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Creating a clear picture of nursing care

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CREATING A CLEAR PICTURE OF NURSING CARE

Renate Kieft

Creating a clear picture of nursing care

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Creating a clear picture of nursing care

Het inzichtelijk maken van verpleegkundige zorg

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het college voor promoties aangewezen commissie

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Chapter 1

Introduction

Creating a clear picture of nursing care

The aim of this thesis is to obtain a proper picture of how the quality of nursing care[1] can be made clear. That objective is directly linked to developments in the work of nurses. It is a professional group that is facing some interesting and sometimes complex challenges, such as caring for people who are reaching more advanced ages and have complex care demands as a result of comorbidity. Nursing staff are also having to deal with digitization[2] and technological innovations, such as the development of various applications (also known as 'apps'). Moreover, healthcare is increasingly confronted with a demand for transparency and a climate of accountability. Accordingly, nursing staff are increasingly being called on to provide insights into the quality of care. This doctoral thesis has adopted the definition of 'quality of care' given by the Institute of Medicine [1] (p. 21), which reads: *"the degree to which healthcare services provided by professionals (including nursing staff) for individuals and populations increase the likelihood of health outcomes relevant to patients and are consistent with current professional knowledge".*

Health outcomes relevant to patients are outcomes that have value for the patient; they are determined jointly with the patient. This means that various care professionals work with the patient, each from the perspective of their own discipline, to determine the relevant healthcare outcomes. A medical specialist, for example, may focus on restricting the size of a tumour while a nurse will teach the patient how to cope with functional limitations and other consequences of cancer in their daily life.

Healthcare outcomes that are influenced by nurses' interventions or actions and are relevant for patients are termed 'nursing-sensitive outcomes' [2]. A nursing-sensitive outcome may show the extent to which the desired result has been achieved, for example "the patient can eat and drink without assistance" or "the patient is pain-free". Alternatively, it may show the degree of change in the health status (including for instance the physical, mental, functional or social state) or well-being, for example "the patient depends to some extent on assistance for the administration of food and drink" or "the patient has a pain score of five".

In the literature, 'nursing-sensitive outcomes' are sometimes confused with 'nursing-

1 The term 'nursing staff' can also refer to a care worker, coordinating nurse or nursing specialist.

2 In this thesis, 'digitization' refers to the situation where health records on paper are converted to electronic health records; medical data can then be processed by a computer [3] (National Institute for Public Health and the Environment & Ministry of Health Welfare and Sport, 2016).

sensitive quality indicators'. Boxed text 1 explains what nursing-sensitive quality indicators are.

Box 1: Nursing-sensitive quality indicators

A quality indicator is deemed to be nursing-sensitive if the outcome of the quality indicator is influenced by nursing care (Burston et al., 2014). The outcomes help to form an opinion about the quality of nursing care. A quality indicator is expressed as a number or percentage (Mainz, 2003a). These numbers or percentages are calculated using data that nursing staff record in the health records, such as the number of patients or percentage of patients in an organization with a pain score of five or more. A quality indicator becomes meaningful once a norm value has been determined. If the norm has been achieved, there is no need to make adjustments. Deviations from the norm mean that adjustments need to be made.

Furthermore, a distinction is made between structural, process and outcome indicators.

- Structural indicators concern the preconditions for the delivery of care, such as the number of nurses on a ward or the number of nurses who have received training.
- Process indicators concern the care process and how nursing staff or other care professionals should act in order to deliver high-quality care. These indicators give an indication of the quality of the delivery of care or the care needs assessment, for example whether protocols are being followed, whether there are waiting lists or whether pain scores are being measured in patients.
- Outcome indicators concern healthcare outcomes, such as the number of falls or the number of people suffering malnourishment at a healthcare provider. Nursing-sensitive care outcomes are part of such outcome indicators. An example of an outcome indicator is the percentage of patients with a pain score of five or more.

The assumption in structural and process indicators is that the structures or processes being measured affect outcome indicators.

Nursing-sensitive quality indicators

A quality indicator is a quantitative measure that alerts others to the quality of the care and the quality of the organization. Existing research into nursing-sensitive outcomes and quality indicators shows that the chosen themes do not always match up. In Canada, Doran *et al.* [4,5] investigated which outcomes are influenced by nursing care and how

these outcomes could be measured in a reliable and valid way. The following themes were defined: 1) functional status (such as ADL and IADL); 2) self-care; 3) symptom management (relating to fatigue, nausea and vomiting, dyspnoea and pain); 4) safety incidents (falls, pressure sores, medication errors and infections). The research by Doran *et al.* [4,5] was part of a national project initiated by the Canadian Nurses Association for the purpose of implementing unambiguous standardized outcome information in the electronic health records (C-HOBIC).

A similar project was set up in the United States, whereby the American Nurses Association – working with the National Quality Forum – specified fifteen nursing themes of which eight were nursing-sensitive outcomes [6]: 1) death among surgical inpatients with treatable serious complications (failure to rescue); 2) pressure sore prevalence; 3) the prevalence of falls; 4) falls with injury; 5) restraint prevalence; 6) urinary tract infections in intensive care unit (ICU) patients associated with urinary catheterization; 7) bloodstream infection rate for ICU and high-risk nursery patients associated with central line catheters; 8) ventilator-associated pneumonia for ICU and high-risk nursery patients. Quality indicators were developed for these themes, with data being collected nationally through the National Database of Nursing Quality Indicators (NDNQI), so that the relationship between nursing care and outcomes can be studied [7].

In the Netherlands, health insurers commission surveys of patients' experience of care, doing so in consultation with patient organizations and healthcare providers. Various questionnaires have been developed for these surveys. Patients' experiences are considered to be a nursing-sensitive quality indicator because the experiences of patients depend in part on the numbers of nursing staff [4,8]. In addition, nursing-sensitive quality indicators are used at the national level to monitor and boost safety and the quality of care. These quality indicators were developed for the individual healthcare sectors with a coordinating role for the Health and Youth Care Inspectorate and in consultation with the health insurers, healthcare providers, patient associations and professional associations.

The mental healthcare, addiction care and forensic care sectors developed a general set of quality indicators that covered the themes of severity of the problems, somatic screening, timely contact after the patient is discharged from the clinic, availability of the medication summary and separation [9]. This set applies to all the relevant care professionals, so it is not clear what share or influence nursing staff have or how the specific contribution of nursing care is assessed.

The set of indicators for hospitals and private clinics includes nursing-sensitive quality indicators for the themes of wound care, malnourishment, delirium and hospital-wide pain measurement [10].

In the past few years, the government has carried out a reform of long-term nursing care in institutions (nursing homes) and at home. The aim is for long-term care and support to be delivered in the person's home for as long as possible (https://www.langdurigezorg.nl/hervorminglangdurigezorg/). In connection with this reform, new quality indicators had to be established for the purpose of the Inspectorate's monitoring and to keep the general public informed about the quality of the care. With the professional associations V&VN and Verenso coordinating the effort, a new set of quality indicators was developed for the nursing home sector, covering pressure sore prevention, advance care planning, medication safety and justified use of restrictive measures [11]. Interestingly, this set is geared primarily to learning and making improvements at the local level, rather than monitoring safety and the quality of care. The quality indicators will be surveyed for the first time in 2018-2019. The evaluation will focus on whether the quality indicators truly help teams learn and make improvements.

Creating a clear picture of nursing care

The discussion above shows that there are national and international differences in the chosen nursing-sensitive outcomes and associated quality indicators. Various explanations can be given for this. Nursing care is delivered in various sectors, each of which has its own focus, dynamics and culture. The decision to use certain quality indicators may be related to this. Another possible explanation for the differences in the chosen quality indicators is that nurses are not particularly capable when it comes to specifying how they can achieve nursing-sensitive outcomes in terms of the functioning and well-being of patients. Nursing staff work in teams, collaborate with various disciplines and also perform activities on the instructions of other disciplines. Nursing staff deliver care based on related knowledge domains, such as the physical, mental, functional and social performance and well-being. There may not be undisputed views on these knowledge domains. Quantifying the unique contribution of nursing care to outcomes is a challenge. It is therefore important to continue the academic research on this subject.

This importance has been recognized in the Netherlands. Partly because of this, the Dutch Nurses Association Verpleegkundigen en Verzorgenden Nederland (V&VN)

started the Excellent Care programme in 2009 (see boxed text 2).

Box 2: Excellent Care

The main aim of the Excellent Care programme (https://www.venvn.nl/themas/excellente-zorg) is to encourage a productive and satisfying working environment in which high-quality care is delivered. This means a working environment in which nursing staff are challenged to make optimum use of their knowledge, skills and expertise. Nursing staff have a responsibility to work continually on improving the quality of care and to offer care that is tailored to the wishes and needs of patients (Kramer & Schmalenberg, 2004a, 2004b, Kramer, Schmalenberg & Maguire, 2004a, 2004b). The programme fits in with the principles of the Magnet Recognition Program that is run by the American Nurses Credentialing Center (ANCC), in which a systematic effort is made to create a working environment for nursing staff geared to providing information and improving nursing-sensitive outcomes.

In the Excellent Care programme, knowledge backed up by academic research has been developed about the working environment of nursing staff and the quality of nursing care. De Brouwer, Kaljouw, Kramer, Schmalenberg & van Achterberg [16] investigated whether Dutch nursing staff feel they have a "productive and satisfying working environment" and whether this perception influenced the perceived quality of nursing care. The measuring instrument for assessing nurses' experiences in their working environments (using eight characteristics) has been translated and validated. This is the Dutch Essentials of Magnetism II instrument (Dutch EOMII). The measuring instrument is used for surveying respondents' experiences regarding the eight characteristics and their subjective perception of the quality of nursing care. An interesting question is whether the opinions or perceptions of nurses about the quality of the care they deliver matches the quality of care actually delivered; take the screening of pain, delirium or malnourishment, for example.

Research by Stalpers, Linden, Kaljouw & Schuurmans [17] shows that outcomes for screening of pain, delirium, malnourishment and prevention of pressure sores are a good indicator for measuring the quality of care. However, nursing staff say that they have 'little time' to reflect on what they do and learn from it. Furthermore, "unfamiliarity with the mandatory quality indicators" and "unreliability of the data for benchmark purposes" also play a role [18]. These findings are relevant because they show that various factors can influence the provision of information about the quality of care.

It is accordingly important to continue to carry out research into nurses' working environments in relation to learning and making improvements. This thesis reports on a study of how and to what extent nursing staff feel they have influence in improving the quality of care. In addition, the methodological quality is examined of the methods used to date for providing information about the quality of care. Little is known about this. Finally, further research is needed into the data that nursing staff currently document in the electronic health records.

That is important, because a search was made in the Excellent Care programme for existing data that could be used to show the contribution nursing makes to outcomes. That included looking at the data on the nationally surveyed nursing-sensitive quality indicators. This data is documented in the electronic health records. It is mandatory for healthcare providers to supply this data. An exploratory assessment in the Excellent Care programme showed that the quality of the digital data that nursing staff record in the health records is an issue that needs attention: data is documented in multiple ways and the data supplied is ambiguous or incomplete. This means that it is hard to make statements about the quality of nursing care or to make comparisons between organizations. This is a significant bottleneck because nurses in the Netherlands are increasingly being called upon to provide supporting scientific evidence for the nursing care and to provide a clear picture of the quality of care [19,20]. The following section therefore takes a closer look at digital data and the importance of working to achieve clarity and uniformity.

Digital data

Digital data is not necessarily unambiguous

Data is increasingly being recorded in electronic health records. The benefit of this is that care professionals such as medical specialists, nursing staff and physiotherapists can share their data with each other or with the patient more easily. Even so, the advantages of reporting digitally are by no means always evident to care professionals. The Dutch Federation of University Medical Centres has published a report on the quality of reporting and the use of data for various purposes [21]. Patients often have to interact with various care professionals and care providers who record all kinds of information about the patient, such as their home situation and family details, smoking habits, symptoms or limitations. The way in which this data is recorded in the electronic health records can however vary.

The same applies for the data that is documented by nurses ("nursing data"). A range of studies have shown that nurses use a wide variety of terms in their documentation [4,22,23]. As a result, the data is not properly comparable and therefore also not properly exchangeable and reusable. When a patient is transferred from one care setting to another, it is often not possible to reuse the data. Nursing staff often have to copy the data across manually and convert it to their own health record or have to ask the patient for the information once again.

Misunderstandings and incorrect interpretations arise because nurses do not understand one another properly. Not only does this increase the chance of errors but it also has a negative effect on the safety of care [24–28].

The lack of unambiguous data recorded by nurses is being discussed to an increasing extent by researchers and people in practice, with a plea also being made that this diversity should be converted into unambiguous data [29–32].

A sustainable information system

The rise of electronic health records means that it is becoming increasingly important to record data unambiguously and to be able to share it safely. In order to tackle the multidisciplinary question of diversity in the data, the National Health Information Council was set up in 2014. This is a venture aimed at providing steering, involving relevant sectoral and umbrella organizations (including V&VN) and the Ministry of Health, Welfare and Sport. The participants in the National Health Information Council are working on developing, setting up, managing and maintaining information standards and other standards, terminology, registers and agreements that comply with the requirements imposed if digital information is to be exchangeable (also referred to as a **sustainable information system**) [33]. This also means they are committing to the agreements that are being made about the standards for the technology and content that will be required to make the data unambiguous.

From diversity to unambiguous data: a sustainable information system for the longer term

Two aspects are important in the transition from diversity to uniformity. The two aspects are related, being referred to jointly as 'creating unambiguous and standardized data'.

- The first is that agreements are needed about how data has to be included within the electronic health record in a way that makes reuse possible. These agreements are to be described in an information model known as 'Health Care Information Model (HCIM)'[3].
- Secondly, it is important that data has the same meaning everywhere and is not open to multiple interpretations. This latter point is also important for nursing staff as a professional group because a wide range of terms are used within nursing to describe the care being delivered. This thesis gives the initial impulse towards developing an unambiguous terminology for patient problems, as seen from the nursing perspective.

Although the focus of nursing care can vary from one sector or setting to the next, the care delivered for the patient in one care setting should be consistent with the care in any other care setting. Patient problems are the basis of the care plan in which nursing staff take decisions together with the patient and make agreements about what care is needed and in which the nursing-sensitive outcomes and results are noted [34]. Unambiguously defined patient problems are a cornerstone for cooperation between nurses, other disciplines and patients: sharing and reusing data and being able to understand one another. The principle here is that the data should be recorded once and used many times. This is explained in the following paragraph.

Record once and use many times: registration at the source

Data can be used for many different purposes. In that context, a distinction is often made between primary data (or source data) and secondary use of that source data. This is explained further below.

Primary data (source data) in the electronic health record

Nurses define the care and outcomes that are needed and relevant, together with the patient. The nurse asks questions, observes and makes measurements of the

3 The first set of the Health Care Information Model was published in 2015 (for more information, see Health Care Information Model).

patient's health and how they are functioning. Nursing staff use this information and put together a care plan, again in consultation with the patient, that records not only the agreements about the desired outcomes but also the needs and wishes of the patient. This is about outcomes that are relevant for the patient and that can be affected by nursing interventions or actions. Monitoring the progress makes it possible to determine whether the nursing care plan needs to be adjusted.

The collected data for individualized patient care is documented in the electronic health record. The electronic health record therefore also contains data that is relevant for the nursing care, supervision, treatment or support of the individual patient. This data is the basis for the health record and it is considered to be the **primary data or source data** [29,35,36]. (see Figure 1).

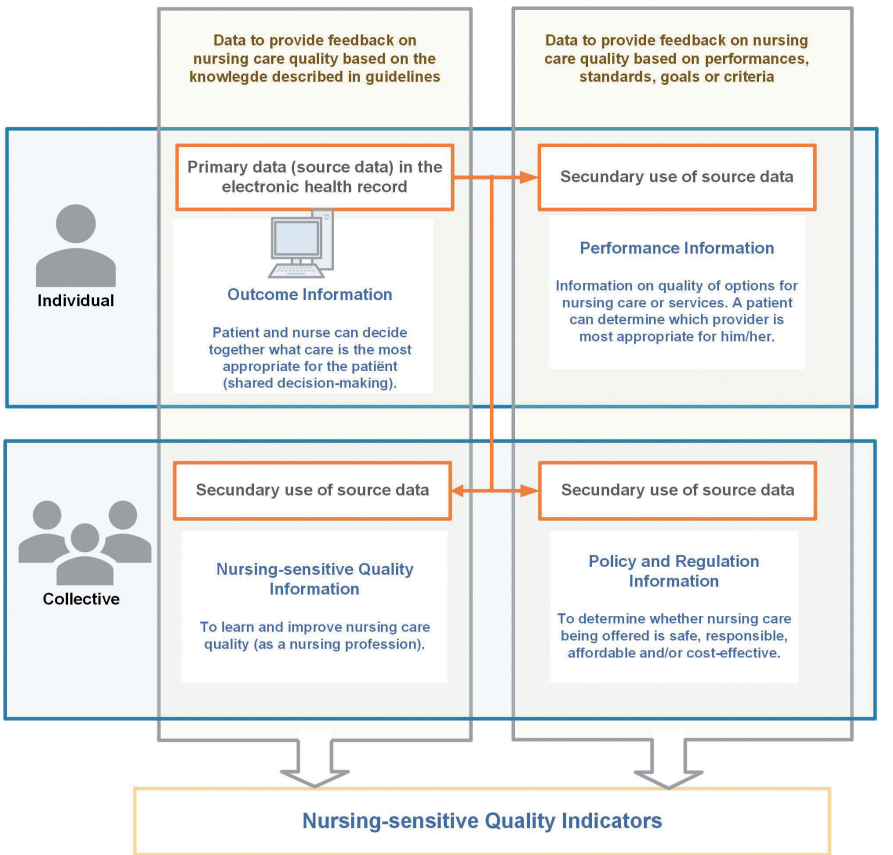

Figure 1. Source data (primary data) and secondary use

It is important that patients are able to make a well-considered choice about the desired outcomes of care such as positive changes in their state of health (which includes the physical, mental, functional and social condition) or the patient's well-being. This **outcome information** must therefore be known and available so that the nurse and patient can decide together what care is the most appropriate for the individual patient

Secondary use of source data
Data can also be used for other purposes (i.e. other than care of the individual patient); this is also referred to as **secondary use of source data** [31,36]. If the source data is recorded in a unambiguous way, that data can also be supplied for secondary use in a form that is unambiguous. This makes it possible, for example, to compare the quality of nursing care between organizations, without the data quality being an issue. The principle of recording once and using many times is also referred to as *registration at the source* (or *recording at the source*).

Secondary use of data in order to obtain a clear picture of nursing care is important from a number of perspectives. The first such perspective is that of the collective interest of nursing as a professional group that needs data in order to demonstrate that nursing interventions or actions make sense and are effective. As a professional group, nursing staff develop knowledge, share it, learn and improve, thereby being able to justify their actions better to patients and others. Information about nursing interventions and actions is in this case always derived from the source data (the primary data) and is used at the professional group level to ***learn and improve: nursing-sensitive quality information*** (see Figure 1).

Secondly, secondary use of source data is important from the perspective of the patient's choice so that they can compare how care providers perform: **performance information** (see Figure 1). A patient needs data about the quality and the results of nursing and other care if they are to determine what care or which care provider is appropriate.

This perspective is important in the context of a regulated market: the patient must be able to choose between care providers. Hischman's theory '*Voice, Exit and Loyalty: Responses to Decline in Firms, Organizations and States*' can be used for studying the relationship between patients and healthcare providers [37,38]. According to this theory, patients can exert influence on the healthcare provider's policy in two ways. Everyone is able to use their 'voice' by opening the quality of the care policy up for discussion, for example through a clients' council. It is also possible to 'exit', i.e. switch over from one healthcare provider or care to another. Behaving in this way – making choices – is a signal

that the providers should implement changes in their policy. However, in order to be able to choose, the patient must have a clear picture of the quality of the nursing and other care and/or the costs associated with it.

Thirdly, secondary use of source data is important for health insurers, policy makers and for the Health and Youth Care Inspectorate (IGJ). The care insurers purchase care and will want to know whether that care is affordable and cost-effective. The IGJ needs data about the care so that their inspectors and supervisors can determine whether the nursing care being offered is safe and responsible and whether the right care is being delivered (in other words, whether the nursing staff's interventions or actions are in line with the knowledge described in a guideline). From that perspective, the secondary purpose for which the source data is being used is for ***policy and regulation information*** (see Figure 1).

Nursing-sensitive quality indicators

In all forms of use, it is important that outcomes are measured that are valuable to the patient and that can be affected by nursing interventions or actions. Data that is primarily recorded in the electronic health record for the purposes of individual patient care is therefore also an important source. This data can be used for producing an opinion on the quality of nursing care. With that in mind, nursing-sensitive quality indicators can be used for a variety of target applications, such as outcome information to base choices on. This information should provide feedback on nursing care quality based on the knowledge described in guidelines. Nursing-sensitive quality indicators can also can be used for performance information and policy and regulation information. This information should provide feedback on nursing quality based on performances, standards, goals or criteria.

It is important that the source data is unambiguous, accurate and consistent [39–42], so that multiple uses and exchange are made possible and the corrected information is at hand for nursing-sensitive quality control, performance, policy-making and regulation purposes.

In this thesis, various studies focus on the perspective described above: nurses can have clear and uniform information available about patient problems in a form that is exchangeable, usable and reusable for secondary purposes. Based on these patient problems, nursing-sensitive outcomes can be derived and determined.

Thesis objective and outline

This doctoral study was commenced as scientific supervision within the Excellent Care programme. The aim of this thesis is to obtain a proper picture of how the quality of nursing care can be made clear. The thesis consists of two parts.

The aim of Part I is to obtain a clear picture of the working environment as one aspect of gaining insights into the quality of nursing care. This objective is based on the idea that a working environment in which nursing staff can work under conditions that let them learn 'on the job' to ensure the right quality of care. This thesis starts by presenting a sub-study that explains how and to what extent nurses feel that they have an influence on the quality of care and what the methodological quality is of the methods that have been used thus far for clarifying the quality of nursing care. That insight is important in order to ensure that learning and improving can become elements of the culture of a care institution.

Part II focuses on improving the quality of the data that nurses document in the electronic health record. That objective is based on the realization that the nursing staff and patients can then have the same unambiguous data available (e.g. about progress) so that the care process of the individual patient can be monitored and so that this data can also be used for other purposes such as quality control, performance measurement, policy-making and regulation without any arguments about the source data quality. This thesis starts by presenting a sub-study that focuses on describing patient problems uniformly. The knowledge and insights gained from this will be a significant help in creating a picture of nursing care without the quality of the data being called into question.

The following research question is central to this thesis:
How is it possible to get a clear picture of the quality of nursing care?
To answer that, the following questions have been defined:

- How and to what extent do nurses have an influence over the quality of care?
- What is the methodological quality of the methods that have been used so far to obtain a picture of the quality of nursing care?
- What patient problems must be recorded once only at the source, so that the information can be used multiple times and exchanged without data loss?

The thesis consists of two parts. Three subs-studies (**Chapters 2-4**) are described in **Part I**, largely focusing on the first two questions. A variety of research methods were used for carrying them out.

The first qualitative sub-study (**Chapter 2**) addresses the question of whether Dutch nurses feel they have any influence within their working environment on improvements in the quality of care. How do the eight features of a productive and satisfying working environment affect the way that nursing staff deliver care to the patients? What factors do nurses think are the positives and the obstacles?

In addition, nurses have their own subjective opinions about the quality of care they deliver [43]. It is therefore interesting to ask whether the subjective perspectives of nurses on the quality of care they provide is linked to the outcomes of nursing-sensitive quality indicators for hospital care.

The second sub-study (**Chapter 3**) is a cross-sectional study that examines the question of whether there is a match between how nurses perceive the quality of care they provide and the quality that is delivered (in the Dutch hospital context).

The third sub-study (**Chapter 4**) covers an investigation into the methodological quality of nursing-sensitive quality indicators in the hospital sector. The quality indicators that legally oblige healthcare providers to supply information about the quality of the care delivered have been studied further. Those are the quality indicators that have been defined for hospitals for monitoring purposes. It is important that the quality indicators that have been developed give a reliable picture of the quality of nursing care [44]. For that reason, the methodological quality of these quality indicators has been assessed: are the outcomes valid, reliable and usable for quality improvement and other accountability purposes?

Part II of this thesis addresses the third question. Through the Excellent Care programme, it transpired that data is recorded in a variety of ways and is incomplete or ambiguous when delivered. In addition, it was stated in section 2 that various parties and the Ministry of Health, Welfare and Sports were working on a long-lasting information system, with efforts being made to ensure registration at the source: recording data once only and then using it multiple times. In the light of these developments, this thesis has investigated how unambiguous (standardized) data for nursing care could be developed. Three sub-studies in this part of the thesis (**Chapters 5-7**) are related to patient problems.

An overview has been created with the help of a representative group of nurses showing the patient problems that are commonest in nursing practice in the Netherlands and to what extent nurses feel they have an influence on preventing or reducing these patient problems (**Chapter 5**).

The insights this gives into patient problems can serve as a basis for defining a list of unambiguous and understandable terms using SNOMED CT as the reference terminology (**Chapter 6**).

The final sub-study focuses on how the terms defined for the subset of patient problems fit with the associated terms as defined by the various classifications (**Chapter 7**). These studies provide an initial impulse towards developing uniformly exchangeable terminology for patient problems, as well as underlining the importance of doing so.

The studies described in this thesis are important because of the underlying thinking, i.e. that nurses can keep improving the quality of nursing care in consultation with the patients. Understanding the underlying factors or mechanisms makes it possible to change both the work and the working environment, thereby improving the quality of care. Providing an initial impulse towards developing uniform terminology for patient problems creates the scientific foundations for a future-proof nursing information model for nurses in the Netherlands.

Table 1 gives an overview of the studies that have been included in this thesis.

Table 1. Overview of the studies in the thesis

Research question for the thesis:
How is it possible to get a clear picture of the quality of nursing care?

Part I:
- How and to what extent do nurses have an influence over the quality of care?
- What is the methodological quality of the methods that have been used so far to obtain a picture of the quality of nursing care?

	Study	Research question	Methodology/Design
1	How nurses and their work environment affect patient experiences of the quality of care: a qualitative study	According to nurses, which elements of their work and work environment influence patient experiences of the quality of nursing care? The sub-questions were: 1. Are these elements related to the eight essentials of magnetism? 2. What is the mechanism by which these elements lead to better patient experiences?	A qualitative study
2	Concordance between nurse-reported quality of care and quality of care as publicly reported by nurse-sensitive indicators	What is the performance of each hospital on the following nurse-sensitive screening indicators: delirium, malnutrition, and pain assessments? What is the nurses' perception of the quality of care; and can any statistical differences between the hospitals be ascribed to differences in nurse characteristics, and Is there a concordance between the two measures of quality of nursing care?	A cross-sectional study
3	The methodological quality of nurse-sensitive indicators in Dutch hospitals: a descriptive exploratory research study	What is the methodological quality of the mandatory NSIs for Dutch hospitals?	A descriptive exploratory research study

Table 1. (Continued)

Part II:
- What patient problems must be recorded once only at the source, so that the information can be used multiple times and exchanged without data loss?

