during the "first wave" of the COVID-19 pandemic. *Soc Sci Med* 2021;282:114111.

11 European Centre for Disease Prevention and Control. *Public health emergency preparedness – core competencies for EU member states*. Stockholm: ECDC, 2017.

12 Kenis P, Schol LGC, Kraaij-Dirkzwager MM, *et al*. Appropriate governance responses to infectious disease threats: developing working hypotheses. *Risk, Hazards & Crisis in Public Policy* 2019;10:275–93.

13 World Health Organization. *Investing in and building longer-term health emergency preparedness during COVID-19 pandemic: interim guidance for WHO member states*. Geneva: World Health Organization, 2020.

14 Suk JE, Van Cangh T, Ciotti M, *et al*. Enhancing public health preparedness: towards an integrated process. *Eurohealth International* 2015;21:36–9.

15 Enderlein U, Schmidt T, Esenamanov V, *et al*. Monitoring and evaluation framework and its implementation in the WHO european region. *Public Health Panor* 2018;4:134–9.

16 World Health Organization. *Framework and toolkit for infection prevention and control outbreak preparedness, readiness and response at the national level*. Geneva: World Health Organization, 2021.

17 Nuzzo JB, Mullen L, Snyder M, *et al*. *Preparedness for a high-impact respiratory pathogen pandemic*. The Johns Hopkins Center for Health Security, 2019. Available: https://www.centerforhealthsecurity.org/our-work/publications/preparedness-for-a-high-impact-respiratory-pathogen-pandemic

18 Kandel N, Chungong S, Omaar A, *et al*. Health security capacities in the context of COVID-19 outbreak: an analysis of international health regulations annual report data from 182 countries. *Lancet* 2020;395:1047–53.

19 Pesigan A, Bhola AK, Pak HC, *et al*. Building operational readiness for responding to emergencies in the who south-east Asia region. *WHO South East Asia J Public Health* 2020;9:37–42.

20 World Health Organization. *A strategic framework for emergency preparedness. licence: CC BY-NC-SA 3.0 IGO*. Geneva: World Health Organization, 2016.

21 Pan American Health Organization. Prehospital emergency medical services readiness checklist for COVID-19. 2020. n.d. Available: https://www.paho.org/en/documents/prehospital-emergency-medical-system-readiness-checklist-covid-19

22 Tan CM, Barnett DJ, Stolz AJ, *et al*. Radiological incident preparedness: planning at the local level. *Disaster Med Public Health Prep* 2011;5 Suppl 1:S151–8.

23 Tartari E, Allegranzi B, Ang B, *et al*. Preparedness of institutions around the world for managing patients with Ebola virus disease: an infection control readiness checklist. *Antimicrob Resist Infect Control* 2015;4:22.

24 Tran BX, Hoang MT, Pham HQ, *et al*. The operational readiness capacities of the grassroots health system in responses to epidemics: implications for COVID-19 control in Vietnam. *J Glob Health* 2020;10:011006.

25 World Health Organization. *Emergency response framework. licence: CC BY-NC-SA 3.0 IGO*. 2nd ed. Geneva: World Health Organization, 2017.

26 World Health Organization. Regional Office for the Western Pacific. *Regional workshop on operational preparedness for early response to emerging infectious diseases, 4-5 august 2010*. Singapore report: WHO Regional Office for the Western Pacific, 2010. Available: https://apps.who.int/iris/handle/10665/208547

27 World Health Organization Regional Office for Europe. *Operational readiness checklist for COVID-19*. Copenhagen: World Health Organization Regional Office for Europe, 2020.

28 WHO Regional Office for the Eastern Mediterranean. *Coronavirus disease 2019 (COVID-19) strategic preparedness and response plan: accelerating readiness in the eastern mediterranean region. licence: CC BY-NC-SA 3.0 IGO*. Cairo: WHO Regional Office for the Eastern Mediterranean, 2020.

29 de Rooij D, Belfroid E, Eilers R, *et al*. Qualitative research: institutional preparedness during threats of infectious disease outbreaks. *Biomed Res Int* 2020;2020:5861894.

30 AFS. *Allied command operations forces standards volume VII - Combat readiness evaluation of land hqs and units*. AFS, 2020.

31 AFS. *ACO forces standards volume II - land forces (AFS vol II) NATO unclassified if annex F is removed*. 2019.

32 Allied Joint Force Command Headquarters Brunssum. *NATO response force (NRF) 2020 [internet]*. Brunssum: Allied Joint Force Command Headquarters Brunssum, 2020. Available: https://jfcbs.nato.int/systems/file_download.ashx?pg=247&ver=19

33 World Health Organization. IHR score per capacity. 2019. Available: https://extranet.who.int/e-spar

34 WHO. *Joint external evaluation tool: international health regulations. licence: CC BY-NC-SA 3.0 IGO*. second edition. Geneva: World Health Organization, 2018.

35 KNAW; NFU; NWO. TO2-federatie; vereniging hogescholen; VSNU (2018): nederlandse gedragscode wetenschappelijke integriteit [DANS]. n.d. Available: https://doi.org/10.17026/dans-2cj-nvwu

36 O'Brien BC, Harris IB, Beckman TJ, *et al*. Standards for reporting qualitative research: a synthesis of recommendations. *Acad Med* 2014;89:1245–51.

37 VERBI Software. *VERBI software 2019, MAXQDA 2020, computer program*. Berlin,

38 European Centre for Disease Prevention and Control. *Health emergency preparedness for imported cases of high-consequence infectious diseases*. Stockholm: ECDC, 2019.

39 van den Oord S, Vanlaer N, Marynissen H, *et al*. Network of networks: preliminary lessons from the Antwerp Port authority on crisis management and network governance to deal with the COVID-19 pandemic. *Public Adm Rev* 2020;80:880–94.

40 Peters J. *Rijnlands organiseren*. Amsterdam: Boom, 2021.

41 Taleb NN. *The black swan: the impact of the highly improbable*. New York: Random House, 2007.

42 IATA. 20 year passenger forecasts.[internet]. international air transport association.[updated unknown]. n.d. Available: https://www.iata.org/pax-forecast/

43 Bloom DE, Cadarette D. Infectious disease threats in the twenty-first century: strengthening the global response. *Front Immunol* 2019;10:549.