	Study	Research question	Methodology/Design
4	A nationwide survey of patient problem occurrence across different nursing healthcare sectors	Which categories of patient problems do nurses encounter in clinical practice most frequently? Which specific patient problems do nurses encounter on a daily basis? What level of influence do nurses report having in preventing or minimising patient problems that occur on a daily basis?	Exploratory online survey research
5	The development of a nursing subset of patient problems to support interoperability	Which SNOMED CT concepts cover patient problems frequently encountered in Dutch nursing practice?	A qualitative approach based on focus groups
6	Mapping the Dutch SNOMED CT subset of patient problems to Omaha System, NANDA International and International Classification of Functioning, Disability and Health	To what extent can the SNOMED CT subset of patient problems be mapped onto the: Omaha System? NANDA International diagnosis tables? ICF?	Descriptive research using a unidirectional mapping strategy.

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Part I

Chapter 2

How nurses and their work environment affect patient experiences of the quality of care: a qualitative study

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Abstract

Background

Healthcare organisations monitor patient experiences in order to evaluate and improve the quality of care. Because nurses spend a lot of time with patients, they have a major impact on patient experiences. To improve patient experiences of the quality of care, nurses need to know what factors within the nursing work environment are of influence. The main focus of this research was to comprehend the views of Dutch nurses on how their work and their work environment contribute to positive patient experiences.

Methods

A descriptive qualitative research design was used to collect data. Four focus groups were conducted, one each with 6 or 7 registered nurses in mental health care, hospital care, home care and nursing home care. A total of 26 nurses were recruited through purposeful sampling. The interviews were audiotaped, transcribed and subjected to thematic analysis.

Results

The nurses mentioned essential elements that they believe would improve patient experiences of the quality of nursing care: clinically competent nurses, collaborative working relationships, autonomous nursing practice, adequate staffing, control over nursing practice, managerial support and patient-centred culture. They also mentioned several inhibiting factors, such as cost-effectiveness policy and transparency goals for external accountability. Nurses feel pressured to increase productivity and report a high administrative workload. They stated that these factors will not improve patient experiences of the quality of nursing care.

Conclusions

According to participants, a diverse range of elements affect patient experiences of the quality of nursing care. They believe that incorporating these elements into daily nursing practice would result in more positive patient experiences. However, nurses work in a healthcare context in which they have to reconcile cost-efficiency and accountability with their desire to provide nursing care that is based on patient needs and preferences, and they experience a conflict between these two approaches. Nurses must gain autonomy over their own practice in order to improve patient experiences.

Background

In countries throughout the world, patient experiences are being monitored in order to obtain information about the delivery and quality of healthcare [1]. Patient experiences can be defined as a reflection of what actually happened during the care process and therefore provide information about the performance of healthcare workers [2]; it refers to the process of care provision [3].

In the United States [4] and many European countries [5], assessing patient experiences is part of a systematic survey programme. In the Netherlands, the government has implemented a national performance framework for comparing the quality of healthcare. This framework contains a set of quality indicators that include patient experiences. The Consumer Quality Index (CQI) is used as the measurement standard [6].

Assessing patient experiences of the quality of care not only provides information about the actual experiences, but also reveals which quality aspects patients regard as most important [7]. Many studies have been performed to analyse what patients consider essential within health-care [8-10]. For example, a study by the Picker Institute Europe [11] revealed eight general quality aspects:

1. Involvement in decisions and respect for preferences
2. Clear, comprehensible information and support for self-care
3. Emotional support, empathy and respect
4. Fast access to reliable health advice
5. Effective treatment
6. Attention to physical and environmental needs
7. Involvement of, and support for, family and carers
8. Continuity of care and smooth transitions

The quality aspects are mostly reflected in questionnaires used to monitor patient experiences, such as the CQI [12] or the Consumer Assessment of Healthcare Providers and Systems (CAHPS) [4]. Patients are asked which aspects in receiving care are of importance and about their actual experiences [13].

Patient experiences have been identified as an indicator for evaluating and improving the quality of care [3,14]. When healthcare organisations assess patient experiences, professionals can use the results for internal quality improvements. Professionals use

patient experiences and preferences to adjust their own practice and to make visible their contribution to patient outcomes [15].

Because nurses spend a lot of time with patients [16], they affect patient experiences of care [17]. Research has shown that the nursing work environment is a determining factor. It seems that when patients have positive experiences of nursing care, nurses also experience a good and healthy work environment [18-20]. A healthy work environment can be defined as a work setting in which nurses are able to both achieve the goals of the organisation and derive personal satisfaction from their work [21]. A healthy work environment fosters a climate in which nurses are challenged to use their expertise, skills and clinical knowledge. Furthermore, nurses who work in such an environment are encouraged to provide patients with excellent nursing care [21]. Research by Kramer and Schmalenberg revealed that several aspects are related to the work environment [22]. The researchers used grounded theory to identify eight 'essentials of magnetism' that define the nursing work environment and influence the quality of nursing care.

From the perspective of nurses, the following eight 'essentials' are crucial in a work environment to the provision of high quality nursing care [22]:

- Clinically competent nurses
- Adequate staffing
- Good nurse–physician relationships
- Autonomous nursing practice
- Nurse manager support
- Control over nursing practice
- Support for education
- A culture that values concern for patients

Relation between nursing work environment and patient experiences of the quality of care

The American Nurses Credentialing Center (ANCC) started the Magnet Recognition Program in the early 1990s. This programme was built upon the study carried out in 1983 by McClure et al. [23]. It is focused on improving patient care, patient safety and patient experiences by creating a good and healthy work environment for nurses. Research has shown that patient experiences in healthy work environments are significantly better [24-26].

The relationship between the nursing work environment and patient experiences was also investigated in a cross-sectional study carried out in 430 hospitals by Kutney-Lee et al. [18]. The researchers used data on patient experiences from the national CAHPS survey. The nursing work environment was measured with the PES-NWI tool, which includes items on nursing leadership and nurse–physician relationships. Data on 20,984 staff nurses were used in the study. The nursing work environment had significant relations with all ten CAHPS measures, indicating that the quality of the work environment has an influence on patient experiences of the quality of care.

This finding corresponds with the cross-sectional study by McHugh et al. [19] in which 428 hospitals and 95,499 registered nurses participated. The researchers used data from the PES-NWI and the CAHPS. They concluded that nurses' dissatisfaction with their work environment was associated with a significantly lower quality of patient experiences.

In the RN4Cast project [20], 61,168 hospital nurses and more than 131,000 patients in Europe and the United States were questioned in a cross-sectional survey. The aim of this immense study was to determine whether the nursing work environment affected patient care. The PES-NWI was used to measure the nurses' perceptions of their work environment. Patients' overall satisfaction was measured with the national CAHPS survey. The perceptions of nurses and those of patients were found to be consistent, indicating that both patients and nurses had more positive experiences in hospitals with better work environments.

Although there is a relationship between the nursing work environment and patient experiences of the quality of care, it is not clear how this relationship is formed and characterised from the perspective of Dutch nurses, and which aspects in daily practice influence patient experiences. Could these aspects somehow be linked to the 'essentials of magnetism'? Little is known about the underlying mechanisms and how these result in better patient experiences. In 2006, the Dutch government started to move towards a healthcare model of responsible consumer choice and care services competition [27]. Because of this entrepreneurial approach, healthcare organisations transformed their policy towards a cost-efficiency and productive care system (e.g. a shorter length of stay per patient) [28]. Furthermore, today's patients tend to suffer from multiple disorders or illnesses, which results in a higher complexity of care and an increased nursing workload. The increasing complexity of patient care requires well-trained nurses who are capable of creating a safe and patient-centred environment [29]. In 2011, the Netherlands Institute for Health Services Research conducted a

literature study to investigate the roles and positions of nurses in Belgium, Germany, the United Kingdom, the United States and Canada, and found differences in levels of education and nursing job profile or job description in all five countries [30].

Given the circumstances and changes with which Dutch nurses are confronted, it is important and relevant to examine and comprehend their views on how their work and work environment contribute to positive patient experiences.

Methods

Aim of study

The aim of this study was to understand from the perspective of nurses how the nursing work environment is related to positive patient experiences.

Research question

The central research question was: According to nurses, which elements of their work and work environment influence patient experiences of the quality of nursing care?

The sub-questions were:

- Are these elements related to the eight essentials of magnetism?
- What is the mechanism by which these elements lead to better patient experiences?

Research design

A phenomenological approach was applied to explore areas about which little is known or to gain an understanding of specific areas. Phenomenology is the study of subjective experience, feelings and behaviours of people [31,32].

Sample size, composition and data collection

To gain a deeper understanding of the influence of the nursing work environment on patient experiences, we conducted four focus groups. The purpose was to elicit ideas, thoughts and perceptions from nurses [31] about patient experiences and how nurses can improve those experiences. We recruited participants by purposeful sampling, using the following criteria:

- Participants must be employed as registered nurses or certified nursing assistants.
- Participants must have worked as nurses for at least two years.
- Participants must be operative in mental health care, hospital care, home care or nursing home care.

Nurses are active in various settings and every setting has its specific dynamics. By

gaining insight into their perspectives, we were able to compare possibly different views. In addition, we obtained an overall view of the total healthcare system.

The organisations we recruited are participating in a Dutch programme called Excellent Care. The programme is based on the eight essentials of magnetism and focuses on creating a dynamic, inspiring and innovative nursing work environment in order to improve the quality of care. We asked the programme director of each organisation to recruit nurses for the focus groups. A total of 26 registered nurses participated. Each focus group consisted of 6 or 7 registered nurses in mental health care, hospital care, home care and nursing home care, respectively. The nurses described their perceptions and views with respect to their own areas of expertise.

Each focus group discussion was led by two researchers. One researcher facilitated the interview, and the other had an observing role and monitored the process. After each focus group, the researchers evaluated and critically reflected on the process in order to examine the quality of the meetings. This investigator triangulation allowed the dissection of possibly different views.

The researchers used an interview guide with predefined topic areas (Table 1, topic list). The sequencing of questions depended on the process of the group and the responses of the informants.

Table 1. Topic list

Questions:	Topics:
– Which elements in daily nursing practice influence patient experiences?	– Clinically competent nurses
– In what way do nurses effect experiences of patients?	– Adequate staffing
– What are inhibiting or facilitating factors?	– Nurse-physician relationship
	– Autonomous nursing practice
	– Nurse manager support
	– Control over nursing practice
	– Support for education
	– A culture that values concern for patients

Each focus group lasted two hours. The researchers explained the procedures and introduced the topic to be debated. When the informants were discussing certain topics, the researchers applied a non-directive approach because of the dynamics

of the group and the different perspectives that were being examined. When certain views were polarised, the researcher stimulated the discussion by introducing a new question or topic. All conversations were digitally recorded and then transcribed to improve transferability.

Ethical considerations

This was a qualitative study in competent subjects without any intervention. It did not involve any form of invasion of the participant's integrity, and in such cases no approval by an ethics committee is required in the Netherlands (according to the Medical Research Involving Human Subjects Act; see ccmo-online.nl). All respondents received written and verbal information about the aim and content of the study. Study participation was voluntary. Data were analysed in an anonymous way and the results were non-traceable to individual participants.

Data analysis

The transcribed data were open coded and categorised. Several themes were extracted by organising and structuring the categories. During the analytical process, interview fragments were constantly compared. The literally transcribed interviews were reviewed several times to check whether elements might have been overlooked. The final analysis was presented to the participants and they were asked to comment on the contents. This member check helped to determine whether we had adequately understood and interpreted the data. The analytical procedure and findings were discussed within the research team to improve the quality of analysis. MaxQDA software was used to support the coding ordering analyses.

Results

The sample consisted of 26 registered nurses (6 male and 20 female nurses). The mean age of the participants and the mean length of nursing experience varied per focus group, as shown in Table 2 below.

Table 2. Demographics of the participants

Focus group	Age (mean)	Gender	Length of nursing experience (mean)
Hospital care	34 years	3 male, 3 female	13 years
Mental health care	36 years	2 male, 4 female	16 years
Nursing home care	51 years	8 female	19 years
Home care	46 years	6 female	22 years

Participants formulated several facilitating elements that they consider fundamental to improving patient experiences of the quality of care. They also mentioned such inhibiting factors as cost-effectiveness and transparency and accountability goals. These factors prevent them from improving patient experiences (Table 3). Both facilitating elements and inhibiting factors are elaborated below.

Table 3. Facilitating and inhibiting elements

Facilitating elements	Inhibiting factors
– Clinically competent nurses	– Cost-effectiveness policy
– Collaborative working relationships	– Transparency and accountability goals
– Autonomous nursing practice	
– Adequate staffing	
– Control over nursing practice	
– Managerial support	
– Patient-centred care	

Facilitating elements

Clinically competent nurses

Participants stated that in order to act in a professional manner, nurses need to have certain competencies, namely social skills, expertise & experience, and priority setting.

Social skills

Participants stated that social skills are an important competency to create a trustful

care relationship. They indicated correct behaviour and attitude, composure, making time for patients, and listening and having empathy as essential nursing competencies. According to participants, these social skills convey a sense of commitment to the patient and play a major role in meeting patient expectations.

> *Nurses must have the ability to develop and maintain good relationships with patients. For patients, nursing care is about being heard and seen. Knowing that you're in safe hands. You allay their fear and uncertainty. You give patients confidence and hope in return. You offer them several options from which they can choose. Someone who is dependent, and does not know what will happen, is more suspicious and anxious.* (Respondent 21, hospital focus group)

Expertise & experience

Participants mentioned three key aspects related to expertise, namely knowledge, technical skills and communicative capabilities. According to participants, the first key aspect means that nurses must have substantive knowledge related to the nursing profession. They indicated that nurses should maintain and follow both existing developments and new insights. According to participants, nurses must continually invest in nursing knowledge and education. In their view, nurses ought to offer state-of-the-art interventions or activities that are in line with the agreed nursing policy

As a second key aspect related to expertise, participants indicated that nurses must have technical skills in order to provide effective and safe care.

The third aspect mentioned by participants is that nurses must have communicative capabilities. Participants said that nurses serve as spokespersons for patients who are often in vulnerable positions. They stated that nurses are easily accessible and can act as a link between the patient and other professions. According to participants, nurses can use the right substantive arguments on behalf of a patient's interests or needs. Participants mentioned that this expertise is important for patients because it is related to the quality of care.

> *If you can answer a care-related question, it gives the patient a certain peace of mind. It signals: she knows what she's talking about. I notice that patients really appreciate it when I share knowledge and offer them information that at the time they don't yet have. Only then can patients make decisions about their own care.* (Respondent 15, nursing home focus group)

In addition to substantive expertise, participants stated that nursing experience is also of influence. According to them, a junior nurse has too little experience to respond creatively to sometimes complex care situations. However, according to participants, junior and senior nurses can learn from each other: they should work as a team and collectively pursue their common objectives. In their view, experience is gained through practice. According to participants, this can be characterised as 'expertise'.

> *When you suspect someone is contemplating suicide, you need to know how serious this is. Is it just a cry of "I'm not feeling well" or are these serious thoughts? Has the patient already made plans, does the patient have a death wish, or is it an impulsive thought? In that sense you need to reflect on the signals very carefully. You can only learn this from practice.* (Respondent 1, mental health care focus group)

Priority setting

As stated by participants, various activities can occur simultaneously during the daily care of patients. According to them, nurses should assess what care is needed and then flexibly coordinate diverse actions with each other. In the view of participants, prioritisation is about the organisation of nursing care. Patients need nurses who have clinical experience in order to coordinate care. Nurses must decide what choices to make, what is urgent and what is important. Those choices influence patient experiences.

Prioritisation is very important. It means that you have to coordinate the daily care and decide which activities have priority. Patients sometimes have to wait for help. If you're in a hasty mood, you transmit that feeling to patients. It shows immediately. The restlessness affects the other patients. (Respondent 18, nursing home focus group)

Participants said that patients sometimes have to wait before they are taken care of, or that nurses are not immediately available to answer questions or deal with problems. According to participants, patients do not always obtain the right and needed care, especially when the nurses' workload is high.

Collaborative working relationships

According to participants, it is important to develop and maintain collaborative working relationships with professionals, including those in their own field. In the view of participants, collaborative working relationships exist when all the involved professionals interact and operate in a complementary manner, and show mutual respect

that is based on knowledge and expertise. Participants stated that all professionals need to discuss and influence patient care on the basis of their own expertise. Participants believe that problems will be solved sooner when ideas and thoughts are exchanged. In their view, it is about sharing information and communication. As stated by participants, communication and aligning with each other is needed so that no conflicting information is given and uniformity in care or treatment is provided. This generates, according to the participants, composure and clarity towards patients.

Participants believe that collaboration and communication affect how patients experience the quality and effectiveness of care.

> *We have a patient who is very compulsive. We made agreements about how to approach and handle this patient. We continually need to communicate with each other, physicians, psychologists, nurses. Clear communication is so important, and I miss that sometimes. When you have good relationships it is easier to review and discuss the treatment administered. It will not only increase your knowledge, but also be helpful in the communication with the patient and his family. It's easier to explain why the specific treatment is being deployed.* (Respondent 5, mental health care focus group)

Autonomous nursing practice

Participants in all four focus groups stated that the scope of practice for which they are accountable influences patient experiences. The scope of practice, according to them, means that nurses can control their own work related to patient care and can make independent decisions about patient outcomes based on clinical judgements. Participants therefore believe it is essential to monitor and measure outcomes, as long as the monitoring is directly related to patient care. However, participants indicated that they did not have insight into care results obtained from assessments.

> *We participate in an annual national prevalence survey. We have to fill out a lot of forms. It's an administrative burden and takes a lot of time – time we can't spend on patient care. We get a pile of papers, screen patients and register them. It doesn't contribute to the quality of care because we never get any feedback. And what does one measurement tell us? It doesn't inform us whether we are doing well or not. I do not believe that. (Respondent 12, home care focus group)*

According to participants, there is no policy to improve patient experiences on the basis of the information derived from assessments. Participants could not indicate

whether the interventions deployed are actually leading to desired nursing care results, including patient experiences. Participants feel they have insufficient autonomy to influence this process.

Adequate staffing

Participants stated that the number of nurses available influences how patients experience the quality of care. Although they could not indicate what number they consider sufficient, they think that a sufficient nurse staffing level is linked to team composition or staff mix. For instance, participants indicated the proportion of registered nurses to student nurses, or the number of different nurse qualification levels in one team. Participants stated that several tasks and assignments have been transferred to nurses with a lower qualification in order to work as efficiently as possible and to achieve higher productivity. As a result, participants believe that nursing care is, in general, increasingly developing in the direction of task-centred care in which different working methods are applied. According to them, this affects patient experiences of the quality and effectiveness of nursing care.

> *Nurses provide care within certain theoretical frameworks that are designed to increase the self-reliance and self-management of the patient. Nurse assistants have a more practical focus and take over patient care at a point when they should not. These two ways of working are confusing for patients. And we think 'How come the patient is made to feel so nervous?' and afterwards we notice two contradictory ways of working.* (Respondent 3, mental health care focus group)

As stated by participants, a sufficient nurse staffing level determines whether patient wishes and needs are met. According to participants, an insufficient deployment of nursing staff has a direct negative impact on patient experience.

> *I work alone in a group. For example, when I'm in the bathroom with a patient, the other patients are alone. So I have to keep my eyes and ears open and must respond to what occurs. And that is not always easy. I constantly think: I must check if everything is all right. Because I'm responsible for the other patients. I always leave the bathroom door partly open, so I can see and listen to what is going on in the living room. I provide patient care too hastily. My patients obviously feel that.* (Respondent 17, nursing home focus group)

Control over nursing practice

The participants stated that control over nursing practice means that nurses are involved in nursing policy or nursing issues. In their view, nurses are not always in charge and cannot always make their own decisions about nursing issues. Participants feel that this affects the quality of nursing care.

> *In the past, I always made my own schedule. Now we have planners and they don't have any experience with care. Efficient planning is more important than patient-centred planning. It doesn't matter whether it suits the patient. The patient should be scheduled later if it fits better in the planned route.* (Respondent 9, home care focus group)

The participants stated that if nurses were more involved in the development of nursing policies, this would have a positive influence on patient care. According to them, they would be able to reflect upon and discuss nursing issues related to the quality of patient care, which would improve the quality of care.

Managerial support

Participants indicated that a manager should pay attention to the team spirit and unity. In their view, a manager must be able to handle conflicts, and also be visible and approachable. Participants said that they believe that a manager should ask the opinion of nurses; therefore, in their opinion, regular contact is important.

A manager, according to the participants, must be able to create the right conditions and have the logistical ability to ensure continuity of care. In their view, this means arranging sufficient personnel, replacement staff and succession planning.

Participants find that managers critically examine the deployment of personnel. According to them, the nursing staff mix has drifted towards a model whereby higher-educated nurses are replaced with lower-educated ones. They noted that management is tied to a system that is dominated by controlling costs. Thus in their view, nurses may want to provide a patient with a specific form of care, while management limits care to a maximum number of minutes based on budgetary considerations. According to participants, nurses regularly experience a tension with management in shaping care that meets patient expectations.

> *We want to provide certain care, but that's at the expense of something else. If we do one thing, we can't do another. For instance, we plan 30 minutes for*

> *patient care. When a patient wants to go outside for a walk, this will cost him 10 minutes of this total time. So we really have to negotiate with the patient or his family. This leads, of course, to lots of misunderstandings. I understand that feeling.* (Respondent 13, nursing home focus group)

Patient-centred care

According to participants, the focus of nurses is the provision of patient-centred care. They define this as nursing care that is focussed on patient needs and preferences and is intended to increase patient self-management and encourage improved health and recovery.

As participants stated, nurses are the first points of contact for patients. In the participants' view, they are often with the patient for 24 hours/7 days a week (except for home care) and gather large amounts of information about them. They think that direct contact with patients is crucial to building and maintaining a relationship of trust. The participants believe that high quality nursing care is achieved when patients feel heard and understood, consider themselves to be in safe hands and know that their care problems have been noticed. This, according to the participants, results in positive patient experiences.

> *We listen to the patient and talk to him. We immerse ourselves in his background. What is important, how he copes and handles care problems. Based on this knowledge, we present the patient with a number of options so that he can decide upon a solution for his care problems.* (Respondent 8, home care focus group)

Inhibiting factors

The participants talked about two inhibiting factors that prevent them from improving patient experiences: cost-effectiveness and transparency & accountability goals.

Cost-effectiveness

Participants stated that organisation policy is focused on the efficient and effective deployment of people and resources. They mentioned the transfer of tasks to less well qualified nurses in order to work as efficiently as possible and to achieve higher productivity. In their view, care is more and more standardised. At the same time, they noted that care has become increasingly complex. According to them, patients are generally older and have multiple age-related comorbidities. The participants

experience an increasing workload and work-associated pressure.

> *In recent years, patient turnover has increased. It means that patients are discharged quicker. As soon as they recover, they're sent home. However, patients sometimes also have chronic disorders. I sometimes think it is irresponsible [to send these patients home so quickly]. Patients get less attention because the work pressure is high.* (Respondent 22, hospital focus group)

Transparency & accountability goals
Participants reported an increasing administrative workload to account for the quality and costs of care.

> *So many forms. Entering the data means a double administrative workload. We use different programs. We first have to register in program X. Then we have to register our measurements and enter all kinds of codes in another program. Log in and log out. The registrations and coding are needed for the government and health insurers. It is not always patient related and does not inform us about the health status of patients.* (Respondent 23, hospital focus group)

The administrative workload is, according to participants, out of balance. They said that this means that monitoring and registration is aimed not at improving nursing care, but at serving an external accountability goal to inform health insurers and the government.

The participants stated that they have little autonomy to change this policy. According to them, monitoring care results should help nurses to improve their own practice. For them, it means that nurses can reflect upon and discuss nursing issues related to quality of patient care, including the results of patient experiences.

Discussion

We interviewed 26 nurses working in various Dutch healthcare settings in order to ascertain their views on how their work and their work environment contribute to positive patient experiences. Using an open approach, we obtained insights into their perceptions and noted what they said. Participants stated that a diverse range of elements are essential to providing high-quality nursing care. When these elements are incorporated into daily nursing practice, the participants expect it will result in more positive patient experiences of nursing care. The elements are: clinically competent nurses, collaborative relationships, autonomous nursing practice, adequate staffing, control over nursing practice, managerial support and patient-centred care.

One of the sub-questions was whether the identified elements are related to the eight essentials of magnetism defined by Kramer and Schmalenberg [22]. We found that they are. The essential of magnetism 'nurse–physician relationships' is, in our opinion, not totally applicable in a modern healthcare system. Although physicians are represented in all settings, also other professionals, such as psychologists, social workers or physical therapists, are part of a healthcare team. The participants stated that a good relationship must be based on collaboration and clear communication not only with physicians, but with all involved healthcare workers. The participants stated that patient wellbeing must be the common aim of all the involved professionals and that communication and collaboration must support this shared goal. We therefore replaced 'nurse–physician relationships' with 'collaborative working relationships'.

Competing policies in the nursing setting

The other sub-question concerned mechanisms by which these elements lead to better patient experiences. By analysing the data it became clear that nurses operate in a complex healthcare context. These different views control the manner in which nurses can practise their profession. We noticed that nurses are confronted with organisation policies that are focussed on cost-efficiency, transparency and accountability goals. According to participants, this has led to a more productive care system. It also became clear that nurses flourish within a patient-centred care system. Such a system supports individual patients in their need to make decisions and participate in their own care. This means that organisations should facilitate a culture where nurses can professionally support patients by practising high-quality nursing care [33].

Each view is defendable on its own, but collectively they contradict each other. The context in which nurses work is almost paradoxical: they have to offer patient-centred

care in a standardised and productive care system.

In the Dutch context, healthcare insurers, the government and healthcare providers are responsible and accountable for providing good quality care. However, these parties have different foci. Each year, healthcare insurers make agreements with healthcare providers about which care will be delivered. These agreements are defined in a healthcare procurement contract [28]. Individuals who legally live in the Netherlands are obliged to take out individual health insurance [27]. In order to make well-considered choices, individuals need to be informed about the quality of care provided by healthcare workers. Healthcare insurers are therefore driven by accountability goals, because they need to determine whether healthcare organisations or professionals meet the minimum standard of performance, as agreed upon in the healthcare procurement contract [34].

The government is the supervisory authority that ensures the proper functioning of the healthcare system and is therefore responsible for the transparency process [35]. In the Netherlands, a national performance framework for comparing the quality of healthcare is implemented under the supervision of the government [36]. This framework contains a set of quality indicators and related measures, including patient experiences [6,37]. Healthcare insurers and the government collect data for external accountability goals [38]. Healthcare providers and professionals themselves are also responsible for the quality of care. Their aim is more internally driven, namely to improve the quality of care and to make visible their contribution to patient outcomes [39,40]. However, our research showed that nurses do not receive feedback on their scores and they are not aware that they could – and even should – use these data to monitor and improve the quality of their work.

It could be argued that the dominance of cost-effective policy and transparency determines the manner in which nurses can practise their profession and that this influences patient experiences of care. Ancarani [41] showed that patient satisfaction was negatively associated with management-controlled wards that are under pressure to produce. Open, collaborative, innovative wards and wards that are focused on the welfare and involvement of nurses and that provide supervisory support and training were positively associated with patient satisfaction. This confirms that the environment in which nurses operate influences patient experiences of the quality of care. This corresponds with the findings of our research, in which participants stated that the dominance of policies focussed on cost-effectiveness and transparency lead to more pressure to produce and a high administrative workload. The participants feel that they

have insufficient autonomy to influence this policy.

Strong nursing practice

To incorporate the identified elements into nursing practice, cost-effectiveness, transparency and patient-centred care policy need to be connected. For example, the registration and monitoring of outcomes should be used not only to quantify achievements against transparency goals, but also for overall nursing quality improvement. Nurses should be able to decide which issues are of importance to improve patient care.

Connecting the different policies requires the participation and commitment of both nurses and nursing management. Nurses need to be challenged to shape their own environment and create a strong nursing practice [42], which will result in more positive patient experiences [43].

Limitations of this study

We conducted four focus groups, one each with nurses in mental health care, hospital care, home care and nursing home care. Although we gained a broader insight into the perspectives of nurses, every sector has its specific dynamics and context. Therefore, one focus group per sector might have been insufficient. However, we reached data saturation as new information did not appear and similar themes emerged within the focus groups.

This study was limited to nurses, but to fully understand the nuances of this relation, it might be interesting to analyse patients' views.

Conclusion

The knowledge obtained from this research has resulted in a better understanding of how nurses regard their role in achieving positive patient experiences. From the viewpoint of the interviewed nurses, several elements are essential in relation to patient experiences of the quality of nursing care: clinically competent nurses, collaborative working relationships, autonomous nursing practice, adequate staffing, control over nursing practice, managerial support and patient-centred culture. These elements correspond to the eight 'essentials of magnetism'. If these elements are incorporated into the nursing practice, it will most likely result in more positive patient experiences of nursing care.

This research revealed several factors that nurses find inhibiting when it comes to improving patient experiences of the quality of nursing care. Current nursing policy is heavily focussed on cost-effectiveness and transparency for external accountability, which creates a high administrative workload and pressure to increase productivity. However, despite all the registrations that take place for external accountability, the participating nurses stated that they do not monitor care results to improve their own practice. They felt they insufficient autonomy to influence this. They believe it is important to reflect upon and discuss nursing issues related to the quality of patient care, including patient experiences.

Recommendation

Further research is recommended to examine whether the elements of a healthy work environment are statistically related to patient experiences in the Dutch healthcare setting. In the Netherlands, patient experiences are measured with the Consumer Quality Index (CQI) [6].

Nurses' perceptions of their work environment are measured using the Essentials of Magnetism Tool II (EOMII) questionnaire [44]. Further research should focus on the statistical relations between CQI and EOMII.

Abbreviations

ANCC: American Nurses Credentialing Center; PES-NWI: Practice environment scale of the nursing work index; EOMII: Essential of magnetism tool II; CQI: Consumer quality index; CAHPS: Consumer assessment of healthcare providers and systems.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

RK participated in the design of the study, conducted the focus groups and analyses, and drafted the manuscript. BdB participated in the data collection (two focus groups) and revised the manuscript. DD participated in formulating the research questions, designing the study, and collecting and analysing the data (two focus groups), and helped to draft the manuscript. ALF participated in the design of the study and helped to draft the manuscript. All authors read and approved the final manuscript.

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Chapter 3

Concordance between nurse-reported quality of care and quality of care as publicly reported by nurse-sensitive indicators

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Abstract

Background

Nurse-sensitive indicators and nurses' satisfaction with the quality of care are two commonly used ways to measure quality of nursing care. However, little is known about the relationship between these kinds of measures. This study aimed to examine concordance between nurse-sensitive screening indicators and nurse-perceived quality of care.

Methods

To calculate a composite performance score for each of six Dutch non-university teaching hospitals, the percentage scores of the publicly reported nurse-sensitive indicators: screening of delirium, screening of malnutrition, and pain assessments, were averaged (2011). Nurse-perceived quality ratings were obtained from staff nurses working in the same hospitals by the Dutch Essentials of Magnetism II survey (2010). Concordance between the quality measures was analyzed using Spearman's rank correlation.

Results

The mean screening performances ranged from 63 % to 93 % across the six hospitals. Nurse-perceived quality of care differed significantly between the hospitals, also after adjusting for nursing experience, educational level, and regularity of shifts. The hospitals with high-levels of nurse-perceived quality were also high-performing hospitals according to nurse-sensitive indicators. The relationship was true for high-performing as well as lower-performing hospitals, with strong correlations between the two quality measures ($r_S = 0.943$, $p = 0.005$).

Conclusions

Our findings showed that there is a significant positive association between objectively measured nurse-sensitive screening indicators and subjectively measured perception of quality. Moreover, the two indicators of quality of nursing care provide corresponding quality rankings. This implies that improving factors that are associated with nurses' perception of what they believe to be quality of care may also lead to better screening processes. Although convergent validity seems to be established, we emphasize that different kinds of quality measures could be used to complement each other, because various stakeholders may assign different values to the quality of nursing care.

Keywords

Hospitals, Nurse perception, Nursing care, Quality assessment, Quality indicators, Quality of care

Background

Nursing care quality is important, because it is linked to patient safety, patient satisfaction, and other health care outcomes [1, 2]. However, assessing a multi-faceted concept such as quality of care has many challenges. Quality indicators are commonly used measures to gain insight into health care organizations' performance regarding the quality of care provided. With regard to nursing quality, nurse-sensitive indicators are used, defined as "those outcomes that are relevant, based on nurses' scope and domain of practice, and for which there is empirical evidence linking nursing inputs and interventions to the outcome for patients" [3, 4]. Health care systems across the world use the public reporting of these indicators for benchmarking purposes. Transparency of quality is of great importance for informed decision-making by various stakeholders, such as health care providers, consumers, insurance companies and policy makers [5]. As in other countries, all hospitals in the Netherlands annually have to report on a mandatory set of nurse-sensitive indicators. Since 2007, the Dutch Health Care Inspectorate requires hospitals to publicly report indicators, such as delirium, malnutrition, pain and pressure ulcers [6].

In the literature, there is much debate about the reliability and validity of nurse-sensitive indicators. For example, studies by Doran and colleagues [7], and Maas and colleagues [8] showed that nurses are able to collect reliable data regarding indicators (e.g., pain). On the other hand, the need for methodological checks of indicators as accurate measures of quality is also emphasized by various authors [9–11]. To contribute to the existing literature about nurse-sensitive indicators, the aim of the present study is to explore the convergent validity of these quality indicators by examining the correspondence with a nurse-reported measure of quality, namely nurses' perception of the quality of care. Where nurse-sensitive indicators provide a quantitative basis to monitor and evaluate nursing care and are referred to as objective quality measures, nurse-reported measures are used to determine nurses' perceptions and are referred to as subjective quality measures [12].

Regarding the objective measures, our focus is on nurse-sensitive screening indicators, referring to how often patients' risk identification has taken place after admission to the hospital. Screening of health risks is one of the core duties of nurses and therefore well-suited as an indicator of care quality [13]. Furthermore, screening indicators are relatively easy to obtain and hospitals can be compared based on their performance without the complex task of adjusting for differences in patients' risks in the various hospitals [14]. We investigated data from six non-university teaching hospitals in the

Netherlands. We examined: (i) the performance of each hospital on the following nurse-sensitive screening indicators: delirium, malnutrition, and pain assessments, nurses' perception of the quality of care; and whether any statistical differences between the hospitals can be ascribed to differences in nurse characteristics, and (iii) whether there is concordance between the two measures of quality of nursing care.

Methods

Study design and sample

This cross-sectional study included data from staff nurses working in one of six non-university teaching hospitals located in different parts of the Netherlands. In the Dutch health care setting, teaching hospitals are general hospitals with a transcending regional role and a teaching status. These hospitals are not equal to academic hospitals, as in many other countries (e.g., USA, Canada), because the university based faculty and a specific research role are not present [15]. The data concerning hospital characteristics, such as hospital size (number of licensed beds) and nursing full-time equivalents (FTE) were supplied by the hospital organizations themselves and the Dutch Hospital Association.

Nurses' perception of quality of care

In the year 2010, the Dutch Nurses' Association issued the Dutch version of the Essentials of Magnetism II survey (D-EoM II) to all contracted staff nurses of the six hospitals. The D-EoM II survey, a validated instrument, asks nurses questions about their work environment, quality of care in their department, job satisfaction, and demographic characteristics [16, 17]. In this study, we used the scores from the question regarding nurse-perceived quality of care: 'On a scale of 1 to 10, with 1 representing 'dangerously low quality' and 10 representing 'very high quality', how do you rate the quality of patient care in your own hospital unit?' The overall response rate to the survey was 53.3 % and 2338 nurses (=46.8 %) answered all the questions, including the nurse-perceived quality of care score.

We included the following demographic characteristics of nurses: (i) experience, (ii) education level, and (iii) working shift. Experience in nursing was expressed in years and was categorized per 5 years, ranging from less than 5 years to over 30 years. Nurses' education level was defined as: (i) Registered Nurses (RNs) with an Associate's degree in nursing, (ii) RNs with a Bachelor's degree in nursing, and RNs with a Bachelor's

degree and additional training; with differences regarding complexity of roles and degree of responsibilities [18]. Working shift referred to the kinds of shifts that nurses work, including: (i) fixed shifts (i.e., exclusively day shifts, evening shifts or night shifts), and rotating shifts. We did not include the effect of gender, because the sample almost exclusively consisted of women. We also decided to exclude age from the analyses, because the years of experience were strongly correlated to age.

Nurse-sensitive indicators

The national database of the Dutch Health Care Inspectorate was used to obtain nurse-sensitive indicator data. At the end of each year, all Dutch hospitals use their internal data management systems to extract the previously defined and legislated quality indicators. The data are publicly reported on a website (www.ziekenhuize ntransparant.nl). In this study, the 2011 dataset was used, including five nurse-sensitive screening indicators concerning delirium, malnutrition, and pain [19]. The definitions and data collection methods are presented in Table 1.

Ethical statement

This research was executed in compliance with the Helsinki Declaration. The Dutch Hospital Data (DHD) reviewed the study protocol in accordance with the protocol 'DHD-databases use' and with local regulations in the Netherlands (Data Protection Act), and gave formal approval to conduct the study (reference number 12.11.21.01/PH.sdh.). Nurses' participation in the survey study was voluntary and anonymous. It was mentioned to them that completing and submitting the survey automatically meant that they gave informed consent.

Table 1. Definitions of nurse-sensitive screening indicators

Indicators	Definition by numerator-denominator	Data collection
Screening of delirium	Number of hospital units in which a risk score was included in the medical record for more than 80 % of all patients 70 years and older	Collected yearly from hospital unit-based data management systems. Submitted to the Inspectorate yearly by hospital organizations.
	Total number of hospital units with admitted patients 70 years and older	
Observation of delirium	Number of patients observed at least once using the measuring methods of DOSS or CAM for the presence of delirium, regardless of the outcome	Collected daily from hospital unit-based data management systems. Submitted to the Inspectorate yearly by hospital organizations.
	Total number of patients with an increased risk of delirium ('screening of delirium')	
Screening of malnutrition	Number of adult patients which on admission are screened for malnutrition Total number of clinically admitted adult patients in a year	Collected daily from hospital unit-based data management systems. Submitted to the Inspectorate yearly by hospital organizations.
Standardized pain assessment in post-operative patients in the recovery room	Number of clinical post-operative patients with a standardized pain assessment in the recovery room Total number of clinical post-operative patients in the recovery room	Collected daily from hospital unit-based data management systems. Submitted to the Inspectorate yearly by hospital organizations.
Standardized pain assessment in post-operative patients in hospital units	Number of clinical post-operative patients with a standardized pain assessment in hospital units Total number of clinical post-operative patients in hospital units	Collected daily from hospital unit-based data management systems. Submitted to the Inspectorate yearly by hospital organizations.

Inspectie voor de Gezondheidszorg. Kwaliteitsindicatoren. Basisset ziekenhuizen 2011 [19]

Statistical analysis

First, descriptive statistics were used to characterize the staff nurses in our sample. To test differences in quality scores among stratified groups of nurses, we used analysis of variance (ANOVA) with Bonferroni post-hoc tests (adjusting for multiple comparisons). The assumptions of normally distributed data were met by normality plots of this large sample. We used univariate general linear models (GLM) to analyze differences in perceived quality between the six hospitals; adjusting for the nurse characteristics (experience, education level, working shifts) by including them into the model simultaneously.

To categorize nurse-perceived quality of care, we determined the percentage of satisfied nurses per hospital; the higher the percentage, the higher hospitals' performance. Nurses who gave a quality score of ≥ 8 (on a scale from 1 to 10) were labeled 'very satisfied', 'satisfied' refers to ≥ 6-8 and 'not satisfied' refers to < 6. Additionally, we ranked the hospitals ranging from 1st to 6th, in which the ranking value of 1st represents the highest-performing hospital (i.e., hospital with the highest percentage of satisfied and very satisfied nurses). We considered nurse-perceived quality of care as a subjective measure regarding nursing quality (i.e., influenced by the nurse's personal judgment).

Regarding nurse-sensitive indicators, we calculated a composite score to address each of the six hospitals' performance level. A valid and simple method to compose a composite score is by averaging percentages [20, 21]. The percentages on the five screening indicators, as described by numerator and denominator in Table 1, were used for this purpose. The composite scores for each hospital were used to categorize the quality of hospitals; the higher the percentage, the higher hospitals' performance. We ranked the hospitals ranging from 1st to 6th, in which the ranking values of 1st resembles the highest-performing hospital (i.e., hospital with the highest mean composite score). We considered nurse-sensitive indicators as objective measures of nursing quality (i.e. involving an impartial measurement, that is, without bias or prejudice).

To test the association between the objective indicators of care and nurses' perception of care, we took the mean composite hospital score on the indicators and correlated that with the percentage of satisfied nurses per hospital. Due to the fact that these analyses were conducted at the hospital-level, we used Spearman's Rho correlation which is the appropriate method in this context as it is known to compare differences in rank-order. All statistical analyses were conducted using SPSS version 22.

Results

The characteristics of nurses and the six hospitals are shown in Table 2. Nursing experience ranged between 1 and 40 years, with an average of 16.8 years across the sample. Predominantly nurses had at least a Bachelor's degree (64.9 %) and were working rotating shifts (80.6 %). The majority of hospitals were mid-sized; there were two larger hospitals, with more than 1000 licensed beds and more than 1000 nursing FTE.

Table 2. Demographic characteristics of the study sample

	Licensed beds	Nursing FTE	Nurses	Experience		Education level						Working shifts **			
						Associate		Bachelor		* Bachelor+		Fixed		Rotating	
	N	N	N	Mean	SD	N	%	N	%	N	%	N	%	N	%
All hospitals			2338	16.76	11.13	821	35.1	1131	48.4	386	16.5	447	19.4	1862	80.6
Hospital A	1102	1198	452	16.54	11.50	221	48.9	177	39.2	54	11.9	112	24.8	337	74.6
Hospital B	663	808	314	18.12	10.50	119	37.9	146	46.5	49	15.6	70	22.3	237	75.5
Hospital C	696	964	326	14.63	10.90	123	37.7	159	48.8	44	13.5	52	16.0	272	83.4
Hospital D	580	795	348	18.49	11.34	133	38.2	146	42.0	69	19.8	61	17.5	282	81.0
Hospital E	1070	1143	595	17.80	11.00	171	28.7	336	56.5	88	14.8	68	11.4	519	87.2
Hospital F	555	813	303	13.94	10.65	54	17.8	167	55.1	82	27.1	84	27.7	215	71.0

* Bachelors + are RNs with a Bachelor's degree and additional training
** Missing values regarding working shifts: All hospitals (N = 29), Hospital A (3), Hospital B (7), Hospital C (2), Hospital D (5), Hospital E (8), Hospital F (4)

The mean perceived quality scores for the hospitals ranged from 6.61 (SD = 1.24) to 7.11 (SD = 1.09). There was a strong positive correlation between years of experience and nurse-perceived quality; more experienced nurses were significantly more satisfied than less experienced nurses. Additionally, nurses with 20 to 25 years of experience were most satisfied, followed by nurses with 25 and 30 or more years of experience. RNs with an Associate's degree were significantly less satisfied as compared to RNs with a Bachelor's degree. Regarding working shifts, it was shown that nurses working fixed shifts were more satisfied than nurses working rotating shifts. Nurses working dayshifts were most satisfied with the quality of care in their hospital. The differences between the six hospitals were significant [$F(5, 2332) = 8.397$; $p < 0.01$] and post-hoc tests revealed that Hospital C had a significantly lower mean score, as opposed to the other hospitals. These differences could not be attributed to nurse characteristics (experience, education and working shifts), because after controlling for these characteristics the effects remained significant [$F(5, 2284) = 3.011$; $p = 0.01$].

Table 3. Ranking by nurses' perception of quality of care

Nurse-perceived quality of care	All	Hospital A	Hospital B	Hospital C	Hospital D	Hospital E	Hospital F
	N = 2338	N = 452	N = 314	N = 326	N = 348	N = 595	N = 303
% Not satisfied <6 (N)	9.4 (219)	10.2 (46)	9.6 (30)	16.3 (53)	6.6 (23)	7.4 (44)	7.6 (23)
% Satisfied ≥6-8 (N)	58.9 (1377)	58.8 (266)	57.3 (180)	62.3 (203)	55.7 (194)	62.4 (371)	53.8 (163)
% Very satisfied ≥8 (N)	31.7 (742)	31.0 (140)	33.1 (104)	21.5 (70)	37.6 (131)	30.3 (180)	38.6 (117)
Ranking							
% Satisfied + very satisfied	90.6	89.8	90.4	83.8	93.3	92.7	92.4

Table 3 summarizes nurses' perception of quality of care and the ranking of the six hospitals. The majority of nurses were satisfied with the quality of care in their hospital. Approximately 9 % (N = 219) were not satisfied and rated the quality of their hospital unit with a score less than 6. Table 3 indicates that, based on the percentage of satisfied (quality score ≥ 6-8) and very satisfied nurses (quality score ≥ 8), Hospital D had the best results and Hospital C had the least favorable results.

Table 4. Ranking by nurse-sensitive indicators

Quality indicator *	Hospital A	Hospital B	Hospital C	Hospital D	Hospital E	Hospital F
% Screening delirium	26.3	61.5	23.1	81.3	86.4	78.6
(N screened/total N)	(5/19)	(8/13)	(3/13)	(13/16)	(19/22)	(11/14)
% Observation delirium	79.8	51.7	32.2	91.9	100.0	15.0
(N observed/total N)	(197/247)	(45/87)	(430/1337)	(91/99)	(425/425)	(9/60)
% Screening malnutrition	45.7	82.0	81.4	94.8	78.6	82.0
(N screened/total N)	(6439/14095)	(16683/20345)	(15175/18637)	(16483/17379)	(18468/23507)	(854/1042)
% Pain recovery room	90.1	90.0	100.0	100.0	100.0	99.7
(N assessed/total N)	(6418/7121)	(8087/8986)	(9473/9473)	(11775/11775)	(10595/10595)	(8432/8456)
% Pain hospital units	83.7	99.4	78.0	98.1	97.1	59.0
(N assessed/total N)	(13045/15583)	(8932/8986)	(7388/9473)	(1411/1439)	(10943/11272)	(4428/7505)
Ranking						
Composite score	65.1	76.9	62.9	93.2	92.4	66.9

* Nurse-sensitive screening indicators (see definitions Table 1)

Table 4 shows the results regarding the nurse-sensitive indicators. High screening percentages were shown for the indicators of pain; in particular 'pain assessment in the recovery room', with values ranging from 90 to 100 %. Large differences between hospitals were found for the screening indicators of malnutrition and delirium; in particular 'observation of delirium', with values between 15 and 100 %. Based on the mean composite scores, Hospital D was identified as the highest-performing hospital with a composite score of 93.2 % and Hospital C had the least favourable composite score of 62.9 %.

We assessed Spearman's Rho correlations to test the overlap between nurse-perceived quality of care and nurse-sensitive indicators. A strong significant correlation was shown between the two quality measures of r S =0.943 (p = 0.005). Hospitals' ranking according to both measures of quality are shown in Table 5. There was a high degree of correspondence; nurses were generally most satisfied in hospitals with high scores on nurse-sensitive indicators, and least satisfied in lower-scoring hospitals.

Table 5. Ranking of quality of nursing care in six Dutch hospitals

	Subjectively measured quality	Objectively measured quality	Ranking nurse-perceived quality	Ranking nurse-sensitive indicators
Hospital A	89.8	65.1	5th	5th
Hospital B	90.4	76.9	4th	3rd
Hospital C	83.8	62.9	6th	6th
Hospital D	93.3	93.2	1st	1st
Hospital E	92.7	92.4	2nd	2nd
Hospital F	92.4	66.9	3rd	4th

Rank 1st denotes the best result, and 6th the least favorable result

Discussion

Nurse-sensitive indicators are widely used to evaluate the quality of nursing care. The present study examines their convergent validity by investigating concordance between publicly reported nurse-sensitive screening indicators (delirium, malnutrition, pain) and nurse-reported quality of care. To our knowledge, this is one of the first studies to explore the direct relationship between objectively measured quality of nursing care and subjectively measured quality, from a nurses' point of view. We found that there was a substantial correlation between the two quality measures. As such, our study adds knowledge to the international debate on the value of nurse-sensitive indicators as measures of quality of nursing care.

In literature, there is a scientific debate about the usefulness of publicly reported quality indicators as comparative performance measures. Critics claim that, because nurse-sensitive indicators are reported by hospital organizations themselves, there is a risk that they adjust the data in order to achieve goals of external accountability [10, 22]. On the other hand, there is evidence that public reporting is associated with actual quality of care [23, 24] and stimulates quality improvement activities at the hospital level [25].

In our study, we demonstrated that there is a strong relationship between publicly reported screening indicators and nurses' satisfaction with the quality of care, thereby implicating that these indicators both can be used to assess nursing care quality. However, we emphasize that the two quality measures are not likely to be completely interchangeable. Needleman and colleagues [2] stated that various kinds of quality measures potentially could have their own value for stakeholders. For example, regarding nurse-sensitive indicators, policy makers and insurance companies could use screening indicators to benchmark hospitals and hospital units. Nurse-sensitive screening indicators are particularly suitable for these kinds of purposes, because they are easy to measure and screening activities are a prime task of nurses. Additionally, health care organizations (e.g., hospitals) may benefit more from satisfaction with care ratings, because they provide input for quality improvement in a specific setting. Thus, the optimal approach for defining quality of nursing care depends on the underlying question and who poses the question.

Comparing objective versus subjective measures is increasingly relevant in current health care research. Previous studies demonstrated significant associations between hospital performance and patient-perceived quality. For example, Jaipaul et al. [26] reported

lower mortality rates in hospitals with higher patient satisfaction with overall quality, and Nelson et al. [27] found that hospitals' financial performance was associated with patients' perception of quality of care. With regard to nurse-perceived quality, some studies elaborated on the relationship with medical performance indicators. McHugh and Witkoski Stimpfel [28] examined the convergent validity of nurse-reported quality by analyzing the correspondence with composite scores for processes related to acute myocardial infarction, pneumonia, and surgical patients. They reported that a 10 % increase in nurses' satisfaction with the quality of care was associated with a 0.6 to 2.0 point increase in composite performance scores. Tvedt et al. [29] found significant correlations between nurse-reported quality and survival probabilities after stroke or acute myocardial infarction. Despite their relevance, these studies solely focused on medical performances. They did not exclusively focus on quality related to nurse-specific indicators (i.e., nurse-sensitive screening indicators). Future research about the usefulness of nurse-sensitive indicators as quality measures can contribute to a better understanding of quality of nursing care.

Our results that Bachelor's educated nurses and more experienced nurses were mostly satisfied about quality of care is the opposite of what previous studies found (e.g., [17, 30]). We do not have a reasonable explanation for these differences, and therefore more studies assessing educational level and years of experience in relation to nurses' perception of quality should be performed. The kinds of shifts that nurses are working has not often been included as a nurse characteristic. We found that nurses working fixed shifts, especially day shifts were more satisfied that those working rotating shifts. An interpretation is that nurses working rotating shifts may have a fragmented perspective of the quality of care, because of the rotating shift schedule. According to our results, the differences between the individual hospitals could not be explained by the included nurse characteristics. There is ample evidence that other factors, such as leadership, autonomy and nurse-physician relationships are important in relation to nurse-perceived quality and other quality outcomes (e.g., [17, 31]). The influence of these kinds of work environment factors however, was not the main focus of the present study.

Limitations

One of the limitations is that, due to missing values on indicators, we were not able to calculate a composite score for each of the six hospitals in 2010. As a result, the nurse-sensitive indicator data were derived in 2011, whereas the survey data of nurses were conducted in 2010. We tested intra-correlations for all nurse-sensitive screening

indicators in the full population of 93 Dutch hospitals and found moderate correlations (r = 0.59 to r = 0.67) between the years 2010 and 2011. Therefore, we argue that the results of both years are comparable and adequately reflect the Dutch context. Further research in a larger sample is necessary to support out findings, because our study sample was limited to six hospitals. Second, critics claim that it may be more interesting to extract unit-level data instead of hospital-level data, because there may be unit characteristics (e.g., patient complexity, workload) that are influential [22, 32]. Many attempts are made worldwide to benchmark on the unit-level, for example by ways of longitudinal studies on specific indicators, such as patient falls [33, 34]. However, it takes years before these kinds of processes are adequately implemented; this is an ongoing process which deserves attention [2, 8]. Third, we used one single-item score to determine satisfaction with quality of care. Although these kinds of quality scores are important indicators of nurses' perspectives, they also have their limits. In line with previous studies [35], it would be useful to further explore interrelations with other satisfaction scores (e.g., recommendation of own hospital, job satisfaction). Fourth, a possible limitation is that some might have reservations about composite scores based on percentages. As described before, is was shown previously that these kinds of composite scores are useful measures to evaluate process performance [20, 21].

Conclusions

Nurse-sensitive quality indicators and nurse-reported quality of care can offer opportunities to differentiate hospitals in terms of quality of nursing care. Our results confirm that quality indicators correspond with nurses' perception of quality, by revealing strong correlations between the objective measurements from publicly reported indicators and nurses' perceived quality of care from a survey. This finding implies that both quality measures are valuable as indicators of hospital performance. Because there is no golden standard to determine nursing care quality, various quality measures could be used by stakeholders (policy makers, health care providers etc.) to complement each other. All in light of the overarching goal of provision of excellent quality of care to patients.

Availability of data and materials

The data supporting the conclusions regarding nurse-perceived quality of care are property of the Dutch Nurses' Association and are available on request to the Dutch Nurses' Association. The dataset of the Dutch Health Care Inspectorate supporting the conclusions regarding nurse-sensitive quality indicators is publicly available at http://

www.ziekenhuizentransparant.nl/.

Abbreviations

D-EoM II: Dutch Essentials of Magnetism II; FTE: full-time equivalents;

RNs: Registered Nurses.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

DS contributed to the design and realization of the study, coordinated the data collection and analysis, and drafted and revised the manuscript. RK revised the manuscript critically for important intellectual content. DL, MK and MS contributed to the concept and design of the study, helped to draft the manuscript and revised the manuscript critically. All authors read and approved the final manuscript.

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Chapter 4

The methodological quality of nurse-sensitive indicators in Dutch hospitals: A descriptive exploratory research study

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Abstract

Objective

Nurse-sensitive indicators (NSIs) are increasingly being developed and used to establish quality of nursing care in Western countries. The objective was to gain insights into the methodological quality of mandatory NSIs in Dutch hospitals, including indicators for pain, wound care, malnutrition and delirium. Design: A descriptive exploratory design was used, starting with desk research into publicly available documents and reports describing the development of the NSIs included in this study. We used the validated Appraisal of Indicators through Research and Evaluation (AIRE) instrument to evaluate the methodological quality.

Results

Although the purpose and relevance of each individual NSI have been described, no detailed information about the criteria for selecting these topics is available. It is not clear which specific stakeholders participated and how their input was used. We found no information about the process of collecting and compiling scientific evidence. It is unclear whether and to what extent the usability of NSIs has been tested.

Conclusion

The methodological quality of NSIs used in Dutch hospitals is less than optimal in various ways and it is therefore questionable if the indicators are accurate enough to identify changes or improve nursing practice. Our study also provides an example of how the methodological quality of NSIs can be assessed systematically, which is relevant considering the increasing use of NSIs in various countries.

Introduction

Nurses collect information in order to monitor the health status of patients, their functioning or well-being [1]. For instance, when a patient is immobile nurses examine the patient's skin to identify whether pressure ulcers may be present. With that information nurses can determine what interventions are appropriate. If the assessment is repeated on a regular basis, the assessment scores or outcomes will help nurses to monitor whether the patient is developing a pressure ulcer or whether the stage of the existing pressure ulcer is improving. In addition, nurses can evaluate the effectiveness of their interventions or actions by calculating the actual pressure ulcer incidence at the unit level. It is then possible to compare the results between the units or even between organisations and determine which unit or organisation has the highest or lowest incidence. This information lets nurses evaluate the quality of nursing care.

To determine the state or quality level of nursing care, nurse-sensitive indicators (NSIs) are developed. NSIs are quantifiable items that monitor or give an indication of the quality of the nursing care provided [2]. 'Nurse-sensitive' means that the NSI scores are actually affected or influenced by nurses [3,4]. The quantifiable items can be calculated as a numerator and denominator. The numerator refers to the outcome of interest (e.g. the incidence of pressure ulcers at the unit level) and the denominator refers to the population at risk (e.g. the number of patients at the unit level). An NSI score needs to encapsulate aspects related to nursing practice and can be used to determine how a unit or an organisation is performing against a certain threshold or norm [5]. An increasing number of studies have identified NSIs for monitoring the quality of nursing care [6–10] such as fatigue [6] or pressure ulcers [10]. Although the selection of NSIs can vary between healthcare sectors or contexts, the NSI scores are used for improving internal quality and external accountability. Internal quality improvement means that nurses evaluate nursing care and can visualise their contribution to patient outcomes [4,11]. Nurses can share and compare nursing quality internally or with other healthcare organisations, which helps identify and understand problems and formulate improvement goals. NSI scores are used for encouraging nursing professionals and organisations to improve performance at the macro (population) and micro (patient) levels [12].

External accountability is about how healthcare quality regulators (e.g. national quality commissions or healthcare inspectorates) control the functioning of the healthcare system and evaluate the impact of policies [13]. External accountability also

covers governmental quality regulation, pay-for-performance contracts or consumer information [12,13]. In this case, NSI scores are needed to evaluate 'return on investment', to enable selective contracting or to help consumer choice.

In a review of measurable nursing quality information, Boo & Froelicher [14] and Magee et al. [15] have indicated that nursing information is used for different internal and external purposes. In order to compare and improve nursing care, attention needs to be paid to the methodological quality of NSIs [16,17]. The methodological quality refers to the development process and application of NSIs. The development describes the process in which scientific evidence is collected and compiled, for instance to strengthen the link with nursing care and patient outcomes or to demonstrate consistency of results across studies. The application implies the extent to which consistent, reliable and valid information is available [18,19]. It means that the NSI specification should be accompanied by clear and precise instructions [20]. The unit of analysis should be specified, as well as the target group and inclusion and exclusion criteria. The NSI should be piloted in practice to test data collection methods and to test if nurses can routinely collect information [16].

Over the past two decades various sets of NSIs have been identified and implemented in various Western countries. For example, in the United States the National Quality Forum (NQF) has developed fifteen NSIs including standardised performance measures to evaluate the quality of nursing care [21,22]. The measures were identified through a consensus development process involving various healthcare stakeholders. The NSIs are incorporated in a national database of nursing quality indicators (NDNQI), that provides quarterly or annual information about nursing care at unit level [23]. Examples of included NSIs are pressure ulcer prevalence, patient falls and falls with injury.

In Canada a similar initiative has been set up, resulting in a Canadian Health Outcomes for Better Information and Care (C-HOBIC) project focussed on the collection of standardised patient outcomes reflective of nursing practice [24]. Various stakeholders, among others, the Canadian Nurses Association and Ontario's Ministry of Health and Long-Term Care supported the project. Patient outcomes related to functional status, self-care, symptom management and safety have been defined, including standardised measurements and empirical evidence linking them to nursing interventions [25]. The collection of outcomes and related (nursing) data provide information about the quality of nursing care.

In Scotland the National Health Service (NHS) developed a national set of NSIs to

evaluate the quality of nursing care, including the incidence of healthcare associated pressure ulcers, provision of nutritional screening and care planning and the incidence of healthcare associated pressure ulcers [26]. In Ireland a Framework for National Performance Indicators for Nursing and Midwifery has been developed in collaboration with the Irish Health Services, including pressure ulcer incidence and falls incidence [27].

In the Netherlands the development and implementation of quality indicators to enhance quality of care is supported by the Dutch Government [28,29]. The Healthcare Inspectorate (linked to the Dutch Ministry of Health, Welfare and Sport) has developed a national supervision programme to identify areas where there are potential risks to the quality of hospital care. Since 2012, the Dutch Nurses' Association (V&VN) has been officially involved in the Inspectorate programme and is responsible for the NSI development process. This involves structural consultations with various departments of the Dutch Nurses' Association in which nursing professionals are represented. Nursing professionals with knowledge or expertise are also involved, depending the subject and aim of the NSI, and mandated to make decisions and approve the final draft NSIs. After approval by nursing professionals and experts, the NSI is submitted to the Inspectorate programme's committee and formally approved. The Inspectorate programme includes NSIs related to wound care, malnutrition, delirium and pain [30]. Hospitals are obliged to provide the information requested. The government can use the results to take actions or develop and adjust policy and strategy to improve nursing care [28]. For that reason, it is important to maintain efforts to strengthen the development and use of suitable NSIs. In this study we focused on the methodological quality of the mandatory Dutch NSIs related to inpatient hospital care and how that quality was assessed.

Study question

What is the methodological quality of the mandatory NSIs for Dutch hospitals?

Methods

Research design

A descriptive exploratory design to assess the methodological quality of mandatory Dutch NSIs.

Composition and data collection

In order to assess the methodological quality, four researchers and nursing experts (RK, AJ, IvP and MH) identified and collected relevant publicly available documents and reports, such as policy documents, programme evaluation reports, publications and benchmarks from stakeholders, governmental agencies and regulatory authorities (Healthcare Inspectorate) and reports on websites (www.vmszorg.nl; www.igz.nl; www.venvn.nl; www.demedischspecialist.nl; www.nfu.nl; http://www.ziekenhuizentransparant.nl/; http://fightmalnutrition.eu/).

Documents, reports and benchmarks up to 2015 were included if the development or implementation process of NSIs related to inpatient hospital care was described. Policy, accountability and evaluation reports about the programme itself were also included (up to 2015).

The four researchers then assessed the methodological quality of the selected NSIs. There are various instruments for evaluating methodological quality, such as the Guidance for Evaluating Evidence and Measure Testing from National Quality Forum [19], the Guide to Inpatient Quality Indicators [31] or the Dutch validated Appraisal of Indicators through Research and Evaluation instrument, abbreviated as AIRE instrument [32]. However, the first two instruments mentioned focus on evaluating measurements or measures rather than quality indicators. The AIRE instrument appeared to be more appropriate for this study, as it is primarily intended for assessing the methodological quality of existing quality indicators and their development paths. Previous studies in the Netherlands also assessed the methodological quality of quality indicators using the AIRE instrument [33–35]. In those studies, the instrument was found to be suitable for assessing the development process of quality indicators, including NSIs.

The AIRE instrument consists of four domains [32]:

– Purpose, relevance and organisational entity.

- Stakeholder involvement in the development process.
- Scientific evidence.
- Additional evidence, formulation and usage.

Each domain contains several items, giving 20 in all (see Table 1). Each item has a score ranging from 1 ('strongly disagree') to 4 ('strongly agree') [32].

Table 1. The Appraisal of Indicators through Research and Evaluation tool (domains and items).

Domain 1: Purpose, relevance and organisational entity	
1.	The purpose of the indicator is described clearly
2.	The criteria for selecting the topic of the indicator are described in detail
3.	The organizational context of the indicator is described in detail
4.	The quality domain the indicator addresses is described in detail
5.	The health-care process covered by the indicator is described and defined in detail
Domain 2: Stakeholder involvement in the development process	
6.	The group developing the indicator includes individuals from all relevant professional groups
7.	Considering the purpose of the indicator, all relevant stakeholders have been involved at some stage of the development process
8.	The indicator has been formally endorsed
Domain 3: Scientific evidence	
9.	Systematic methods were used to search for scientific evidence
10.	The indicator is based on recommendations from an evidence-based guideline or studies published in peer-reviewed scientific journals
11.	The supporting evidence has been critically appraised
Domain 4: Additional evidence, formulation and usage	
12.	The numerator and denominator are described in detail
13.	The target patient population of the indicator is defined clearly
14.	A strategy for risk adjustment has been considered and described
15.	The indicator measures what it is intended to measure (validity)
16.	The indicator measures accurately and consistently (reliability)
17.	The indicator has sufficient discriminative power
18.	The indicator has been piloted in practice
19.	The efforts needed for data collection have been considered
20.	Specific instructions for presenting and interpreting results

Data analysis

Prior to the appraisal, the four researchers (RK, AJ, IvP and MH) studied and reviewed the documents and reports that had been included [28–30]. The methodological quality of the mandatory NSIs was then evaluated (see Table 2 for an overview of the mandatory NSIs).

Table 2. Overview of the mandatory NSIs (2015)

Hospital care: mandatory NSIs (2015)
Wound care: Wound expertise centre
Wound care: Diabetic foot classified by the Texas classification
Malnutrition: Screening for malnutrition (children)
Malnutrition: Treatment of malnutrition (adults and children)
Delirium: Risk assessment for delirium
Delirium: Screening for and observation of delirium
Pain: Hospital-wide patient standardised pain assessment

Four researchers (RK, AJ, IvP and MH) completed the AIRE instrument independently, separately for each NSI. The scores were based on knowledge extracted from the documents and reports studied. The scores were put in an Excel file. The item scores of each NSI were converted to the domain level by a standardised calculation procedure.

First, the maximum possible score for a domain was calculated by multiplying the maximum score per item (a score of 4) by the number of items in that domain and the number of researchers. The minimum possible score was calculated using the same procedure, except with a minimum score per item (a score of 1). The standardised domain score is the *{*score obtained per domain minus the minimum possible score for that domain*}* divided by *{*the maximum possible score minus the minimum possible score*}*, all times 100% [32]. An example of the calculation procedure is set out in Fig. 1.

Figure 1. Example of the calculation procedure.

Example

If 4 researchers give the following scores for Domain 2:

	Item 6	Item 7	Item 8	**Total**
Researcher 1	3	2	3	**8**
Researcher 2	2	2	3	**7**
Researcher 3	2	2	3	**7**
Researcher 4	2	2	3	**7**
Total	**9**	**8**	**12**	**29**

Maximum possible score = 4 (strongly agree) x 3 (items) x 4 (researchers) = 48

Minimum possible score = 1 (strongly disagree) x 3 (items) x 4 (researchers) = 12

The scaled domain score will be:

$$\frac{\text{Obtained score} - \text{Minimum possible score}}{\text{Maximum possible score} - \text{Minimum possible score}} \times 100\%$$

$$\frac{29 - 12}{48 - 12} \times 100 = \frac{17}{36} \times 100\% = 0{,}4722 \times 100\% = \mathbf{47\%}$$

One researcher (IvP) entered the data and calculated the scores while another researcher (RK) cross-checked the data entry and calculations. Both the item and domain scores were placed in a table. Because no guidance was available on how to interpret the scores, this study arbitrarily defined domain scores of between 0 and 33% as low methodological quality, 34–66% as moderate and 67–100% as high. The results were clarified by following the domains of the AIRE instrument. The scores supported the researchers (RK, DD, DS) in their analysis and discussion.

To measure the interrater reliability we performed a weighted kappa test. First we calculated Cohen's kappa between two researchers. Then an average over all pairs of researchers was calculated (researcher 1 × 2, researcher 1 × 3, researcher 1 × 4, researcher 2 × 3, researcher 2 × 4, researcher 3 × 4). Degrees of agreement were categorised as follows: k of 0.2–0.4, fair agreement; k of 0.4–0.6, moderate agreement; k of 0.6–0.8, substantial agreement; and k of 0.8–1.0, almost perfect agreement.

Results

The methodological quality of NSIs was assessed with the AIRE instrument. The domain scores are presented in Fig. 2. The item scores of each NSI are presented in Appendix A in Supplementary materials.

In general, according to the researchers, domain 1 has a moderate methodological quality (with a range of 52%–55%) as shown in Fig. 2. This also applies for domain 2, except for the scores of both malnutrition NSIs, for which the methodological quality is low. Domain 3 (with a range of 11%–36%) and domain 4 (with a range of 18%–40%) tend towards low methodological quality. The NSI screening for malnutrition has the lowest scores (a range of 11%–52%). Interrater agreement between the researchers was substantial with Cohen's kappa values of k = 0.6 to 0.8 for four NSIs (wound expertise centre, diabetic foot, screening malnutrition, pain) and moderate with k values of 0.4–0.6 for the remaining NSIs (see Appendix A in Supplementary materials). The results are explained in the following section.

Figure 2. Overview of domain scores assessed with the AIRE instrument.

National basic set of Dutch NSI (2015)	Domain 1	Domain 2	Domain 3	Domain 4	*Range (NSI-level)*
Wound care: Wound expertise centre	55%	47%	31%	40%	*31%-55%*
Wound care: Diabetic foot classified by the Texas classification	52%	47%	19%	18%	*18%-52%*
Malnutrition: Screening for malnutrition (children)	52%	28%	11%	22%	*11%-52%*
Malnutrition: Treatment of malnutrition (adults and children)	53%	22%	25%	25%	*22%-53%*
Delirium: Risk assessment for delirium	52%	47%	31%	22%	*22%-52%*
Delirium: Screening for and observation of delirium	53%	42%	36%	36%	*36%-53%*
Pain: Hospital-wide standardised pain assessments	52%	50%	22%	37%	*22%-52%*
Range (domain level)	*52%-55%*	*22%-50%*	*11%-36%*	*18%-40%*	

NSI 'Wound expertise centre'

Purpose, relevance and organisational entity

This NSI has been in the basic set of the Inspectorate programme since 2013. It refers to whether a hospital involves or has access to a wound expertise centre. The criterion for selecting this NSI is that different professionals and disciplines are involved in caring for patients with (chronic) wounds, resulting in inefficient treatment of wounds. The consequence is a delay in effective treatment or admission to a hospital or residential care. The expectation is that involving a wound expertise centre will lead to better

wound healing and improved quality of life and well-being. The description does not provide information about which healthcare processes are covered by the NSI.

Stakeholder involvement

The accompanying description of the indicator states that professionals of the Wound Care department of the Dutch Nurses' Association (V&VN) and the Wound Care Consultant Society (WCS) were involved in the development process. No information has been found about the reasoning for selecting these professionals and their specific expertise or if and why other stakeholders such as patients' representatives were not involved.

Supporting scientific evidence

The statements are supported with references from scientific evidence of a study on 'leg ulcer clinics in Britain', although only the name of the author and publication year are given (for example: Moffat 1992). No further information is available in the accompanying description of the indicator.

Additional evidence, formulation and usage

The indicator itself consists of a single question: 'Does the hospital have access to a wound expertise centre'? It is not clear if the indicator has been piloted in the Netherlands. The efforts needed to set up a wound expertise centre have not been described. Features of a wound expertise centre are described in the accompanying description of the indicator.

NSI 'Diabetic foot classified by the Texas classification'

Purpose, relevance and organisational entity

The NSI refers to the number of patients with a diabetic foot classified by the Texas classification. The reasoning behind the selection of this classification is described as follows (basic set 2015; p. 71):

Table 3. Indicator questions of the NSI "diabetic foot classified by the Texas classification"

1. Does the hospital treat patients with a diabetic foot? Yes/No
2. Is the care for the patient included spread over multiple locations? Yes/No
3. Is the number of patients with a diabetic foot documented? Yes/No
4. Are patients with a diabetic foot classified using the Texas classification? Yes/No
5. If not, with which other classification are patients with a diabetic foot documented?
6. How many patients are classified as grade 1 (Superficial wound, not involving tendon, capsule or bone)?
7. How many patients are classified as grade 2 (Wound penetrating to tendon or capsule)?
8. How many patients are classified as grade 3 (Wound penetrating to bone or joint)?
9. Is the wound expertise centre consulted when treating patients with a diabetic foot?

There are various international classification systems. The Wagner and Texas classifications are the best –known. In the consensus text from 1998, the Dutch classification has also been described. The classification is included in the basic set because the Texas classification has been validated internationally'.

As mentioned in the accompanying description of the indicator, the main reason for developing this NSI is that one uniform registration system is a requirement in order to monitor how many patients with a diabetic foot are treated and to provide insights into the various grades of diabetic foot. The analyses are at the hospital level.

Stakeholder involvement

Although it is stated in the accompanying description of the indicator that professionals are involved in the development process, it does not say which professionals. No information has been found about the involvement of stakeholders (e.g. patients or insurers).

Supporting scientific evidence

No references to scientific evidence about the Texas classification have been included or supporting evidence that a single registration system will provide more insights into how many patients with a diabetic foot are treated.

Additional evidence, formulation and usage
No definition of a diabetic foot was found in the accompanying explanation of the NSI. The diagnosis process for a diabetic foot as well as the care process and responsibilities are not described. It is also not clear which patients should be included or excluded. The indicator itself consists of nine questions, which are specified in Table 3. It is not clear if the NSI has been piloted in practice. The efforts needed to ensure that nurses can work with a single registration system have not been described.

NSI 'Screening for malnutrition'

Purpose, relevance and organisational entity
The accompanying description refers to the extent to which patients are systematically screened for malnutrition and monitoring to ensure malnourished patients are treated appropriately and in time.

Malnutrition is defined as:
- Children (28 days – 1 year) weighing 2 SDs or more below the average weight-to-age growth curve
- Children (1–<18 years) weighing 2 SDs or more below the average weight-to-height growth curve
- Adults (≥18 years) with a SNAQ score on admission of ≥3 or a MUST score of ≥2

The reasoning behind the selection of this indicator is that the prevalence of malnutrition in hospitals is high (20–40% of adults and children) and that malnourishment in patients may be undetected and untreated. The analysis is at the hospital level.

Stakeholder involvement
There is no statement of which professionals with specific expertise of paediatric nutrition and malnutrition were involved in the development process. No information has been found to state whether stakeholders were involved.

Supporting scientific evidence
It is not clear if systematic methods were used to search for scientific evidence. In the accompanying description, the statements about the purpose and relevance are not supported with references from evidence-based guidelines or scientific evidence from studies published in peer-reviewed scientific journals. The Screening Tool Risk On Nutritional Status and Growth (STRONGkids) was used for determining whether each case involves acute malnutrition. It is not clear if this is based on recommendations

from a guideline or scientific evidence. A reference with a link to the Dutch malnutrition steering group is given. This gives more information about malnutrition.

Additional evidence, formulation and usage

The numerator and denominator are specified in Fig. 3. The target group is children aged between 28 days and 18 years. Each child needs to be assessed upon admission. Children in outpatient settings and infants younger than 28 days are excluded. The accompanying description does not specify how the scores of the STRONGkids tool need to be documented nor how the counting process should be conducted (e.g. prevalence or continuous measurement). Following the link to the malnutrition steering group did not reveal any specific instructions about the instrument and how to interpret the results. It is not clear if the NSI has been piloted in practice and if the indicator has sufficient discriminative power.

The accompanying description refers to one study that investigates the feasibility and value of STRONGkids.

Figure 3. Screening and treatment of malnutrition: numerator and denominator.

NSI Malnutrition

1. **Screening for malnutrition (children)**
    a) The percentage of children screened for malnutrition
        - Number of children screened for acute malnutrition during admission
        - Denominator: number of children admitted during the reporting year
    b) The percentage of children classified as having acute malnutrition
        - Numerator: percentage of children classified as having acute malnutrition
        - Denominator: number of children screened for acute malnutrition during admission
2. **Treatment of malnutrition (adults and children)**
    a) Percentage of severely malnourished adults with an appropriate protein intake
        - Numerator: number of severely malnourished adults with an appropriate protein intake on the fourth day of admission
        - Denominator: number of severely malnourished adults on the fifth day of admission
    b) Percentage of acutely malnourished children with an adequate protein intake
        - Number of malnourished children with an adequate protein intake on the fourth day of admission
        - Denominator: number of severely malnourished children on the fifth day of admission
    c) Percentage of acutely malnourished children with an adequate energy intake.
        - Numerator: number of malnourished children with an adequate energy intake on the fourth day of admission
        - Denominator: number of severely malnourished children on the fifth day of admission

NSI 'Treatment of malnutrition'

Purpose, relevance and organisational entity
The accompanying description states that malnourished patients should be treated appropriately and in good time, meaning that malnourished patients should receive dietary treatment within 48 h. It states that untreated malnutrition increases postoperative morbidity, prolonged hospitalisation, premature death and delayed wound healing. The analysis is at the hospital level.

Stakeholder involvement
It was not stated which professionals with specific expertise of (paediatric and other) nutrition and malnutrition were involved in the development process. No information was found about whether stakeholders had been involved.

Supporting scientific evidence
It is not clear if systematic methods were used to search for scientific evidence. In the accompanying description, the statement that patients should receive dietary treatment within 48 h is not supported with references from evidence-based guidelines or scientific evidence from studies published in peer-reviewed scientific journals.

Additional evidence, formulation and usage
The numerator and denominator are specified in Fig. 3. The target group of indicator 2a (Fig. 3) is adults with severe malnourishment, though without specifying what 'severe' means. A protein intake norm has been specified. The target groups of indicators 2b and 2c (Fig. 3) are acutely malnourished children aged >1 year. Inclusion or exclusion criteria are not mentioned. An adequate intake has been defined.

There is no specification of how the protein or energy intake (adults and children) should be described or specified and how often it needs to be documented. The accompanying description states that the counting for all included malnourished patients should be based on the intake on the fourth day of admission of each malnourished patient. This intake can be assessed on the fifth day of admission. The outcome of the indicator is the number of patients with an adequate intake (protein or energy). It is not clear if the NSI has been piloted in practice, if the efforts to collect information have been considered and if the indicator has sufficient discriminative power.

NSI 'Risk assessment for delirium'

Purpose, relevance and organisational entity
The purpose of this NSI is to develop a standardised assessment and treatment for delirium. The reason for selecting this NSI is that delirium is associated with an increased length of stay, complications during stay, increased hospital mortality and decreased functional recovery of the underlying disease. The analysis is at the hospital level.

Stakeholder involvement
There is no statement of which professionals with specific expertise in delirium or which stakeholders were involved in the development process.

Supporting scientific evidence
The statements are not supported with references from evidence-based guidelines or scientific evidence from studies published in peer-reviewed scientific journals. Within the specification of the indicator, there are no references to scientific evidence from studies published in peer-reviewed scientific journals.

Additional evidence, formulation and usage
The NSI refers to the percentage of nursing wards assessing the risk of delirium (Fig. 4). A definition of delirium is described and based on the 'Diagnostic and statistical manual of mental disorders' (DSM-IV) criteria for delirium, which include a reference. The target group is elderly patients (70-plus). Every patient aged 70 or older needs to be assessed upon admission to hospital. Inclusion and exclusion criteria are not mentioned.

The risk assessment for delirium consists of three questions:

- Do you have memory problems?
- Did you need help with anything in the last 24 h?
- Did you have periods of confusion during a previous admission or sickness?

A patient has a high risk of developing delirium if one or more positive answers are given. Although it is stated that the assessment scores should be documented structurally, it does not specify how the assessment scores need to be documented.

Figure 4. Risk assessment and screening for & observation of delirium: numerator and denominator.

NSI Delirium (numerators and denominators)

1. Risk assessment for delirium
    - Numerator: the number of nursing wards where over 80% of all patients (aged 70 or older) have a delirium risk score recorded on admission in the medical records
    - Denominator: the number of nursing wards to which patients aged 70-plus are admitted at any time during the record year
2. Screening for and observation of delirium
    - Numerator: number of patients assessed at least once for delirium by the Delirium Observation Screening Scale (DOSS) (regardless of outcome)
    - Denominator: number of patients assessed by the method of indicator 1 and who have a high risk of developing delirium (numerator of indicator 1), along with patients who were assessed by other means and have a high risk of developing delirium

NSI 'Screening for and observation of delirium'

Purpose, relevance and organisational entity
The purpose of this NSI is to develop a standardised assessment and treatment for delirium.

Stakeholder involvement
There is no statement of which professionals with specific expertise in delirium or which stakeholders were involved in the development process.

Supporting scientific evidence
The statements are not supported with references from evidence-based guidelines or scientific evidence from studies published in peer-reviewed scientific journals. Within the specification of the indicator, there are no references to scientific evidence from studies published in peer-reviewed scientific journals.

Additional evidence, formulation and usage
The NSI refers to the percentage of patients with a risk of developing delirium who have been screened and observed for the presence of delirium. The target group is elderly people (70 and older) with a confirmed high risk of developing delirium.

In the accompanying description, it is not specified how and how often the assessment

scores need to be documented. It is noted that the patients included should be counted once per quarter (four times a year). The outcome of the indicator is the average of the four quarterly counts.

NSI 'Hospital-wide patient standardised pain assessment'

Purpose, relevance and organisational entity
The NSI refers to hospital-wide standardised pain assessment for the entire patient population, including patients with cancer. The reason for selecting this indicator is that accurate and timely pain assessment can prevent complications and influence patient wellbeing and recovery.

The transition to hospital-wide standardised pain assessment will be supervised in three phases. First, the preconditions for establishing hospital-wide standardised pain assessment will be monitored. The second phase will focus on recording pain scores and the final phase is monitoring the actions and results following the pain scores. The purpose of this NSI is related to the first phase. The analysis is at the hospital level.

Stakeholder involvement
There is no statement of which professionals with specific expertise of pain or which stakeholders were involved in the development process.

Supporting scientific evidence
The statements are not supported with references from evidence based guidelines or scientific evidence from studies published in peer-reviewed scientific journals.

Additional evidence, formulation and usage
The indicator consists of three questions:
- Does the hospital have a hospital-wide protocol for detecting and treating pain that is used by relevant non-surgical units?
- Does the hospital have a pain service team for non-surgical patients?
- Do professionals have access to hospital-wide electronic medical records in which pain scores can be documented?

In the description accompanying this indicator, there is no definition of 'pain'. In the description accompanying the indicator, no explanation or definition of a 'pain service team' is provided either.

Discussion

This study aims to evaluate the methodological quality of mandatory NSIs in Dutch hospitals, including those for wound care, malnutrition, delirium and pain. The methodological quality was assessed using the AIRE instrument.

Purpose, relevance and organisation entity

Although the purpose and relevance of each individual NSI have been described, no detailed information about the criteria for selecting these topics or the organisational context of the NSIs is available. It is therefore not clear if the healthcare processes of each NSI are covered sufficiently and if the NSI scores actually reflect the quality of nursing care. This is a relevant question, because the NSI scores need to identify areas for nursing practice improvements or distinguish differences between hospitals [16]. Comparing the list of Dutch NSIs against existing NSIs in other countries, we found that the National Health Service of Scotland has developed a similar national set of NSIs applicable for the inpatient hospital setting, namely 'pressure ulcer prevention', 'falls', 'food, fluid and nutrition' and 'monitoring and observation' [36]. The National Quality Forum (NQF) has set up a Nurse-sensitive Care Measure Set that comprises fifteen measurements [22], which to our knowledge are not mandatory for hospitals but included in the NDNQI. However, none of the Dutch NSIs included match the NQF list. One possible explanation for this might be that the criteria and relevance for selecting the topics of national NSIs differ. For instance, the area identified might have a large impact on a national population or it might have a potential cost-saving rationale. Furthermore, it is arguable whether the NSI 'Diabetic foot classified by the Texas classification' is truly an NSI. Its purpose is to monitor if language has been used uniformly. There is an argument that a well-functioning monitoring system can only operate if nurses define the nursing information collected unambiguously and uniformly. In this case, using uniform terminology is a precondition for all NSIs [20]. This precondition of using an uniform terminology is adopted in the C-HOBIC project in Canada.

However, the findings of our study may help us to understand that identifying and defining of NSIs is not straightforward.

Stakeholder involvement in the development process

It could be argued that the choice and inclusion of an NSI in a national basic set has

to do with different stakeholders' perspectives (e.g. patients, healthcare providers or health insurers) [37]. Although the accompanying descriptions with the basic NSI set state that relevant stakeholders are involved, it is not clear if a stakeholder analysis has been performed. No information is available about which specific stakeholders are of interest, why, how they participated in the development of the NSI and how their input was used. There is for instance no description of whether patients' experiences or perspectives were consulted to determine priorities in the selection of the NSI. However, the findings of our study correspond with those of Kötter et al. [38] who showed that the input of patients (or patient representatives) were consistently not reported in the publications retrieved and that little is known about the effects of patients' (or patient representatives') involvement in the selection and development of NSIs. Considering the differences in information needs of stakeholders, it is recommended that their views should be taken into account in order to strengthen the rationales behind the selection of an NSI [37].

Scientific evidence

When reviewing the results of scientific evidence, we found no information about the process of collecting and compiling scientific evidence. Neither was there a summary or a critical appraisal of the quantity or quality of the underlying evidence. It is not clear whether a literature search was performed to identify if and why the NSIs are nurse-sensitive, how they are linked to outcomes and why they have been included.

Outcome indicators sensitive to nursing care can have different perspectives. For instance, from an economic perspective, an increased length of stay is only acceptable if it adds value for patients. NSIs related to adverse events will focus on complications during the hospital stay, such as falls or mortality [39]. It is also important to take account of the context to which the NSI applies, because the NSI scores can be influenced by patient variables (e.g. age or comorbidity), organisational variables (e.g. working environment [40]) and nursing variables (e.g. education) [3]. A summary or a critical appraisal of the underlying evidence should be available [16] in order to explain potential variation in the NSI scores of hospitals.

Additional evidence, formulation and usage

It is unclear whether and to what extent the usability of NSIs has been tested, or if the NSIs are accurate enough to identify changes in nursing practice. It seems for instance that the numerator and denominator of the indicator measuring malnutrition are highly

impracticable: the energy or protein intake has to be calculated on the fourth and fifth admission day of each malnourished patient. Who monitors and reports how many days patients have been hospitalised? What should be done when a patient is transferred to another nursing ward? Imprecise technical specifications might be a potential cause of inaccurate data collection. In the Netherlands, hospitals can participate in various programmes, e.g. a national safety management programme or the National Prevalence Measurement of Quality of Care (the LPZ), both collecting data. Hospitals might use this information for different purposes. The national safety management programme has been launched to prevent or reduce healthcare-related accidents and adverse events. It entails implementing a safety management system for eleven themes, including malnutrition, delirium and pain [41,42]. The National Prevalence Measurement of Quality of Care has defined several NSIs, including malnutrition and pain [43]. Looking at e.g. the criteria for diagnosing malnutrition, the safety programme uses the following definition: 'Body mass index < =20 (patients affected by COPD <21); and/or >10% unintentional weight loss in the past six months; and/or >5% unintentional weight loss in the past month' [42]. According to the LPZ a malnourished patient has a 'BMI <18.5 (patients older than 65 BMI <20); and/or unintentional weight loss of more than 10% in the past six months' [44]. These definitions differ from the definition of the national mandatory NSI 'malnutrition'.

Burston et al. [4] have discussed how standardisation of definitions is one condition for allowing comparison of NSI scores. Moreover, looking at the concept of an NSI, Heslop et al. [2] argued that theory building with clarified concepts and their underlying relationships is needed. Heslop et al. [2] found different terms and definitions for the concept of an NSI (e.g. outcome indicators/measurements, performance indicators). It is possible that the lack of a clear definition of the concept itself and variations in categories might lead to differences into the development process of NSIs.

The international debate on NSIs focusses not only on the development and methodological quality of indicators, bus also on the collection of data used to calculate NSI scores. Nurses operate in a complex healthcare context with organisation policies that are focussed on cost-efficiency, transparency and (professional) accountability goals [45]. Nursing characteristics (e.g. skill mix) or patient characteristics (e.g. comorbidity, age) might influence patient outcomes as well. To reduce the possibility of incorrect interpretations, data needs to be unambiguous. It means that data should have a single clearly defined meaning. The need for unambiguous nursing data is a topic of increased debate, particularly in relation to the use of electronic health records (EHR). EHR are considered as 'primary/source data', meaning that the data is used for

monitoring patients' health or functioning problems, nursing interventions, and patient outcomes in direct patient care. This primary/source data can be used for 'secondary purposes' such as scientific research, public health monitoring or quality control [46]. Both for direct patient care as well as for secondary use, the quality of primary/source data should be consistent and unambiguous. This is one of the starting points of the Canadian C-HOBIC project, which focusses on implementing unambiguous patient outcome data related to nursing care in an EHR [24]. Comparability and interoperability of primary/source data is a necessity for secondary use of data. According to Hovenga [47]. we need to understand 'what is required of data and systems to achieve the desired outcomes across our data and systems' ([47]; page 29). In a literature review, Galster [48] found that data is duplicated instead of being reused, because it is considered as inadequate, not available or accessible. Hoi [20] stated that NSIs and measurement methodology should incorporate unambiguous data so nurses' contribution to quality of care can be investigated in a reliable and valid manner. An infrastructure to develop, implement and govern nursing data nationwide to integrate nursing data into EHR's would be valuable [47]. In order to facilitate international learning, however, such a national infrastructure would have to use internationally accepted terminologies (e.g. SNOMED CT).

Research implications

This study has raised questions about the methodological quality of the NSIs used in Dutch hospitals. We expected to find a scientific basis for the selected indicators, including published research or documents describing the scientific basis and explaining the reasoning behind the selection and development of indicators. However, we found that this information is lacking or at least not made public. That in itself is already a relevant finding. To ensure quality related to the collection of nursing data and consistently measure nurses' performance, it is important to gain knowledge and insight into the methodological quality of the existing nursing-sensitive set of indicators. This knowledge can be gathered by making scientific opinions, reports, or similar documentation publicly available. Our study might also have added value for experts and clinicians in other countries who are involved in development, selection or implementation of NSIs, since we showed how the methodological quality can be established and discussed.

If we aim to use data to improve quality of care, it is important to maintain efforts to strengthen sustainable development and use of suitable NSIs. Particularly because hospitals are obliged to provide the information requested and the scores are used

for governmental quality regulation, pay-for-performance contracts and nursing care improvements. From the public health point of view, a peer-reviewing mechanism in which researchers and policy makers evaluate the creation and establishment of NSIs, is crucial. The purpose is to get insight into the development process and functioning, which will support the public health and scientific debate as well. The prioritising, selecting and development process seems to become increasingly transparent, but have not yet been crystallised or established entirely. Comparison against NSIs from other countries, including their descriptions and methodological issues, could be considered for future studies. We recommend a standardised format for publishing the methodological quality and characteristics of NSIs.

Research limitations

This study focuses on the methodological quality of Dutch NSIs. We used the AIRE instrument for the assessment. Although the agreement between the researchers was substantial and moderate, the use of the AIRE instrument should be tested further in order to improve its reliability. Apart from that, the methodological appraisal of NSIs was based on information from publicly available documents. The development process was not always described in detail, which should be allowed for when considering the implications of our findings.

Conclusion

The methodological quality of mandatory NSIs used in Dutch hospitals is less than optimal. Although the purpose and relevance of each individual nurse-sensitive indicator have been described, no detailed information about the criteria for selecting these topics is available. It is not clear which specific stakeholders participated and how their input was used. We found no information about the process of collecting and compiling scientific evidence. It is unclear whether and to what extent the usability of NSIs has been tested. It is therefore open to question whether the indicators are accurate enough to identify changes or improve nursing practice. This might be problematic because the scores are used for governmental quality regulation, pay-for-performance contracts and nursing care improvements. Appropriate methodologies and strategies in the development process of NSI and transparency about the process itself are both important issues for addressing inconsistency in the quality of NSIs and establishing a successful implementation. The way we assessed the methodological quality of NSIs might be useful for nursing researchers, professionals and policy makers developing and implementing NSIs.

Conflict of interest statement

The authors declare that they have no competing interests.

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Appendix A. Overview of scores per NSI

NSI	Domain 1						Domain 2				Domain 3				Domain 4									
Wound expertise centre	*Item 1*	*Item 2*	*Item 3*	*Item 4*	*Item 5*	***Total***	*Item 6*	*Item 7*	*Item 8*	***Total***	*Item 9*	*Item 10*	*Item 11*	***Total***	*Item 12*	*Item 13*	*Item 14*	*Item 15*	*Item 16*	*Item 17*	*Item 18*	*Item 19*	*Item 20*	***Total***
Researcher 1	3*	2	2	3	2	12	3	2	3	8	1	3	1	5	2	3	2	3	2	3	2	3	2	22
Researcher 2	4	3	2	4	2	15	2	2	3	7	1	3	1	5	2	2	2	2	1	2	1	3	2	17
Researcher 3	3	3	3	3	2	14	2	2	3	7	1	3	1	5	3	3	2	3	2	2	2	3	2	22
Researcher 4	3	3	2	3	1	12	2	2	3	7	3	4	1	8	2	2	1	2	2	2	2	3	2	18
Total score per item	13	11	9	13	7	53	9	8	12	29	6	13	4	23	9	10	7	10	7	9	7	12	8	79
Total domain score (%)						**55**				**47**				**31**										**40**
Interrater reliability																								**k 0.6**
	Domain 1						**Domain 2**				**Domain 3**				**Domain 4**									
Diabetic foot	*Item 1*	*Item 2*	*Item 3*	*Item 4*	*Item 5*	***Total***	*Item 6*	*Item 7*	*Item 8*	***Total***	*Item 9*	*Item 10*	*Item 11*	***Total***	*Item 12*	*Item 13*	*Item 14*	*Item 15*	*Item 16*	*Item 17*	*Item 18*	*Item 19*	*Item 20*	***Total***
Researcher 1	3	2	2	3	2	12	4	3	3	10	1	2	1	4	1	2	1	2	1	1	2	3	3	16
Researcher 2	4	3	1	4	2	14	1	1	3	5	1	3	1	5	1	1	1	2	1	1	1	2	1	11
Researcher 3	4	3	1	4	2	14	1	1	3	5	1	3	1	5	1	2	1	2	1	1	2	2	2	14
Researcher 4	4	2	1	3	1	11	3	3	3	9	1	2	2	5	1	1	1	3	1	1	1	3	2	14
Total score per item	15	10	5	14	7	51	9	8	12	29	4	10	5	19	4	6	4	9	4	4	6	10	8	55
Total domain score (%)						**52**				**47**				**19**										**18**
Interrater reliability																								**k 0.6**

	Domain 1						Domain 2				Domain 3				Domain 4									
Screening for malnutrition	*Item 1*	*Item 2*	*Item 3*	*Item 4*	*Item 5*	***Total***	*Item 6*	*Item 7*	*Item 8*	***Total***	*Item 9*	*Item 10*	*Item 11*	***Total***	*Item 12*	*Item 13*	*Item 14*	*Item 15*	*Item 16*	*Item 17*	*Item 18*	*Item 19*	*Item 20*	***Total***
Researcher 1	3	2	2	3	3	13	2	3	3	8	1	2	1	4	2	2	1	2	1	1	2	2	2	15
Researcher 2	3	3	2	2	2	12	1	1	3	5	1	2	1	4	2	2	1	2	1	1	1	2	2	14
Researcher 3	3	3	3	3	2	14	1	1	3	5	1	1	2	4	1	2	1	2	1	1	1	2	2	13
Researcher 4	3	2	2	3	2	12	1	1	2	4	1	2	1	4	2	3	1	2	1	1	2	3	3	18
Total score per item	12	10	9	11	9	51	5	6	11	22	4	7	5	16	7	9	4	8	4	4	6	9	9	60
Total domain score (%)						**52**				**28**				**11**										**22**
Interrater reliability																								**k 0.6**

	Domain 1						Domain 2				Domain 3				Domain 4									
Treatment of malnutrition	*Item 1*	*Item 2*	*Item 3*	*Item 4*	*Item 5*	***Total***	*Item 6*	*Item 7*	*Item 8*	***Total***	*Item 9*	*Item 10*	*Item 11*	***Total***	*Item 12*	*Item 13*	*Item 14*	*Item 15*	*Item 16*	*Item 17*	*Item 18*	*Item 19*	*Item 20*	***Total***
Researcher 1	3	3	2	3	3	14	3	3	2	8	2	3	1	6	3	2	1	2	1	1	2	3	3	18
Researcher 2	3	2	2	2	3	12	2	1	2	5	2	2	2	6	2	2	1	2	1	1	2	2	2	15
Researcher 3	3	2	3	3	2	13	1	1	1	3	1	2	2	5	3	2	1	1	1	1	1	2	2	14
Researcher 4	3	3	2	3	2	13	1	1	2	4	1	2	1	4	2	1	1	1	1	1	1	4	4	16
Total score per item	12	10	9	11	10	52	7	6	7	20	6	9	6	21	10	7	4	6	4	4	6	11	11	63
Total domain score (%)						**53**				**22**				**25**										**25**
Interrater reliability																								**k 0.5**

	Domain 1						Domain 2				Domain 3				Domain 4									
Risk assessment for delirium	*Item 1*	*Item 2*	*Item 3*	*Item 4*	*Item 5*	***Total***	*Item 6*	*Item 7*	*Item 8*	***Total***	*Item 9*	*Item 10*	*Item 11*	***Total***	*Item 12*	*Item 13*	*Item 14*	*Item 15*	*Item 16*	*Item 17*	*Item 18*	*Item 19*	*Item 20*	***Total***
Researcher 1	3	2	2	2	3	12	2	3	4	9	1	3	1	5	1	1	1	1	1	1	2	2	2	12
Researcher 2	3	3	3	3	2	14	2	2	3	7	2	3	3	8	3	2	2	3	2	2	2	2	2	20
Researcher 3	4	3	2	2	3	14	2	1	4	7	1	3	1	5	2	2	1	1	1	1	1	3	2	14

Researcher 4	3	2	2	2	2	11	1	1	4	6	1	3	1	5	2	2	3	1	1	1	1	1	2	14
Total score per item	13	10	9	9	10	51	7	7	15	29	5	12	6	23	8	7	7	6	5	5	6	8	8	60
Total domain score (%)						**52**				**47**				**31**										**22**
Interrater reliability																								**k 0.4**

	Domain 1						**Domain 2**				**Domain 3**				**Domain 4**									
Screening for and observation of delirium	*Item 1*	*Item 2*	*Item 3*	*Item 4*	*Item 5*	***Total***	*Item 6*	*Item 7*	*Item 8*	***Total***	*Item 9*	*Item 10*	*Item 11*	***Total***	*Item 12*	*Item 13*	*Item 14*	*Item 15*	*Item 16*	*Item 17*	*Item 18*	*Item 19*	*Item 20*	***Total***
Researcher 1	3	2	2	3	3	13	3	3	2	8	1	3	1	5	3	3	1	2	1	1	2	2	2	17
Researcher 2	4	3	2	3	2	14	3	3	3	9	2	4	2	8	2	2	2	2	2	1	2	2	3	18
Researcher 3	3	3	2	3	2	13	1	1	3	5	2	4	1	7	3	3	2	3	2	2	3	2	2	22
Researcher 4	3	3	2	2	2	12	1	1	3	5	1	3	1	5	3	3	1	2	1	1	2	3	2	18
Total score per item	13	11	8	11	9	52	8	8	11	27	6	14	5	25	11	11	6	9	6	5	9	9	9	75
Total domain score (%)						**53**				**42**				**36**										**36**
Interrater reliability																								**k 0.5**

	Domain 1						**Domain 2**				**Domain 3**				**Domain 4**									
Pain	*Item 1*	*Item 2*	*Item 3*	*Item 4*	*Item 5*	***Total***	*Item 6*	*Item 7*	*Item 8*	***Total***	*Item 9*	*Item 10*	*Item 11*	***Total***	*Item 12*	*Item 13*	*Item 14*	*Item 15*	*Item 16*	*Item 17*	*Item 18*	*Item 19*	*Item 20*	***Total***
Researcher 1	3	2	2	3	3	13	4	3	4	11	1	3	1	5	3	4	2	1	1	1	2	3	3	20
Researcher 2	3	3	2	4	2	14	1	1	4	6	1	3	1	5	3	3	1	1	1	1	2	3	3	18
Researcher 3	3	2	1	3	2	11	1	1	4	6	1	3	1	5	3	4	1	1	1	1	1	4	3	19
Researcher 4	3	2	2	4	2	13	2	1	4	7	1	3	1	5	3	4	1	1	1	1	1	4	3	19
Total score per item	*12*	*9*	*7*	*14*	*9*	*51*	*8*	*6*	*16*	*30*	*4*	*12*	*4*	*20*	*12*	*15*	*5*	*4*	*4*	*4*	*6*	*14*	*12*	*76*
Total domain score (%)						**52**				**50**				**22**										***37***
Interrater reliability																								**k 0.8**

Supplementary data associated with this article can also be found, in the online version, at https://doi.org/10.1016/j.healthpol.2018.05. 015.

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Part II

Chapter 5

A nationwide survey of patient problem occurrence across different nursing healthcare sectors

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Abstract

Aim

The aim of this study was to determine the patient problems that nurses encounter in different clinical settings and the extent to which they report being able to influence those patient problems.

Design

Exploratory online survey research.

Method

Data were collected through an online questionnaire. We prepared a 2 × 2 matrix to compare the rate of occurrence against the average level of reported influence. Descriptive statistics were used for the data analysis.

Results

A total of 440 nurses working in different settings completed the questionnaire. Nurses report having the most influence on patient problems related to selfcare, mobility and functions of the skin. Nurses experience less influence on problems with voice/speech and the tasks required for participation in work/employment.

Introduction

Nurses provide care to people of all ages in various healthcare settings such as hospitals, residential care, general practices, primary care, psychiatric health care and care for the disabled. Nurses with various levels of education work together in collaboration with other healthcare professionals [1]. The focus of nursing care can differ between clinical settings. For instance, psychiatric health nurses take care of patients with mental and emotional disorders (eg, depression, schizophrenia) and focus on coping and adjustment of anxiety or mood problems [2]. Hospital nursing care might be more concentrated on patients with physical diseases, such as heart failure or cancer and nursing care could be focused on the coping and adjustment of pain, dyspnoea or nausea [3]. Although the focus of nursing care can differ between clinical settings, the problems or health issues that patients experience are not restricted to one specific setting. For instance, a patient with severe mobility problems has an increased risk of developing pressure ulcers, regardless of the healthcare setting where the patient resides. From the patient's perspective, it is important that nursing care can be continued and that nursing information is uptodate, accurate and not contradictory. From the perspective of nurses, it is important to have an actual record of the nursing care process that a patient has gone through and which can follow the patient after transfer to another setting.

The information nurses gather, share and exchange should therefore be used or reused when a patient is transferred from one setting to another. However, a retrospective patient record review showed variation in what nurses write in patient records in Dutch hospitals. Patient problem labels (N = 1635) with variances in descriptions were ascertained in 369 nursing records [4]. Similarly, other studies on the transfer of information also found a wide variability of information in the nursing records [5,6]. The variation and variability hampers the exchange and reuse of data within and across settings [7-9]. It is therefore essential to have a clear view of patient problems that commonly occur in clinical nursing practice across different healthcare settings.

Background

Patient problems form the basis for a nursing care plan where nurses make clinical decisions in agreement with the patient and/or their close relatives, coordinate care, set goals and monitor care results [10]. Throughout this paper, the term “patient problem” will be used as a synonym for a nursing diagnosis, health or healthrelated issues, phenomena or problems. One essential aspect of identifying a patient problem is that nurses can plan interventions and actions to help the patient to achieve positive results [11]. For example, when an area of skin is placed under pressure, with appropriate interventions nurses can prevent that pressure ulcer emerges. In general, the scope of nursing care is focused on patient problems arising from an illness, disorder or disability and contributes to maintaining or restoring health, the ability to function and quality of life. The illness itself is not necessarily the focal point; rather, that is how the patient functions. This is viewed as an interaction between the illness or disorder on the one hand and, on the other, the ability to function and participate in a social context [12]. Patient problems defined by nurses should therefore reflect and capture this scope.

On the other hand, there is a different perception about the inclusion of patient problems related to nursing practice. For instance, the classification of nursing diagnosis as developed by Nanda International included a nursing diagnosis of “feeding selfcare deficit” [13], which is not included as a problem by the Omaha System classification [14]. Besides, nurses also describe patient problems in their own words [4], leading towards a diversity of patient problems and definitions. It could be argued that nurses do not have access to consistent and coherent nursing information, including patient problems. To determine which patient problems reflect and capture the scope of the nursing clinical practice, identifying the occurrence of relevant patient problems is a necessary first step [15].

The aim of this research was to gain more insights into the occurrence of patient problems in the Dutch clinical nursing practice. In the Netherlands, running a query to identify which patient problems occur in nursing practice is difficult, because nursing care is mostly reported by hand in patient records (as narrative text). We therefore conducted a survey study among Dutch nurses across different healthcare settings to determine what patient problems they encounter. We also examined the extent to which they report being able to influence (prevent or minimise) patient problems. The extent of the influence that nurses experience in preventing or minimising patient problems may give an insight into which patient problems are relevant to nursing care [16]. This present study has been set up to gain more insight in the type of patient

problems needs to be shared in the context of the clinical nursing practice across different healthcare setting and populations.

Research questions

- Which categories of patient problems do nurses encounter in clinical practice most frequently?
- Which specific patient problems do nurses encounter daily?
- What level of influence do nurses report having in preventing or minimising patient problems that occur daily?

Method

Research design

Exploratory online survey research.

Sample and recruitment process

For this study, 838 registered nurses were approached who had expressed willingness to complete online questionnaires. These nurses were participants in a pre-existing survey panel, the Nursing Staff Panel (http://www.nivel.nl/panelvenv). The Nursing Staff Panel was recruited through a previous survey among a representative random sample of Dutch healthcare employees working in the largest healthcare sectors in the Netherlands (ie, hospitals, mental health care, general medical practice, home care, healthcare for the disabled and residential care for the elderly) and who were known and had been approached by the Dutch Employee Insurance Agency (UWV). This agency is responsible for social security payments and records all employees in the Dutch healthcare sector. Only nursing staff providing direct patient care was invited to become participants of the Nursing Staff Panel. This procedure encouraged a diverse and representative composition for the panel in terms of age, gender, region and employer [17,18].

Developing the online questionnaire

As the aim of this study was to gain more insight into the occurrence of patient problems across different healthcare sectors, a questionnaire was set up (Fig. 1). The questionnaire was based on the theoretical framework of the International Classification of Functioning, Disability and Health (ICF), because of its conceptualization of health and healthrelated functioning [19]. Nurses examine the relationships between disorders, limitations in activity and functioning and care for patients in different healthcare contexts [20,21]. The ICF approaches human functioning from three perspectives: the body, the individual and the social aspects [19]. The human organism is classified into organ systems, identified as the “body functions and structure” component. The second and third perspectives are addressed using the “activity and participation” component. Both components, “body functions and structure” and “activity and participation”, are divided into 17 categories. These categories are in turn subdivided into subcategories with terms and descriptions. A category can include several subcategories. To address all aspects of patient problems from the different healthcare contexts, the patient problems were systematically organised by using the sorting of the ICF checklist [22]. The researcher checked if the

categories could be connected to nursing practice and added a subcategory if necessary. Each category and subcategory was defined. The ICF definitions were literally incorporated into the online questionnaire (http://apps.who.int/classifications/icfbrowser/). The final categories and subcategories are shown in Appendix 1.

The Questionnaire

For Question 1, the respondent was shown the 17 categories and asked to state the number of days during the preceding period of five working days on which they encountered patient problems (see Fig. 1, Question 1). An explanation accompanying the question stated that it was irrelevant whether the problem occurred repeatedly with the same patient or with various patients.

Figure 1. The online questionnaire

Question 1: Please consider your last five working days and indicate on how many days you encountered patient problems within a category.
Each category was defined (the ICF definitions were literally used).

ICF categories	Every working day	3 or 4 working days	1 or 2 working days	None
1. Mental functions				
2. Sensory functions and pain				
3. Voice and speech functions				
4. Functions of the cardiovasculair, haematological, immunological and respiratory systems				
5. Functions of the digestive, metabolic and endocrine systems				
6. Genitourinary and reproductive functions				
7. Movement-related functions				
8. Functions of the skin and related structures				
9. Learning and applying knowledge				
10. General tasks and demands				
11. Communication				
12. Mobility				
13. Self-car				
14. Domestic life				
15. Interpersonal interactions and relationship				
16. Major life areas				
17. Community, social and civic life				

Question 2: Please indicate the category that you encounter most frequently in your daily nursing activities
Each category was specified in subcategories of patient problems (based on the ICF checklist).

Question 3: Please indicate which specific problems you encounter every working day
Each patient problem was defined (the ICF definitions were literally used)

Question 4: Please indicate how much influence you experience on preventing or minimizing these problems: none, a bit, moderate, quite a lot, a great deal
Each category was specified in subcategories of patient problems (based on the ICF checklist).
Each patient problem was defined (the ICF definitions were literally used).

Categories marked by respondents as “every working day” were counted automatically by the survey software. If a respondent gave this answer in more than seven categories, they were asked a supplementary question (Question 2). All respondents were subsequently shown the categories they had indicated (up to a maximum of seven) and asked to state which specific problems they encounter every working day (Question 3). An explanation accompanying the question, where each patient problem was defined in accordance with the definitions of the Dutch translation of the ICF [19]. The respondents were next asked to indicate how much influence they have in preventing or minimising problems (Fig. 1, Question 4), with five possible answers: “none” (score 1), “a bit” (score 2), “moderate” (score 3), “quite a lot” (score 4) and “a great deal” (score 5).

To test the content validity of the draft questionnaire, a researcher (RK) approached seven experts (known by the researcher). The experts had a background in nursing and were familiar with the ICF. The experts had no suggestions. Fifteen professionals with backgrounds in nursing tested the face validity of the questionnaire. The professionals were recruited by the board members of the departments of the Dutch Nurses’ Association (http://www.venvn.nl/Afdelingen). The professionals recruited were approached by email. Their comments concerned textual adjustments, which were literally incorporated into the drafted questionnaire.

Data collection

Subsequent to the test phase, an e-mail containing a hyperlink to the questionnaire was sent to 838 nurses. These nurses were participants in the Nursing Staff Panel (http://www.nivel.nl/panelvenv). The e-mail explained the objective and importance of the research. The respondents could complete the questionnaire anonymously. Nurses who had not yet done so were sent a maximum of three e-mail reminders at intervals of 2 weeks.

Ethical considerations

All respondents received a letter explaining the objective of the study and stating that participation was voluntary. Further ethical approval of this study was not required under the legislation (www.ccmo.nl/en/) applicable in the Netherlands, as all respondents were competent individuals and this study did not involve any interventions or treatments.

Data analysis

The data collected were exported to SPSS (versions 18 and 21). The frequencies of specific categories were arranged according to rate of occurrence and collated in a table. Next, the frequencies of the patient problems in each specific category were computed and sorted in descending order from most to least. Two groups were created by using the median to identify the 50% most frequently occurring and 50% least frequently occurring patient problems. The median frequency was 65.5 with a minimum of 4 and a maximum of 185. Similarly, we used the median to form two groups of level of influence: “high level” and a “low level” of perceived influence. The median level was 2.96 with a minimum of 1.83 and a maximum of 3.68. A 2 × 2 table was then used to combine the frequency of occurrence with the level of reported influence. This created four quadrants: (i) frequently occurring/high level of influence experienced, (ii) frequently occurring/low level of influence experienced less frequently occurring/high level of influence experienced and (iv) less frequently occurring/low level of influence experienced. The four quadrants provide a framework by which patient problems and the level of reported influence can be explored and analysed further.

Results

In February and March 2014, 440 of the nurses approached completed the questionnaire (response rate of 52.5%). Of these, 377 (86%) were female (see Table 1). The average age of the respondents was 49 (standard deviation, or SD 10.2). The majority have a Bachelor's degree in nursing (53%), while 35% have an Associate degree and 2% a Master's degree. The largest group are those employed at hospitals (35%), followed by psychiatric healthcare (17%), general medical practice (16%), primary care (15%), health care for the disabled (11%) and residential care for the elderly (6%).

Table 1. Demographics (N = 440)

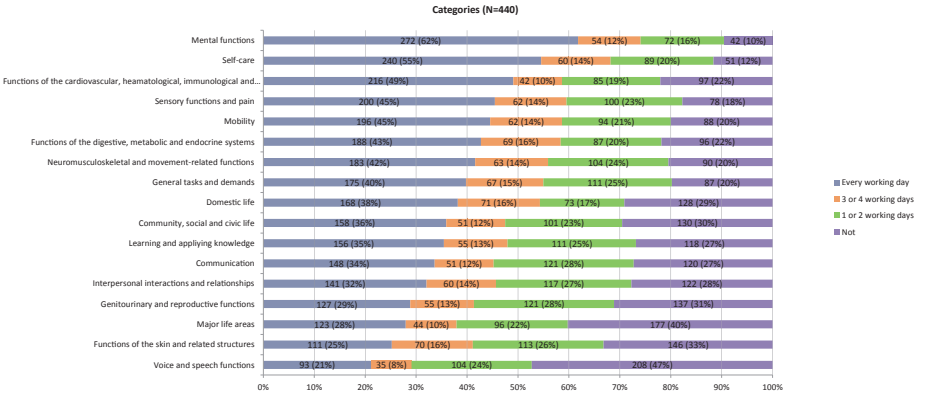
Demographics	Mean (%) SD	
Gender		
Female	377	(86%)
Male	63	(14%)
Age	49	(2464) SD 10,2
Education level		
Nurses with an Associate degree	156	(35%)
Nurses with a Bachelor's degree	233	(53%)
Nurses with a Master's degree	10	(2%)
Unknown	41	(9%)
Health care sector		
Hospital care	155	(35%)
Psychiatric health care	73	(17%)
General medical practice	72	(16%)
Primary care	65	(15%)
Disability health care	48	(11%)
Residential elderly care	27	(6%)
Work experience in years, mean (range)	24	(1–46) SD 10,6
Working hours per week, mean (range)	28	(5–40) SD 6,9

Most commonly occurring categories of patient problems

A total of 88% of respondents reported encountering one or more categories of patient problems "every working day". Figure 2 shows that 62% of respondents encounter patient problems in the category "mental functions" on a daily basis, followed by the categories "self-care" (55%) and "functions of the cardiovascular, haematological, immunological and respiratory systems" (49%). The least reported categories were

"voice and speech functions" (21%), "functions of the skin and related structures" (25%) and "major life areas" (28%).

Figure 2. Categories of patient problems in the health care sector as a whole



Specific patient problems and the level of influence reported

Table 2 displays the results according to the rate of occurrence and the average reported level of influence. The "Cat." column indicates the category containing the specific patient problem. Column "n" states the number, that is, how often a patient problem was encountered on a daily basis. The "Mean i" column gives the average level of influence that respondents reported.

Table 2. Patient problems compared to level of reported influence

Quadrant 1				Quadrant 2			
Frequently occurring/high level of influence experienced				Frequently occurring/low level of influence experienced			
Cat		**n**	**Mean I**	**Cat**		**n**	**Mean I**
5	Defecation	87	3.64	**15**	Complex interpersonal interactions. such as	81	2.96
					forming or terminating relationships		
13	Washing oneself	185	3.64	**7**	Functions of the joints and bones	120	2.95
13	Dressing	164	3.64	**4**	Heart functions. including heart rate. rhythm	130	2.94
13	Toileting	151	3.61	**1**	Energy and drive functions	76	2.92
2	Pain and sensation of pain	107	3.54	**1**	Attention	147	2.91
13	Caring for body parts	165	3.54	**1**	Temperament and personality functions	113	2.90
13	Eating and drinking	97	3.51	**1**	Orientation	137	2.88
5	Water. mineral and electrolyte	81	3.50	**1**	Perceptual functions	69	2.86
	balance functions						
12	Changing and maintaining body	116	3.45	**4**	Blood vessel function	106	2.80
	position						
4	Blood pressure functions	131	3.44	**17**	Community life	77	2.80
4	Respiratory system	104	3.41	**1**	Experience of self and time functions	82	2.74
5	Weight maintenance	92	3.39	**1**	Thought functions	127	2.60
10	Carrying out daily routine	81	3.38	**7**	Muscle power functions	79	2.57
10	Undertaking a single or multiple	81	3.29	**1**	Memory	138	2.53
	tasks			**1**	Intellectual functions	114	2.25
13	Looking after one's health	164	3.28				
9	Solving problems	77	3.27	Quadrant 4			
12	Moving around using transportation	76	3.22	Less frequently occurring/low level of influence experienced			
1	Emotional functions	167	3.21				
10	Handling stress and other	89	3.18	**Cat**		**n**	**Mean I**

	psychological demands			**15**	Particular interpersonal interactions. such as	68	2.95
12	Carrying. moving and handling	79	3.18		relating with strangers. formal relationships.		
	objects				family and intimate relationships		
11	Communicating receiving	88	3.10	**11**	Conversation	61	2.93
12	Walking and moving	135	3.08	**5**	Endocrine gland functions	30	2.85
11	Communicating producing	74	3.07				
17	Recreation and leisure	72	3.06	**6**	Sensations associated with urinary functions	26	2.84
14	Household tasks	97	3.02				
15	Basic interpersonal interactions	82	3,00	**6**	Urinary excretory functions	42	2.80
1	Sleep	147	2.99	**9**	Sensory experiences	16	2.80
Quadrant 3				**6**	Urination functions	54	2.77
Less frequently occurring/high level of influence experienced				**1**	Consciousness	61	2.75
Cat		**n**	**Mean I**	**4**	Functions of the immunological system	41	2.62
8	Protective functions of the skin	44	3.68	**17**	Religion and spirituality	20	2.60
4	Sensations associated with cardiovascular and respiratory functions	52	3.50	**16**	Work and employment	38	2.58
5	Thermoregulatory functions	43	3.46	**6**	Sexual functions	9	2.56
6	Sensations associated with genital and reproductive functions	5	3.40	**7**	Sensations related to muscles and movement functions	63	2.56
8	Functions of the hair and nails	14	3.38	**16**	Education	24	2.55
8	Repair functions of the skin	28	3.33	**14**	Acquiring a place to live	29	2.52
5	Ingestion functions	49	3.29	**16**	Economic life	43	2.49
5	Functions related to metabolism system	58	3.23	**2**	Hearing	60	2.44
11	Communication devices and techniques	13	3.18	**7**	Muscle endurance functions	21	2.42
5	Sensations associated with the digestive system. including nausea. feeling bloated etc.	56	3.16	**6**	Menstruation functions	5	2.40

8	Sensation related to the skin	23	3.14	**9**	Basic learning and applying knowledge	37	2.39
5	Digestive functions	28	3.04	**7**	Muscle tone functions	51	2.36
14	Shopping and gathering daily necessities	65	3.03	**2**	Taste. smell and touch function	43	2.30
4	Functions of the haematological system	58	3,00	**6**	Procreation functions	4	2.25
				7	Involuntary movement functions	31	2.20
				2	Seeing	45	2.17
				3	Voice function	20	1.95
				3	Fluency and rhythm of speech functions	18	1.94
				3	Articulation	31	1.83

Quadrant 1 (frequently occurring/high level of influence experienced) and quadrant 3 (less frequently occurring/high level of influence experienced) contain patient problems that respondents said they had a high level of influence over in terms of prevention or minimization. Problems related to the “functions of the skin and related structures” (category 8), “general tasks and demands” (category 10), “mobility” (category 12) and “selfcare”(category 13) are particularly striking. Nurses reported having a high level of influence over all the problems in these categories, irrespective of the rate of occurrence.

Quadrant 2 (frequently occurring/low level of influence experienced) and quadrant 4 (less frequently occurring/low level of influence experienced) contain patient problems that respondents said they had a low level of influence over. In this case, all the problems related to “voice and speech functions” (category 3), “neuromusculoskeletal and movement related functions” (category 7) and “major life areas” (category 16) are particularly striking. Irrespective of the rate of occurrence, respondents stated they had a low level of influence when it came to preventing or minimising problems in these categories. Nurses also experience a low level of influence over most of the problems in the category “mental functions” (category 1), except over problems with “emotional functions” and “sleep”. The latter two are included in quadrant 1 (frequently occurring/ high level of influence).

Discussion

Using an online survey, we collected information about patient problems in the clinical nursing practice across different healthcare settings and the level of influence nurses say they have in preventing or minimizing these problems. The first research question aimed to gain more insight into the occurrence of categories of patient problems. Our study showed that mental functions, self-care and the functions involved in the cardiovascular system, haematological, immunological systems and the respiratory system were frequently occurring categories. An interesting finding is that a category can have a high rate of occurrence, but nurses do not necessarily perceive any influence on all patient problems included in the specific category. For instance, the category "cardiovascular system, haematological, immunological systems and the respiratory system" was ranked as a frequently occurring. Looking at the specific patient problems included, nurses experienced a high level of influence on a less frequently occurring patient problem related to "sensations associated with cardiovascular and respiratory functions" (quadrant 3) in contrast to the patient problem "heart functions, including heart rate, rhythm" (quadrant 2: frequently occurring/low level of influence).

When we consider the "high level of influence" more closely, we found that nurses feel they are in a position to influence a considerable number of patient problems (quadrants 1 and 3); related to washing, dressing, eating/drinking, pain, respiratory functions and handling stress. When reviewing the results, we found that our findings are broadly consistent with several studies. Doran's extended analysis of the evidence to include nursing outcomes in acute, community, home and longterm healthcare settings [23] confirmed that patient problems related to pain, symptom management (including fatigue, nausea and vomiting), dyspnoea and adverse patient outcomes (including pressure ulcers) can be affected by nursing care. Also, functional status (containing washing and drying yourself, dressing, toileting, eating, household activities and getting from bed to chair) as well as psychological distress are seen as nursing-sensitive, along with emotional functioning, handling stress and sleeping problems. Escalada-Hernández et al. [24] performed a retrospective study that identified the nursing diagnoses of 690 patients with psychiatric illnesses. They found that common nursing diagnoses related to self-care deficits, including bathing, dressing, feeding, ineffective health management. The study by Paans & Müller-Staub [4] conducted in ten hospitals found the most prevalent patient problems to be acute pain, nausea, fatigue, feeding and risk of impaired skin integrity.

When we consider the "low level of influence" more closely, we found that nurses

feel they have a low level of influence (quadrant 2 and 4) on several patient problems, eg, patient problems with attention, perception, memory, thought, orientation or problems associated with hearing, speaking, voice, urination, religion, work/economic life. In reviewing the results, we found that both the study by MacNeela et al. [2] on the scope of mental health nurses and the study by Escalada-Hernández et al. [24] found prevalent patient problems related to thought, cognition and perception.

There are several possible explanations for the fact that nurses experience low influences on these patient problems. It may be that nurses simply have low influence on the prevention or minimisation of those types of problems. It could be argued that nurses collaborate with other professionals who are more influential due to their knowledge and competence. On the other hand it is conceivable that nurses are not choosing the correct interventions because they lack the experience or knowledge required to tackle those patient problems. Another explanation is that the patient problems reported are sectorspecific and as such occur more often in a particular sector. Further research should be undertaken to explore why nurses feel this way.

Although the focus of nursing care might differ between clinical settings, our study provides more insights into which patient problems are relevant to clinical nursing practice across different healthcare settings. The problems or health issues that patients experience are not restricted to one specific setting. When a patient with a problem related to attention or memory functions is being transferred from one care setting to another, it is important to exchange the right information to continue appropriate nursing care.

A salient point in this respect is that we are looking at the influence nurses feel they have, not their actual influence. While we have no reason to assume that there is a significant difference between the two notions, we have noticed that the above-mentioned studies investigating patient problems used different vocabularies and classifications. Not only are different terms applied, but the level of detail differs from very specific to more general as well. Moreover, different terms and definitions will lead to inconsistency in outcomes, which will be ineffective in terms of influencing health policy [25-27].

The development of unambiguously defined nursing patient problems is an important issue for future research. To ensure that information will be transferred accurately from one healthcare context to another, nurses need to establish a standardised core set of patient problems [28], where each patient problem should have a unique term

representing its meaning. Although nurses do not perceive a significant influence on the development of relevant nursing information [29], they should explore whether a consensus can be reached regarding the various patient problems.

Research strengths and limitations

One positive aspect of this research is that the respondents represent the entire nursing profession – all healthcare sectors are included. A response rate of 52% is acceptable compared with a mean response rate for online surveys of 36.83% [30]. However, there are limitations to this study. First, nurses in the hospital sector are the largest group of respondents. Second, the mean age of the nurses who participated in our study (49) is higher than the national mean age of nurses working in the healthcare sectors (43) (www.azwinfo. nl; 2014). In addition, 377 respondents (86%) were female, which is somewhat higher than the national proportion of 84% (www.azwinfo. nl). This may affect the extent to which the results can be generalized; the results of our study are however consistent with those of the studies mentioned previously [2,4,23,24]. We have therefore gained more understanding about patient problems that are common in nursing practice and the content underlying them.

Finally, we used medians to create the quadrants to ensure even distributions of the observations. The median for influence divided the problems into problems with less than a moderate level of influence and problems with at least a moderate level of influence. Despite the arbitrary nature of the dividing lines, we gained a better picture of which patient problems are relevant and useful to clinical nursing practice.

Conclusion

The purpose of the current study was to determine which patient problems nurses encounter daily and the nurses' perceived degree of influence in preventing and minimizing these patient problems. This study found in general that patient problems related to self-care, such as washing yourself, dressing, toileting and pain occur frequently and that nurses perceive a high level of influence. On the other hand, nurses felt they had less influence on patient problems related to voice/speech or the tasks and actions required to participate in work/ employment. The findings of this study enhance our understanding of the patient problems that reflect clinical nursing practice and complement those of earlier studies investigating patient problems. Despite its exploratory nature, the patient problems identified could be used as the foundation for establishing a standardized core set of patient problems to exchange and reuse

information within and across different healthcare settings. Overall, this research has increased our knowledge of and insight into patient problems that encapsulate the scope of nursing care.

Implications for nursing practice

This research has revealed an overview of patient problems that encapsulate nursing practice. This finding has important implications for research to find a semantically consistent way of defining patient problems, as is required to exchange or reuse information within and across settings. Besides, nurses and nursing informatics should take the lead in exploring how various patient problems can be described and reported in a consistent manner (unambiguously). Only then will nurses be able to communicate, study the effectiveness of their actions and their contribution to the quality of care provided. Finally, nursing management and policymakers should address the findings of this study. It may provide support for developing and implementing policy to improve the consistency of nursing information capturing nursing practice in electronic health records.

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Conflicts of interest

No conflict of interest has been declared by the authors.

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Appendix 1. Overview of ICF categories and subcategories used in the questionnaire. The definitions are online available at: http://www. who.int/classifications/icf/icfchecklist.pdf?ua=1

Category	(Problem with) Subcategory	
b1.	**MENTAL FUNCTIONS**	
1	b110	Consciousness
1	b114	Orientation
1	b117	Intellectual functions
1	b134	Sleep
1	b126	Temperament and personality functions
1	b130	Energy and drive functions
1	b140	Attention functions
1	b144	Memory
1	b152	Emotional functions
1	b156	Perceptual functions
1	b160	Thought functions
1	b180	Experience of self and time functions
b2.	**SENSORY FUNCTIONS AND PAIN**	
2	b210	Seeing
2	b230	Hearing
2	b250	Taste function
2	b280	Pain and sensation of pain
b3.	**VOICE AND SPEECH FUNCTIONS**	
3	b310	Voice function
3	b320	Articulation
3	b330	Fluency and rhythm of speech functions
b4.	**FUNCTIONS OF THE CARDIOVASCULAR, HAEMATOLOGICAL,IMMUNOLOGICAL AND RESPIRATORY SYSTEMS**	
4	b410	Heart functions, including heart rate, rhythm
4	b415	Blood vessel function
4	b420	Blood pressure functions
4	b430	Functions of the haematological system
4	b435	Functions of the immunological system
4	b440	Respiratory system
4	b460	Sensations associated with cardiovascular functions
b5.	**FUNCTIONS OF THE DIGESTIVE, METABOLIC AND ENDOCRINE SYSTEMS**	
5	b510	Ingestion functions
5	b515	Digestive functions
5	b525	Defecation
5	b530	Weight maintenance

5	b535	Sensations associated with the digestive system
5	b540	Functions related to metabolism system
5	b545	Water, mineral and electrolyte balance functions
5	b550	Thermoregulatory functions
5	b555	Endocrine gland functions
b6.	**GENITOURINARY AND REPRODUCTIVE FUNCTIONS**	
6	b610	Urinary excretory functions
6	b620	Urination functions
6	b630	Sensations associated with urinary functions
6	b640	Sexual functions
6	b650	Menstruation functions
6	b660	Procreation functions
6	b670	Sensations associated with genital and reproductive functions
b7.	**NEUROMUSCULOSKELETAL AND MOVEMENT RELATED FUNCTIONS**	
7	b710	Functions of the joints and bones
7	b730	Muscle power functions
7	b735	Muscle tone functions
7	b740	Muscle endurance functions
7	b765	Involuntary movement functions
7	b780	Sensations related to muscles and movement functions
b8.	**FUNCTIONS OF THE SKIN AND RELATED STRUCTURESANY OTHER BODY FUNCTIONS**	
8	b810	Protective functions of the skin
8	b820	Repair functions of the skin
8	b840	Sensation related to the skin
8	b850860	Functions of the hair and nails
d1.	**LEARNING AND APPLYING KNOWLEDGE**	
9	d110	Sensory experiences
9	d130d160	Basic learning and applying knowledge
9	d175	Solving problems
d2.	**GENERAL TASKS AND DEMANDS**	
10	d210d220 Undertaking a single or multiple tasks	
10	d230	Carrying out daily routine
10	d240	Handling stress and other psychological demands
d3.	**COMMUNICATION**	
11	d310d325	Communicating receiving
11	d330345	Communicating producing
11	d350	Conversation
11	d360	Communication devices and techniques
d4.	**MOBILITY**	

12	d410d425	Changing and maintaining body position
12	d430d445	Carrying, moving and handling objects
12	d450d465	Walking and moving
12	d470d475	Moving around using transportation
d5.	**SELF CARE**	
13	d510	Washing oneself
13	d520	Caring for body parts
13	d530	Toileting
13	d540	Dressing
13	d550d560	Eating and drinking
13	d570	Looking after one's health
d6.	**DOMESTIC LIFE**	
14	d610	Acquiring a place to live
14	d620	Shopping and gathering daily necessities
14	d630d640	Household tasks
d7.	**INTERPERSONAL INTERACTIONS AND RELATIONSHIPS**	
15	d710	Basic interpersonal interactions
15	d720	Complex interpersonal interactions, such as forming or terminating relationships
15	d730d770	Particular interpersonal interactions, such as relating with strangers, formal relationships, family and intimate relationships
d8.	**MAJOR LIFE AREAS**	
16	d810d830	Education
16	d840d855	Work and employment
16	d860d870	Economic life
d9.	**COMMUNITY, SOCIAL AND CIVIC LIFE**	
17	d910	Community life
17	d920	Recreation and leisure
17	d930	Religion and spirituality

Chapter 6

The development of a nursing subset of patient problems to support interoperability

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Abstract

Background

Since the emergence of electronic health records, nursing information is increasingly being recorded and stored digitally. Several studies have shown that a wide range of nursing information is not interoperable and cannot be re-used in different health contexts. Difficulties arise when nurses share information with others involved in the delivery of nursing care. The aim of this study is to develop a nursing subset of patient problems that are prevalent in nursing practice, based on the SNOMED CT terminology to assist in the exchange and comparability of nursing information.

Methods

Explorative qualitative focus groups were used to collect data. Mixed focus groups were defined. Additionally, a nursing researcher and a nursing expert with knowledge of terminologies and a terminologist participated in each focus group. The participants, who work in a range of practical contexts, discussed and reviewed patient problems from various perspectives.

Results

Sixty-seven participants divided over seven focus groups selected and defined 119 patient problems. Each patient problem could be documented and coded with a current status or an at-risk status. Sixty-six percent of the patient problems included are covered by the definitions established by the International Classification of Nursing Practice, the reference terminology for nursing practice. For the remainder, definitions from either an official national guideline or a classification were used. Each of the 119 patient problems has a unique SNOMED CT identifier.

Conclusions

To support the interoperability of nursing information, a national nursing subset of patient problems based on a terminology (SNOMED CT) has been developed. Using unambiguously defined patient problems is beneficial for clinical nursing practice, because nurses can then compare and exchange information from different settings. A key strength of this study is that nurses were extensively involved in the development process. Further research is required to link or associate nursing patient problems to concepts from a nursing classification with the same meaning.

Background

Since the emergence of the electronic health record, nursing data is being recorded and stored digitally. Nurses constantly collect and analyse data from all contacts with the patient, whatever the setting. Data such as a weight or blood pressure is objective and does not include further (clinical) interpretation on its own [1].

Data only becomes meaningful if it can be interpreted within a certain context. For instance, weight becomes relevant when a patient has lost a considerable amount of weight in a short time or when a patient is suspected to have anorexia. When data is placed within a context, it is defined as information [1].

Record-keeping is important, because this information is the basis of communication between nurses and patients and other professionals. It is also the basis for planning care, making decisions about interventions and evaluating the results [2]. In addition, the need to exchange or reuse information within and across different healthcare settings has been increasing over recent years. Patients are hospitalised for shorter durations; their recovery is shifting from hospital to an ambulatory care setting, primary care or home care.

In order to share and exchange information without risk of misinterpretation, nursing data needs to be unambiguous. There is a growing body of literature that recognises the importance of this issue. The studies by Park and Cho [3], Westra et al., [4], and Randorff Højen and Rosenbeck Gøeg [5] emphasise that the words i.e. terms and meaning that nurses need for record-keeping should be defined consistently using terminology that facilitates reuse. However, several studies looking at nursing documentation have shown that a great variety of terms are used across and within different healthcare settings: locally preferred terms [3] as well as multiple terminologies or classifications (such as the international classification of functioning and disabilities (ICF) [6], Omaha System [7] or the classification for nursing diagnosis (from NANDA International; NANDA-I); interventions (the Nursing Intervention Classification; NIC) and nursing outcome (Nursing Outcome Classification; NOC) (NNN) [8]).

This also applies to the Netherlands, where healthcare organisations are currently shifting from a paper-based to an electronic health record system. According to the national eHealth monitor among nurses, 84% of hospital-based nurses record their nursing data digitally, in contrast to only 40% of nurses working in home and primary healthcare organisations, who in some cases record data both digitally and on paper

[9]. Both locally preferred terms and different classifications (e.g. the Omaha System, Nanda-I diagnosis or ICF) are integrated in the electronic health record but without consistency across different nursing settings. Difficulties arise when nurses share and exchange information with others involved in the delivery and continuity of nursing care; this is also known as the interoperability issue [10–12].

In the last decades of the twentieth century, the diversity in nursing information was already discussed by Dutch researchers and work has been undertaken to investigate the need for one standardised nursing language [13–15] or to collect standardised nursing data to analyse and compare nursing data across populations, settings, geographical areas and time [16]. Despite these efforts, there is still a diversity of nursing information, impeding the exchange and reuse of nursing information within and between healthcare sectors [17].

Currently, the Ministry of Health, Welfare and Sport, stakeholders (e.g. the national competence centre for standardisation and eHealth (Nictiz), the Netherlands Federation of University Medical Centres and the Dutch Hospital Association) and professional organisations (e.g. the Dutch Nurses' Association, hereinafter referred to as the collaborating parties), collaborate to develop, construct and maintain unambiguous data for professionals involved in patient care, including nurses [18–21]. This means that nursing and other professionals should transform various (nursing) data using different coding systems into a single common format to allow comparison and exchange of data. One key aspect in the development is one standardised language for all professionals.

The preferred terminology for professionals in the Netherlands and many other countries (e.g. United States, United Kingdom, etc.) involved in patient care is SNOMED CT. This terminology contains more than 300,000 concepts. Each concept encapsulates a clinical thought or idea, for instance a patient problem [22]. A concept has one or more terms that must unambiguously represent the meaning of the concept, such as 'pressure ulcer'. A concept can have corresponding synonyms allowing local preferences or dialects (e.g. pressure sore or contact ulcer) or to express terms in different languages (e.g. the Dutch term decubitus or the Spanish term úlcera por decúbito). The concept has the same covering details consisting of a single unique code or identifier 399,912,005, allowing professionals to exchange and reuse information [23] (http://browser.ihtsdotools.org).

Because a terminology can contain an enormous number of concepts, subsets are

developed to ensure appropriate use in daily practice. Subsets consist of specific concepts selected from the core set representing a particular context, for instance patient problems in nursing practice [24].

Subsets focused on patient problems, also called subsets of patient problems or catalogues, have been discussed in several studies [25–27]. These studies pointed out the importance of the clinical domain being covered. Using a pre-existing national survey panel (Nursing Staff Panel; see http://www.nivel.nl/panelvenv), Dutch clinical nurses were asked to indicate which patient problems they most frequently encountered in daily practice, as well as the influence nurses said they had on these problems [28]. This resulted in an overview of patient problems reflecting Dutch clinical nursing practice domain across healthcare settings (version 0.1) as shown in Additional file 1: Overview of patient problems (level of occurrence compared to level of reported influence). Nevertheless, these patient problems and their meanings need to be specified in detail to enable consistent and accurate use by nurses in clinical practice.

The aim of this study is to develop a national nursing subset of patient problems based on the SNOMED CT terminology to assist interoperability, using the overview of patient problems mentioned earlier as a framework.

This developed subset of patient problems will benefit standardisation and consistent use of nursing information in electronic health records, and improve communication between nurses and other professionals within and across different healthcare settings.

Research question

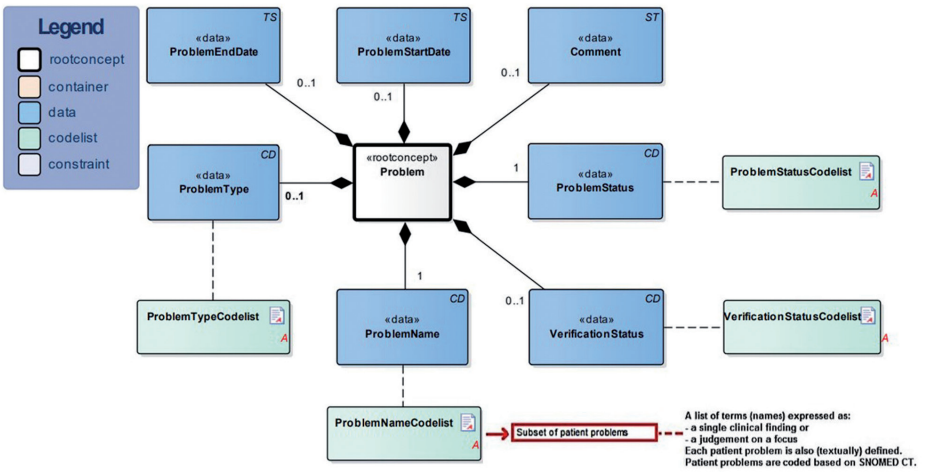
Which SNOMED CT concepts cover patient problems frequently encountered in Dutch nursing practice?

Conceptual framework

The construction of unambiguous (nursing) data has been based on an information model also known as a detailed clinical model or a clinical building block [29] and is established by the collaborating parties [30]. A single clinical building block describes a certain clinical concept and the characteristics thereof that should (required data items) or could (optional data items) be recorded and in what way (e.g. physical quantities or predetermined coded values). One such clinical building block describes patient problems (i.e. diagnosis, Fig. 1) including the required data item “problem name”. This

data item defines the problem based on a predetermined code list: in the context of nursing practice, it can refer to the nursing subset of patient problems developed in this study. More detailed information about clinical building blocks can be found on: https://zibs.nl/wiki/ HCIM_Mainpage.

Figure 1. Clinical building block for patient problems (diagnosis) version 3.0 (01–05-2016)



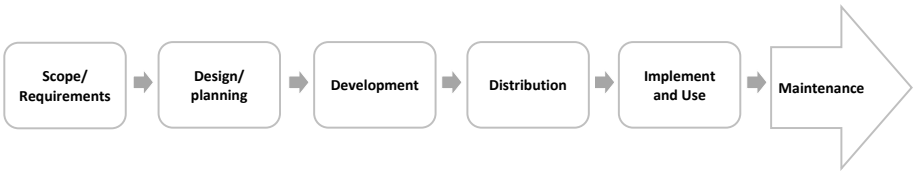
The nursing patient problems are constructed in line with the ISO 18104 standard. This standard is established by the International Organisation for Standardisation Technical Committee (ISO/TC) and describes a set of shared characteristics for constructing nursing diagnoses (e.g. clinical finding, focus, judgement) [31]. It means that each nursing patient problem can be expressed as a single clinical finding (e.g. anxiety, pain) or as a judgement on a particular focus (e.g. walking disability). A judgement is an opinion or finding related to a focus (e.g. disability, ineffective). A focus is an area of attention (e.g. walking). Patient problems are coded based on SNOMED CT.

Clinical building blocks for patient problems let healthcare professionals, including nursing professionals, describe and report their practice in a consistent manner and develop a single unified language [29]. For instance, medical specialists have developed a diagnosis thesaurus, a list of medical diagnoses based on the structure of the clinical building block and SNOMED CT [32]. For this study, a list of patient problems for nursing practice was developed based on the same SNOMED CT principles.

Methods

Various studies have described methods for the development of terminological subsets [25, 27, 33–35]. Most of the studies referred to and used a process model (or aspects of one), meaning that a process from creation through to maintenance was described. The conclusion can be drawn that a process model seems to be promising as a method for developing a nursing subset. However, there also seems to be a lack of uniformity in the stages, approaches and techniques, so the process models have not yet been fully explored and are still evolving [36]. In this study we used the process model for the development and maintenance of subsets as part of the International Release of SNOMED CT as described by the IHTSDO [37] and the Dutch instruction 'making a SNOMED CT subset' derived from it and set up by Nictiz [38], which involved the following six stages: 1) Scope/Requirements; 2) Design/Planning; 3) Development; 4) Distribution 5) Implement and Use; 6) Maintenance. Figure 2 gives an overview of the stages. Each stage will be explained in the next paragraphs.

Figure 2. The process model from creation through to maintenance for SNOMED CT subsets (source IHTSDO [37])



Stage 1: Scope/requirements

In this stage, we defined the purpose of the subset and relevant requirements, such as the scope of content and the users. First an expert team was set up, consisting of a researcher (RK) and a nursing expert (EV), both with extensive knowledge of the structure and content of SNOMED CT, and two representatives of Nictiz (acting as the Dutch SNOMED CT Release Centre): the Terminologies Coordinator (PV) and a terminologist (EG).

The expert team identified the scope, which was to develop a national nursing subset of patient problems based on the SNOMED CT terminology to assist interoperability. The users of the subset were defined as clinical nurses working in various healthcare settings. Other existing subsets were then explored to evaluate whether they met the

requirements. To our knowledge, two national SNOMED CT nursing subsets of patient problems have been developed, namely a United States (US) [25] and a Danish [26] nursing subset. Denmark developed a national homecare nursing subset of 80 concepts (not available online yet) building upon the US nursing subset [26]. Patient problems from the US nursing subset were retrieved from the 'Unified Medical Language System' (UMLS) Metathesaurus database, developed by the National Library of Medicine (NLM) [25]. The database contains concepts from various different classifications and terminologies. Queries were performed by the UMLS to collect patient problems from SNOMED CT and four nursing classification systems (the Omaha System, NANDA International, the Home Healthcare Classification (HHC) and the ICNP). The patient problems included were reviewed manually and discussed, resulting in 369 nursing problem concepts (https:// www.nlm.nih.gov/research/umls/Snomed/nursing_problemlist_subset.html).

Although this subset could be useful for building on, we decided to develop a new subset. The main reason for this decision was the findings of a previous study, 'A nationwide survey of patient problem occurrence across different nursing healthcare sectors', in which Dutch clinical nurses were asked to indicate which patient problems they encountered most frequently in daily practice, as well as the influence nurses said they had on these problems [28]. This resulted in an overview of patient problems (version 0.1) reflecting the Dutch clinical nursing practice across healthcare settings. Using this overview as a framework we could specify the patient problems as identified by nurses themselves. This approach differs from the US subset, which contains concepts from various different classifications and terminologies (regardless of their occurrence or the perceived level of influence).

Stage 2: Design/planning

In this stage, we defined the composition, the involvement of participants, sampling and recruitment process. Focus groups with nursing professionals were held to determine which SNOMED CT concepts cover the patient problems (version 0.1). In order to recruit participants, an invitation to participate in the focus groups was sent in a digital newsletter from the Dutch Nurses' Association (V&VN). This monthly newsletter was mailed to 70,000 members of the Dutch Nurses Association, giving information about the study as well as the registration process.

Sixty-seven nurses replied to the recruitment message in the newsletter and agreed to participate. We organised seven focus groups, using the following inclusion criteria:

- Employed as nursing professional.
- At least 2 years' experience as a nursing professional.
- Working in hospital care, residential care, psychiatric care, primary care or care for the mentally disabled.

Because the nurses were active in a variety of nursing practice contexts, patient problems could be discussed from different perspectives, which was necessary to determine whether the patient problems were comprehensive, unambiguous and acceptable in a broad nursing context. The expert team also took part in each focus group.

The focus group meetings lasted two and a half hours. The nursing expert (EV) led the meeting, explained the procedures, and introduced the method and the patient problems to be discussed. The terminologist (EG) identified and selected corresponding SNOMED CT concepts and ensured that the concepts were consistently and accurately applied in line with the SNOMED CT guidelines. The nursing researcher (RK) observed and monitored the process.

Stage 3: Development

There is a variety of approaches for developing subsets, such as developing a new reference set or adopting, copying and adapting an existing reference set [37, 38]. In this study, developing a new subset was deemed appropriate, firstly because the development could build upon the existing overview of the study mentioned earlier in which 440 Dutch nurses had already participated [28] and secondly because the involvement of nurses could be maintained in order to improve backing and approval of the final subset.

The development process was set up in four phases [38]: a) the selection of SNOMED CT concepts; b) review and translation process with focus groups; c) defining and modelling; d) validation of the subset. This setup was based on the Dutch Nictiz instruction 'Making a subset' [38].

a) Selection of SNOMED CT concepts
The first phase comprised selection of SNOMED CT concepts by the expert team. The overview of patient problems (version 0.1) acted as a framework (Additional file 1). The patient problems (version 0.1) contained both Dutch and English terms. The expert team then selected and identified a matching SNOMED CT concept (or the nearest

match) for each patient problem based on the term and definition in version 0.1. The concepts were selected from the core distribution of the International SNOMED CT Edition (January 2016 release) managed by SNOMED International and available online at http://browser.ihtsdo-tools.org/.

An example of the concept 'Pressure ulcer' from the core distribution of SNOMED CT is shown in Fig. 3. The concept has a unique numeric identifier (399912005) and equivalent synonyms (Contact ulcer, Pressure sore). Each concept is linked to a more general concept in the hierarchical structure, the so-called 'parent'. In the example of a 'Pressure ulcer', the parent is 'Chronic ulcer of the skin'. It is also possible to specify 'Pressure ulcer' in increasing detail. The specifications are referred to in the underlying hierarchy as 'children', for example 'Pressure ulcer stage 1 and stage 2' and so forth.

SNOMED CT concepts that were equivalent to concepts from the International Classification of Nursing Practice (ICNP) were preferred in order to ensure that the terms accurately represented the nursing domain. The ICNP is a formal terminology for nursing practice developed by the International Council of Nurses (ICN) [39]. SNOMED International and the ICN collaborated in order to harmonise both terminologies to increase interoperability and to encourage the use of terms as established by the ICNP [40]. SNOMED International and ICN developed an ICNP-to-SNOMED CT Equivalency Table for Diagnosis and Outcome Statements [41], meaning that each ICNP diagnosis included in the equivalency table has the same meaning as the SNOMED CT patient problems included (English edition, release version 20,160,131). The equivalency table was used to ensure that the SNOMED CT concepts matched consistently.

b) Review and translation process (with focus groups)
In the second phase, the patient problems plus matching pre-selected SNOMED CT concepts were reviewed and discussed. Each focus group discussed and reviewed an average of 12 patient problems. Both the patient problem from version 0.1 and the matching SNOMED CT concept were presented to the participants of each focus group. The SNOMED CT concepts were presented directly from the browser (see the example in Fig. 3) so that the hierarchy could be clarified by switching between different concepts and their parents or children if necessary.

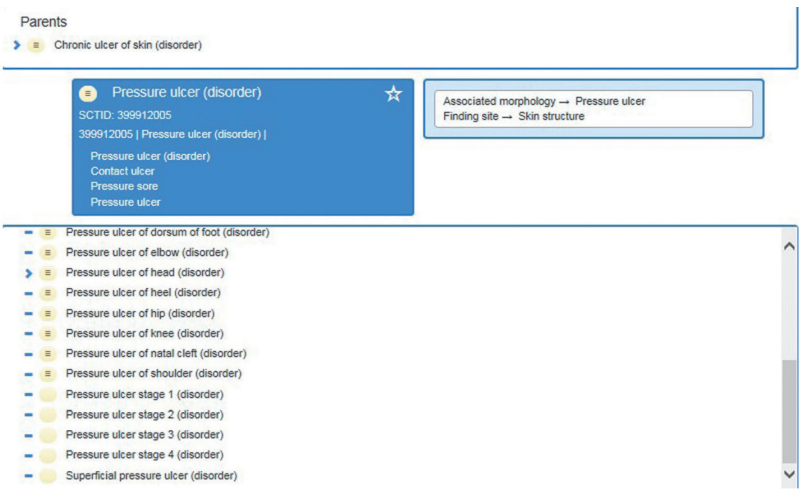
The participants discussed the preselected concepts using the following predefined questions:

– Is the term sufficiently comprehensive for electronic recording?

– Is the term unambiguous and understandable? Is the term professionally acceptable for nursing practice?

These questions were derived from the viewpoint of the Nursing Special Interest Group on the nursing contribution to quality assurance of SNOMED CT [42]. Nursing professionals participate in the Nursing Special Interest Group to advise IHTSDO on 'the development, validation, uptake and implementation of SNOMED CT and related products' [43] (p. 4).

Figure 3. Example of the concept 'Pressure ulcer' in the SNOMED CT hierarchy (English edition, release version 20,160,131)



Each concept had a SNOMED CT term derived from the English edition (release version 20,160,131). The terms were translated to Dutch following the SNOMED CT guidelines for translation [44]. The nursing professionals from the focus groups and the expert team were involved in the translation process. Nursing professionals confirmed that the preferred Dutch terms corresponded to the terms used in their daily activities and were clinically acceptable.

The SNOMED CT patient problems included in the equivalency table have the same meaning as the ICNP diagnosis. We were therefore able to validate the translation process by using the Dutch catalogue from the International Classification of Nursing Practice (ICNP) [45]. The ICNP beta version, including terms and definitions, was translated (working in both directions) into Dutch by the Dutch Nursing Union (Nu'91) in cooperation with the ICN.

Once a focus group reached a consensus about a concept, the terminologist coded the selected concept. If a focus group did not reach a consensus about a concept, it was

debated in another focus group until a consensus was obtained. If the groups found a concept to be either inconsistent or incomplete or if there were no appropriate concepts, requests for additions or changes to SNOMED CT or new concepts for it were submitted to the Dutch National Release Centre (Nictiz).

c) Defining and modelling
In the third phase, the expert team defined each SNOMED CT concept in Dutch (in SNOMED CT terms: 'textually defining'). The (textual) definitions provide additional information about the intended meaning or usage of each concept. To ensure that the meanings of nursing concepts were reflected accurately, national Dutch guidelines were examined and the definitions available in them were used where possible. If no definition was available, the definitions of nursing diagnosis as established by the International Classification of Nursing Practice (ICNP) were used; these were also described in the Dutch ICNP catalogue [45]. If no definition was available in the ICNP catalogue, the definition from another classification was used (for instance the International Classification of Functioning and Disability).

After each focus group, the expert team broke the selected SNOMED CT concepts down into two items, a name and a textual definition. A SNOMED CT concept could be expressed as a single clinical finding or as a judgement about a focus (as described in the "Conceptual framework"). The terminologist also ensured that the concepts were consistently applied and accurately coded in line with the SNOMED CT guidelines [46, 47].

The participants in each focus group were given an overview of the terms and (textual) definitions discussed in their meetings to review as a final check.

d) Validation of the subset

The final subset, consisting of SNOMED CT patient problems with corresponding terms and definitions (n = 119) and associated SNOMED CT codes, was presented to all participants (n = 67) to determine if nursing practice was consistently covered. All the participants also confirmed that the terms and definitions accurately reflected nursing practice and that the terms used were unambiguous and understandable.

The nursing subset of SNOMED CT patient problems was also presented to the SNOMED International Nursing Special Interest Group, who were asked to review it to ensure consistency.

Review of the subset needs to be maintained over time, both to review the subset against specified use cases and to accommodate changes to existing content or add new SNOMED CT content. Separate review projects are being set up, but were beyond the scope of this study.

The final subset was distributed in an electronic format and released online. Each patient problem includes a link to a common feedback form where nurses are encouraged to make recommendations or request revisions, additions or new concepts.

Stage 4: Distribution

Subsets can be distributed as part of the International Release, as part of a National Edition or as part of an Affiliate Edition [37]. For this study, it was decided that the subset will be distributed six-monthly as part of a National Edition, which is in line with the distribution frequency of the International Release. The standard format for distributing the SNOMED CT subset is a Simple Reference Set representing an extensional definition of a subset of components (more information about a simple reference set type can be found in the SNOMED International Practical Guide to Reference Sets [37].

Stage 5: Implement and use

When a subset has been developed, it should be implemented for use in nursing practice. Implementation means that the subset should be integrated into software systems. It is important to support the implementation with guidance during implementation. Additionally, collaboration with users and vendors is necessary in order to test the intended use and its effectiveness. The implementation in software systems and use in practice were not included in the scope of this study and will be followed up with another study.

Stage 6: Maintenance

This stage consisted of establishing a management and maintenance structure, including change management and the revision cycle. The management and maintenance structure was set up in line with NEN 7522:2010 nl 'Maintenance of coding systems and other terminological systems', which is a standard defining roles and responsibilities of organisations and people involved in the development of terminological systems. It is applicable only to Dutch healthcare [48].

Results

Demographics

A total of 67 participants participated in seven focus groups in order to define comprehensive, unambiguous and acceptable patient problems. The majority of participants were female (n = 56; 84%), which is comparable to the national proportion of nurses who are female (84%) (https://www.azwinfo.nl/; 2014). The mean age of participants was 41 (standard deviation SD = 12.3) – see Table 1. Compared to the national population, it is lower than average (age 43) (https://www.azwinfo.nl/; 2015). The mean length of work experience is 17 years (SD = 11.5). Nurses from each healthcare sector were represented in each focus group (Table 1).

Table 1. Demographics of the participants and focus groups

FG	N	Gender n (%)		Age	Work experience	Healthcare sector n (%)				
				mean ± SD [range]	mean ± SD [range]					
		Male	Female			Hospital care	Residential Care	Psychiatric care	Primary care	Mentally disabled care
1	8	3 (37%)	5 (63%)	46 ± 12.5	25 ± 11.8	3 (38%)	0	2 (25%)	2 (25%)	1 (12%)
				[23–58]	[2–36]					
2	15	2 (13%)	13 (87%)	42 ± 14.1	18 ± 12.3	5 (33%)	3 (20%)	3 (20%)	1 (7%)	3 (20%)
				[23–60]	[2–38]					
3	8	0	8 (100%)	44 ± 11.6	17 ± 10.7	2 (25%)	1 (13%)	0	4 (50%)	1 (13%)
				[27–59]	[5–35]					
4	8	1 (13%)	7(87%)	41 ± 10.5	15 ± 9.3	2 (25%)	1 (13%)	1 (13%)	4 (50%)	0
				[25–57]	[2–33]					
5	8	2 (25%)	6 (75%)	39 ± 12.7	13 ± 10,1	5 (63%)	0	1 (13%)	2 (25%)	0
				[24–63]	[2–30]					
6	9	1(11%)	8 (89%)	34 ± 10.9	11 ± 10.5	4 (44%)	1 (11%)	3 (33%)	0	1 (11%)
				[24–57]	[2–34]					
7	11	2 (18%)	9 (82%)	39 ± 12.5	16 ± 12.1	4 (36%)	5 (46%)	1 (9%)	0	1 (9%)
				[24–56]	[2–32]					
Total	67	11 (16%)	56 (84%)	41 ± 12.3	17 ± 11.5	25 (36%)	11 (16%)	11 (16%)	13 (19%)	7 (10%)
				[23–63]	[2–38]					

Dutch nursing problem list

The resulting Dutch nursing subset of patient problems list includes 119 general patient problems labelled as a current or potential (in SNOMED CT 'at risk') patient problem. Each patient problem has been defined and has a SNOMED CT identifier (see Additional file 2).

Although the participants reached consensus about all concepts included, five concepts were extensively discussed prior to consensus (see Table 2). Participants felt that the proposed SNOMED CT concepts did not convey the appropriate meaning for nursing practice. These concepts were therefore excluded and replaced with the patient problem concepts in the first column of Table 2 as included in the final set. The participants have indicated that these terms reflect nursing practice properly and more understandably.

Table 2. Five extensively discussed concepts within the SNOMED CT core concept set

Included SNOMED CT concepts		Excluded SNOMED CT concepts	
123,979,008	Abnormal body temperature (finding)	85,623,003	Ineffective thermoregulation (finding)
248,062,006	Self-injurious behaviour (finding)	130,968,006	SSelf-mutilation (finding)
284,905,001	Difficulty performing toileting activities (finding)	284,905,001	Self-toileting deficit (finding)
247,592,009	Poor short-term memory (finding)	423,698,005	Limited recall of recent event (finding)
714,884,000	Difficulty transferring location (finding)	714,914,005	Impaired ability to transfer location (finding)

The participants could not find appropriate concepts to express compulsive video gaming or to express patient problems related to impaired insight into their disease, for which new concepts have been added:

- 12,561,000,146,105 Impaired insight into the disease (finding) and
- 12,551,000,146,107 Compulsive video gaming (finding)

Defining patient problems

Each patient problem was given a definition; 79 (66%) of the 119 patient problems were covered by the definitions (of the diagnosis or focus) established by the ICNP. The

remaining patient problems were defined using either an official national guideline (n = 24; 20%) or a classification (International Classification of Functioning, Disability and Health and DSM-V) (n = 8; 7%). The definitions of 10 patient problems (8%) were derived from the SNOMED CT hierarchy.

SNOMED CT identifiers

Each of the 119 patient problems has a unique SNOMED CT identifier. Of these, 65 (55%) have a matching ICNP code and 48 (40%) patient problems have a partial match. They are either more general or more detailed concepts in the SNOMED CT hierarchical structure and are not equivalent to an existing ICNP concept from the equivalency table. For example, the participants included the more general concepts '386,702,006 Victim of abuse (finding)' and '106,143,002 Sexuality related problem (finding)'. Concepts related to abuse and sexuality are specified more precisely in ICNP. Finally, six (5%) of the 119 patient problems are not included in ICNP: obsessional thoughts, intertrigo, permanently and temporarily unable to perform work activities due to medical condition, hypomanic mood, undernourished, and disturbance in speech.

For four patient problems, the participants suspect they are included in both SNOMED CT and ICNP, but that ICNP gives a relationship with another SNOMED CT concept. For example, the SNOMED CT concept 'Difficulty coping (finding)' is related to ICNP's 'impaired adjustment', while a concept 'difficulty coping' also exists in ICNP.

Three patient problems are included in both SNOMED CT and ICNP, but were not found in the SNOMED CT Equivalency Table, as shown in Table 3. According to the participants, they are equivalent.

Table 3. ICNP Concepts that were not incorporated in the SNOMED CT Equivalency Table for Diagnosis and Outcome Statements

SNOMED CT		ICNP	
224,965,009	Grief finding (finding)	10,022,345	Grief
366,979,004	Depressed mood (finding)	10,022,402	Depressed Mood
190,902,006	Fluid imbalance (disorder)	10,042,335	Fluid imbalance

Discussion

This study was initiated to develop a computer-comparable and exchangeable Dutch nursing subset of patient problems to assist interoperability within and between electronic health records.

The research question aimed to determine which SNOMED CT concepts covered patient problems frequently encountered in Dutch nursing practice. Together with 67 nurses, working in various Dutch healthcare settings, a total of 119 current and potential patient problems were included and defined. Comparing the results of our study against the US nursing subset [25], there was an overlap of 55 patient problems that were included in both subsets. One possible explanation for the differences between the US subset and our Dutch subset might be that different methods were used for including patient problems. In our research, the subset is based on the overview of patient problem occurrence as experienced and the level of influence [28] in contrast to the US subset which is based on patient problems found in the Metathesaurus [25].

In addition, practicing nursing professionals were extensively involved in our study in the selection and definition of SNOMED CT concepts. Although the nursing perspective was strongly represented, in general nurses have a variety of qualification levels and are practice nurses, nurse specialists or advanced nurse practitioners. In addition, there are different views about the job descriptions and competencies of nurses. A literature study by Mistiaen et al. [49] on the role and position of professionals in the nursing profession from an international perspective not only found differences per nation in job descriptions but also in the descriptions of nursing competencies. The authors concluded that it was difficult to compare the descriptions of nursing jobs and competencies [49]. It could be that the different views on nursing competencies and tasks have influenced the selection of patient problem concepts. However, involvement of nurses in selecting and defining nursing concepts is important, because these concepts are the foundation that nurses use for planning, coordinating and evaluating nursing care and for communicating within and across healthcare settings.

The majority of the concepts (95%) either match ICNP concepts from the equivalency table or have partial matches (with an ICNP focus). This is an important finding, because the ICNP is the reference terminology for nursing. By selecting SNOMED CT concepts that match ICNP, we ensured that the SNOMED CT concepts accurately represented the nursing domain as much as possible. One interesting finding was that six concepts were not found in the ICNP. Further examination is necessary to determine if these concepts

can be integrated into the ICNP.

The method used in this study not only identifies clinically relevant content for use in documentation of nursing care, but also facilitates a review process helping to harmonise both terminologies. For example, we found concepts with an equivalent ICNP concept that were not present in the equivalency table.

In this study the meanings of each patient problem concept and apparently overlapping concepts were comprehensively discussed and definitions were added. It is important to understand how patient problem concepts are structured. One of the issues that emerged was how to incorporate best evidence as outlined by clinical practice guidelines in nursing information, supported by a standardised terminology [50, 51]. Nurses are expected to apply evidence-based knowledge in their daily practice. For instance, treatment of a stage II pressure ulcer on the sacrum will be different than for a stage IV pressure ulcer stage located on the heel [52]. To ensure the best outcomes for patients, nurses need to collect and document appropriate and unambiguous information about the patient problem concept of a 'pressure ulcer', as outlined in a clinical practice guideline [52], such as location, stage, colour, wound edges and odour (p. 35). If this nursing information can be linked to SNOMED CT, it will not only lead to better patient outcomes and improved patient safety [53], but nurses will also be assisted in their clinical decision-making process [54, 55].

This study demonstrates that only 24 (20%) patient problems, including pressure ulcers, could be defined using the definition of an official national clinical guideline. A possible explanation for this might be either that there is no consistency between the terminology and clinical guidelines, or that few national clinical guidelines provide scientific or consensus-based evidence to deal with the patient problems that nurses come across in clinical practice. We believe it is important to take account of this issue.

Research implications

This study has contributed to the development of computer-comparable and exchangeable information to support interoperability. This is important, because healthcare organisations are transitioning towards electronic documentation of nursing information. When organisations plan to implement the SNOMED CT nursing subset of patient problems, they may be faced with other existing nursing classifications, for instance if organisations use electronic health records based on the Omaha System. It is therefore necessary to link or associate a nursing patient problem concept to a

concept from a nursing classification with the same (or similar) meaning. This process is also known as 'mapping'. Further research should be undertaken to ensure accurate mapping.

It is also recommended that there should be international collaboration in order to establish an international nursing subset that can be used across different health systems.

Research strengths and limitations

This study used the process model for the development of SNOMED CT subsets. Although there is only limited knowledge available about the methodological quality when developing subsets (to ensure the validity and reliability of subsets), the various stages helped structure the process and will ensure consistency for other researchers involved in developing subsets. Although this study makes an important contribution to clinical data modelling and enhances the understanding of developing terminology subsets, further research to validate the process model is recommended.

A key strength of this study is that nurses from diverse healthcare sectors were extensively involved in the development process, which is important when information is being exchanged within or between different healthcare sectors. However, nursing care takes place in a variety of healthcare settings. Nurses provide care to patients of all ages, with or without comorbidity, in different social contexts and so forth. Although we used mixed focus groups, it could be argued that not all nursing contexts were covered and consequently some patient problem concepts not have been included. This limitation may affect the extent to which the results can be generalised. However, we used the overview of patient problems (level of occurrence compared to level of reported influence) as a framework, which acted as a basis for selecting SNOMED CT concepts. This overview was set up by nurses from diverse healthcare sectors by using a pre-existing national survey panel [28]. Nevertheless, it is important to monitor the usability and completeness of the subset in different use cases.

In addition, we have gained more understanding about patient problems that are common in nursing practice and their underlying content. The findings of this study have also extended our knowledge of standardisation of nursing information and will help solve interoperability issues.

Conclusion

The present study was designed to develop a Dutch national nursing subset of patient problems based on a standardised terminology (SNOMED CT). This study identified 119 comprehensive, unambiguous and accurately defined patient problems covering nursing practice. The study is beneficial for clinical nursing practice, because nurses will be helped by the interoperability of nursing information within and across different healthcare settings. The results also can contribute to the development of an international subset in order to investigate nursing care across nations consistently.

Additional files

- Additional file 1: Overview of patient problems (level of occurrence compared to level of reported influence)

- Additional file 2: Nursing subset of patient problems. Also: https://www.nictiz.nl/standaardisatie/terminologiecentrum/referentielijsten/nationale-kernset/dutch-nursing-problem-list/

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Availability of data and materials

All data generated or analysed during this study are included in this published article (and its supplementary information files).

Authors' contributions

RK participated in the design of the study, carried out the focus groups, data analyses

and drafted the manuscript. EG and EV participated in the data collection (focus groups) and the data analyses. PV participated in the design of the study and helped to draft the manuscript. ALF participated in the design of the study and helped to draft the manuscript. DD participated in formulating the research questions, in the design of the study, and helped to draft the manuscript. All authors read and approved the final manuscript.

Ethics approval and consent to participate

All participants received a letter explaining the objective of the study and stating that participation in the focus groups was voluntary. They all signed an informed consent form. Further ethical approval of this study was not required under the legislation applicable in the Netherlands (http:// www.ccmo.nl/en/), as all participants were competent individuals and this study did not involve any interventions or treatments.

Consent for publication

Not applicable.

Competing interests

The authors have all approved the manuscript and declare that they have no competing interests.

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Additional file 1. Overview of patient problems (level of occurrence compared to level of reported influence)

Quadrant 1				Quadrant 2			
Frequently occurring/high level of influence experienced				Frequently occurring/low level of influence experienced			
Cat		**n**	**Mean I**	**Cat**		**n**	**Mean I**
5	Defecation	87	3.64	**15**	Complex interpersonal interactions. such as	81	2.96
					forming or terminating relationships		
13	Washing oneself	185	3.64	**7**	Functions of the joints and bones	120	2.95
13	Dressing	164	3.64	**4**	Heart functions. including heart rate. rhythm	130	2.94
13	Toileting	151	3.61	**1**	Energy and drive functions	76	2.92
2	Pain and sensation of pain	107	3.54	**1**	Attention	147	2.91
13	Caring for body parts	165	3.54	**1**	Temperament and personality functions	113	2.90
13	Eating and drinking	97	3.51	**1**	Orientation	137	2.88
5	Water. mineral and electrolyte	81	3.50	**1**	Perceptual functions	69	2.86
	balance functions						
12	Changing and maintaining body	116	3.45	**4**	Blood vessel function	106	2.80
	position						
4	Blood pressure functions	131	3.44	**17**	Community life	77	2.80
4	Respiratory system	104	3.41	**1**	Experience of self and time functions	82	2.74
5	Weight maintenance	92	3.39	**1**	Thought functions	127	2.60
10	Carrying out daily routine	81	3.38	**7**	Muscle power functions	79	2.57
10	Undertaking a single or multiple	81	3.29	**1**	Memory	138	2.53
	tasks			**1**	Intellectual functions	114	2.25
13	Looking after one's health	164	3.28				
9	Solving problems	77	3.27	**Quadrant 4**			
12	Moving around using transportation	76	3.22	**Less frequently occurring/low level of influence experienced**			
1	Emotional functions	167	3.21				
10	Handling stress and other	89	3.18	**Cat**		**n**	**Mean I**
	psychological demands			**15**	Particular interpersonal interactions. such as	68	2.95
12	Carrying. moving and handling	79	3.18		relating with strangers. formal relationships.		
	objects				family and intimate relationships		

11	Communicating receiving	88	3.10	**11**	Conversation	61	2.93
12	Walking and moving	135	3.08	**5**	Endocrine gland functions	30	2.85
11	Communicating producing	74	3.07				
17	Recreation and leisure	72	3.06	**6**	Sensations associated with urinary functions	26	2.84
14	Household tasks	97	3.02				
15	Basic interpersonal interactions	82	3,00	**6**	Urinary excretory functions	42	2.80
1	Sleep	147	2.99	**9**	Sensory experiences	16	2.80
Quadrant 3				**6**	Urination functions	54	2.77
Less frequently occurring/high level of influence experienced				**1**	Consciousness	61	2.75
Cat		**n**	**Mean I**	**4**	Functions of the immunological system	41	2.62
8	Protective functions of the skin	44	3.68	**17**	Religion and spirituality	20	2.60
4	Sensations associated with cardiovascular and respiratory functions	52	3.50	**16**	Work and employment	38	2.58
5	Thermoregulatory functions	43	3.46	**6**	Sexual functions	9	2.56
6	Sensations associated with genital and reproductive functions	5	3.40	**7**	Sensations related to muscles and movement functions	63	2.56
8	Functions of the hair and nails	14	3.38	**16**	Education	24	2.55
8	Repair functions of the skin	28	3.33	**14**	Acquiring a place to live	29	2.52
5	Ingestion functions	49	3.29	**16**	Economic life	43	2.49
5	Functions related to metabolism system	58	3.23	**2**	Hearing	60	2.44
11	Communication devices and techniques	13	3.18	**7**	Muscle endurance functions	21	2.42
5	Sensations associated with the digestive system. including nausea. feeling bloated etc.	56	3.16	**6**	Menstruation functions	5	2.40
8	Sensation related to the skin	23	3.14	**9**	Basic learning and applying knowledge	37	2.39
5	Digestive functions	28	3.04	**7**	Muscle tone functions	51	2.36
14	Shopping and gathering daily necessities	65	3.03	**2**	Taste. smell and touch function	43	2.30
4	Functions of the haematological system	58	3,00	**6**	Procreation functions	4	2.25
				7	Involuntary movement functions	31	2.20
				2	Seeing	45	2.17
				3	Voice function	20	1.95
				3	Fluency and rhythm of speech functions	18	1.94
				3	Articulation	31	1.83

Additional file 2. Nursing subset of patient problems

Snomed FSN	Text definition	Snomed ID	Match ICNP concept	Partial match with ICNP concept	No match with ICNP concept
abnormal body temperature (finding)	problem with the body temperature, measured in ° C (degrees Celsius). Body temperature is defined by 'internal body heat related to body metabolism' (ICNP)	123979008		1	
abnormal defecation (finding)	problem with movement and evacuation of stool through the bowel (ICNP)	179950008		1	
acute confusion (finding)	image of acute and chronic change, often fluctuating which includes attention deficit disorder and consciousness and changes in cognition (memory, orientation, language) or observation (guideline delirium adults and elderly; NVKG 2013)	130987000	1		
acute pain (finding)	pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage (Guideline postoperative pain; 2012)	274663001	1		
alcohol abuse (disorder)	misuse of alcohol for a non-therapeutic effect that may be harmful to health and may cause addiction (ICNP)	15167005	1		
altered body image (finding)	problem with the mental picture of one's own body in whole or in part, or of one's physical appearance (ICNP)	225507001	1		
anxiety (finding)	a sense of threat, danger or stress, without concrete content and not related to an object (ICNP)	48694002	1		
aphasia (finding)	defective or absent language function of using and understanding words together with damage to certain parts of the brain (ICNP)	87486003		1	
at risk for falls (finding)	an unintended change of the body position, which results in landing on the floor or any other lower level (Guideline prevention of fall incidients of elderly; CBO,2004)	129839007	1		
at risk for infection (finding)	risk for infection. Infection is defined by 'an invasion of the body by pathogenic microorganisms that reproduce and multiply, causing disease by local cellular injury, secretion of toxin or antigen-antibody reaction' (ICNP)	78648007	1		
at risk for suicide (finding)	risk for suicide. Suicide is defined by 'performing suicidal activities which lead to death of self' (ICNP)	225444004	1		

Additional file 2. (Continued)

Snomed FSN	Text definition	Snomed ID	Match ICNP concept	Partial match with ICNP concept	No match with ICNP concept
At risk of acute confusion (finding)	image of acute and chronic change, often fluctuating which includes attention deficit disorder and consciousness and changes in cognition (memory, orientation, language) or observation (guideline delirium adults and elderly; NVKG 2013)	423192007	1		
At risk of constipation (finding)	risk for decrease in the frequency of defecation accompanied by difficulty or incomplete passage of stool; passage of excessively hard, dry stool (ICNP)	129691005	1		
At risk of loneliness (finding)	at risk for the subjective experience of a pleasurable or unacceptable lack of (quality of) certain social relationships (De Jong Gierveld, Tilburg; 2007/Platform ouderenzorg)	129698004	1		
At risk of pressure ulcer (finding)	at risk for a localized damage to the skin and/or underlying tissue, mostly at the level of a bony prominence, as a result of pressure or pressure in combination with sliding force (National multidisciplinary guideline pressure ulcer prevention and treatment; V&VN, nov 2011)	285304000	1		
At risk of undernutrition (finding)	at risk for a nutritional status in which there is a deficiency or imbalance of energy, protein, and/or other nutrients, which leads to measurable adverse effects on the body size and body composition, on the functioning and on clinical outcomes (Guideline screening and treatment of undernutrition, stuurgroep ondervoeding; juni 2011)	129845004	1		
blood pressure alteration (finding)	problem with effects of fluctuating blood pressure. Bloodpressure is defined by 'the force of circulating blood on blood vessel walls, or the hydrostatic pressure exerted by the blood on the vasculature of the arteries' (ICNP)	129899009	1		
body temperature above reference range (finding)	decreased ability to change internal thermostat accompanied by increased body temperature, warm dry skin, drowsiness and headache associated with dysfunction of the central nervous system or endocrine system (ICNP)	50177009	1		

Additional file 2. (Continued)

Snomed FSN	Text definition	Snomed ID	Match ICNP concept	Partial match with ICNP concept	No match with ICNP concept
burn of skin (disorder)	an injury due to the influence of heat on the skin for a certain period of time and above a certain critical temperature, above the critical temperature (+/- 40° C) occurs damage to the skin (Association of Dutch Burn Centres http://brandwondenstichting.nl/brandwonden-voorkomen/wat-zijn-brandwonden/)	284196006		1	
caregiver difficulty performing caretaking (finding)	problem with personal care; unpaid and often long-term care for sick family members or friends (more than eight hours per week and/or longer than three months) (https://www.rijksoverheid.nl/onderwerpen/mantelzorg)	705044006	1		
chronic pain (finding)	pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage (Concept care standard chronic pain; 2016)	82423001	1		
obsessional thoughts (finding)	persistent thought or idea that the mind is constantly and involuntarily working on (http://www.psychischegezondheid.nl/)	67698009		1	
compulsive gambling (disorder)	extensively gambling with an effect that may be harmful to health (ICNP)	18085000		1	
compulsive video gaming (disorder)	extensively gaming with an effect that may be harmful to health (ICNP)	12551000146107		1	
delusions (finding)	false sense of reality that cannot be corrected by reason, argument or persuasion or by evidence of one's own senses (ICNP)	2073000		1	
depressed mood (finding)	feelings from sadness to melancholy with decreased concentration, loss of appetite and insomnia (ICNP)	366979004	1		
diarrhea (finding)	Passage of loose, liquid, unformed stool, increased frequency of elimination accompanied by increased bowel sounds, cramping and urgency of defecation (ICNP)	62315008	1		
difficulty changing position (finding)	problem with getting into and out of a body position and moving from one location to another, such as getting up out of a chair to lie down on a bed, and getting into and out of positions of kneeling or squatting [ICF]	303387009		1	

Additional file 2. (Continued)

Snomed FSN	Text definition	Snomed ID	Match ICNP concept	Partial match with ICNP concept	No match with ICNP concept
difficulty complying with treatment (finding)	problem with performing activities to meet therapeutic health care requirements and conform to the prescribed treatment course of the caregiver and the healthcare provider (Time for better use of medicines; NPCF, 2008)	304900007		1	
difficulty coping (finding)	problem with managing stress and having a sense of control and increased psychological comfort (ICNP)	18232000	1		
difficulty drinking (finding)	problem with taking fluids during meals and during the day or when thirsty (ICNP)	288857007		1	
difficulty establishing relationships (finding)	difficulty in starting an engagement with one or more persons (ICNP)	423238001		1	
Self-feeding deficit (finding)	problem with bringing food to the mouth and feeding oneself until satisfied (ICNP)	7653001	1		
difficulty inferring meaning (finding)	problem to understand information with the mind, both verbally and nonverbally [ICF]	310825003		1	
difficulty maintaining a position (finding)	staying in the same body position as required, such as remaining seated or remaining standing [ICF]	282851000		1	
difficulty maintaining relationships (finding)	problem maintaining contact within a relationship with one or more persons under the social rules in the company (ICNP)	424573006		1	
difficulty making conversation (finding)	problem with making a conversation or verbal communication between two or more persons (SNOMDED CT hierarchy)	288638001		1	
difficulty managing medication (finding)	problem with the independently use and administration of medication (ICNP)	285038001	1		
difficulty managing personal financial activities (finding)	problem with caring for and managing personal money/capital (ICNP)	300686005	1		
difficulty performing dressing activities (finding)	problem with putting on or removing clothes (ICNP)	284972002	1		
difficulty performing mouthcare activities (finding)	problem taking care of mouth and teeth/molars or dentures (SNOMED CT hierarchy)	289128002	1		
difficulty performing personal grooming activity (finding)	problem with brushing and in other ways look after and clean the hair and nails (ICNP)	704439001	1		

Additional file 2. (Continued)

Snomed FSN	Text definition	Snomed ID	Match ICNP concept	Partial match with ICNP concept	No match with ICNP concept
difficulty performing shopping activities (finding)	problem with buying items necessary for maintaining daily life; purchasing, trading or bartering for items needed for the home (ICNP)	300723007	1		
difficulty performing toileting activities (finding)	problem with carrying out toileting activities for urination and defecation (ICNP) and take care of oneselves	284905001		1	
difficulty performing washing and drying activities (finding)	problem with the washing and drying of the entire body, or body parts, such as bathing, showering, washing of hands and feet, face and hair (ICNP)	288552005		1	
difficulty preparing food for eating (finding)	problem with taking care of providing food and meals in terms of quantity and quality, processing of food, storing of food, serving and distribution of food necessary for maintaining daily life (ICNP)	286457005	1		
difficulty transferring location (finding)	problem with moving from one surface to another, such as sliding along a bench or moving from a bed to a chair, without changing body position [ICF]	714884000		1	
difficulty using self-expression (finding)	problem with specific mental functions necessary to produce meaningful messages in spoken, written, signed or other forms of language [ICF]	288742009		1	
disorientated (finding)	problem with ascertaining relationship to environment in terms of time; in terms of place at a given point in time and in terms of awareness of own identity and in terms of recognition of people around (ICNP)	62476001	1		
disorientated in place (finding)	problem with ascertaining relationship to environment in terms of place at a given point in time such as country, province, city, workplace, home (ICNP)	72440003		1	
disorientated in time (finding)	problem with ascertaining relationship to environment in terms of time such as year, season, month, day, precise time (ICNP)	19657006		1	
disorientation for person (finding)	problem with ascertaining relationship to environment in terms of awareness of own identity such as age, date of birth and in terms of recognition of people around (ICNP)	62766000		1	

Additional file 2. (Continued)

Snomed FSN	Text definition	Snomed ID	Match ICNP concept	Partial match with ICNP concept	No match with ICNP concept
disturbance in role performance (finding)	problem with interacting according to implicit or explicit set of expectations, rules and standards of behaviour expected by others (ICNP)	27179007	1		
disturbance in speech (finding)	problem with the production of various sounds by the passage of air through the larynx [ICF]	29164008			1
disturbance of attention (finding)	focused attention and mental activity to store and recall knowledge (ICNP)	76039005		1	
disturbance of consciousness (finding)	problem with mental responsiveness to impressions from a combination of the senses, keeping the mind alert and sensitive to the external environment (ICNP)	3006004		1	
diversional activity deficit (finding)	problem with spending time on diversional activities like hobbies, sport, recreation (SNOMED CT hierarchy)	23935006	1		
drug abuse (disorder)	misuse of drugs or medication for a non-therapeutic effect that may be harmful to health and may cause addiction (ICNP)	26416006	1		
dyspnea (finding)	conscious experience of a disruption of breathing, in other words the feeling of inadequate breathing, an unpleasant and particularly threatening and anxious feeling. The degree of the experienced dyspnea is not dependent on the severity of the underlying cause (Guideline dyspnoe, cough and rattle; IKZ, 2005; www.oncoline.nl)	267036007	1		
eczema (disorder)	itchy, polymorphic skin with redness, edema, papules, vesicles, crusts, flakes and/or lichenification, as a result of a non-infectious inflammation of the skin, caused by intrinsic and/or environmental factors (https://www.nhg.org/standaarden/samenvatting/eczeem#idp19440)	43116000		1	
eruption of skin (disorder)	skin eruption of erythema of different colours and protuberance, local oedema, urticaria, vesicles and itching (ICNP)	271807003		1	
fatigue (finding)	feelings of decreased strength or endurance, weariness, mental or physical tiredness, and listlessness with lower capacity of physical or mental work (ICNP)	84229001	1		

Additional file 2. (Continued)

Snomed FSN	Text definition	Snomed ID	Match ICNP concept	Partial match with ICNP concept	No match with ICNP concept
feeling agitated (finding)	condition of purposeless psychomotor excitement, restless activity, pacing, releasing of nervous tension associated with anxiety, fear or mental stress (ICNP)	24199005	1		
feeling lonely (finding)	the subjective experience of a pleasurable or unacceptable lack of (quality of) certain social relationships (De Jong Gierveld, Tilburg; 2007/Platform ouderenzorg)	267076002		1	
fertility problem (finding)	problem with capacity to participate in the conception of a live foetus that delivers as a viable child (ICNP)	27034006		1	
finding of speed of thought (finding)	problem with an accelerated or slowed thought process (SNOMED CT hierarchy)	365276007		1	
finding related to risk factor in pregnancy (finding)	risk of complications during pregnancy. Pregnany is the condition of growing and nurturing a developing foetus in body lasting from approximately 266 days period to birth from the day of fertilisation (ICNP)	199312002	1		
fine motor impairment (finding)	problem with the use of the hands and fingers for small movements, the grasping and manipulation of an object (http://www.fijne-motoriek.nl/)	228148009		1	
fluid imbalance (disorder)	regulation of uptake and excretion of body fluids such as the quantity and balance of water and electrolytes in the body (ICNP)	190902006	1		
grief finding (finding)	feelings of sorrow associated with anticipatory or actual significant loss and death; Shock and disbelief, (Stage of Shock); Exhaustion, extreme tiredness and lethargy, mental anguish, reactions of bereavement and mourning, crying or sobbing, alarm, disbelief, denial, anger (Stage of Reaction); Adjustment, acceptance, reorientation, express feelings of loss, accept reality of loss, absence of somatic stress, express positive expectations about the future (Stage of acceptance) (ICNP)	224965009		1	
hallucinations (finding)	apparent registration of sensory stimuli which are not actually present, classified according to the senses, such as auditory, visual, olfactory, gustatory or tactile hallucinations (ICNP)	7011001	1		

Additional file 2. (Continued)

Snomed FSN	Text definition	Snomed ID	Match ICNP concept	Partial match with ICNP concept	No match with ICNP concept
hearing problem (finding)	problem with faculty of hearing due to responses to stimuli from auditory organs, capacity to hear (ICNP)	300228004	1		
housing problems (finding)	problem with the residential building, constructed for human dwelling, residence and homes, shelter providing protections and space for humans, such as unsuited to limitations in mobility, poor housing, lack of space, moisture in the house (ICNP)	105531004		1	
hypomanic mood (finding)	a distinct period of abnormally and persistently elevated, expansive, or irritable mood [DSM-V]	281257007			1
Hypothermia (finding)	decreased ability to change internal thermostat, reduced body temperature, cool, pale and dry skin, shivering, slow capillary refill, tachycardia, cyanotic nail beds, hypertension, piloerection associated with prolonged exposure to cold, dysfunction of the central nervous system or endocrine system (ICNP)	386689009	1		
impaired ability to learn new material (finding)	problem with the process of acquiring knowledge or skill by means of systematic study, instruction, practice, training or experience (ICNP)	247617009		1	
impaired home maintenance management (finding)	problem with practice of care for or proper attention to making environment or dwelling place comfortable, cosy; making oneself and others feel at home; providing a secure and well managed household (ICNP)	67175002	1		
impaired insight in disease	problem with the realization that (or understanding that) a person has a disease or health problem, and what the significance for life is (http://mens-en-gezondheid.infonu.nl/ziekten/82477-ziekte-ziektebesef-en-betekenis.html)	12561000146105		1	
impaired social interaction (finding)	problem with behavior of mutual social interchange, participation and social exchange among individuals and groups (ICNP)	88598008	1		
impaired touch discrimination (finding)	problem with the faculty of feeling due+ to responses to stimuli from tactile organs, capacity for orientation by touch and pressure from tactile organs in integument (ICNP)	299923005		1	
impairment of mental alertness (finding)	problem with the level of watchfulness or vigilance, paying attention to something, ready to take action (ICNP)	704426000	1		

Additional file 2. (Continued)

Snomed FSN	Text definition	Snomed ID	Match ICNP concept	Partial match with ICNP concept	No match with ICNP concept
inadequate social support (finding)	lack of social or psychological help from somebody to succeed, keep from failing and to bear the weight of and maintain in position, hold up [ICNP]	425022003	1		
incontinence of feces (finding)	involuntary, uncontrolled passage and expulsion of stool (ICNP)	72042002	1		
Ineffective breathing pattern (finding)	difficulty with pattern of moving air into and out of the lungs with a certain respiratory rate and rhythm, depth of inspiration and strength of expiration [ICNP, indirect]	20573003		1	
intertrigo (disorder)	a localized superficial skin disorder in the large skin folds, which is characterized by continued redness (erythema) on both sides of the fold. In addition, one or more of the following symptoms can occur: maceration (softening), fissures (cracks), erosions, a oozing skin or crust formation (National multidisciplinary guideline (intertrigo) prevention and treatment; V&VN, 2011)	58759008			1
itching of skin (finding)	sensation of annoying tingling, cutaneous feeling followed by impulse to scratch skin (ICNP)	418363000	1		
low self-control (finding)	problem with disposition taken to take care of what is needed to maintain oneself, keeping oneself going, handle basic individual and intimate necessities and activities in life (ICNP)	705000008	1		
manic mood (finding)	continued abnormally elevated disinhibited state of emotion/loss of inhibition, filled with positive vitality, negating concerns and decreased need for sleep [DSM-V]	405273008		1	
memory impairment (finding)	problem with mental acts by which sensations, impressions and ideas are stored and recalled (ICNP)	386807006	1		
menstruation finding (finding)	problem with the recurring cycle of shedding, re-growth and proliferating of the endometrium of the uterus as menstruation; average length of the menstrual cycle from first day of bleeding to first of another is 28 days; length; duration and quantity vary; menstrual cycle begins at menarche and ends at the menopause (ICNP)	32301000146106 (the link will be available in the SNOMED CT release of september 2017)		1	
mood swings (finding)	problem with a varying level of feelings and emotional tone (ICNP)	18963009	1		

Additional file 2. (Continued)

Snomed FSN	Text definition	Snomed ID	Match ICNP concept	Partial match with ICNP concept	No match with ICNP concept
nausea (finding)	sensation of feeling sick with an inclination to vomit, unpleasant sensation vaguely referred to the epigastrium and abdomen, offensive to taste or smell (ICNP)	422587007	1		
obstipation (disorder)	decrease in the frequency of defecation accompanied by difficulty or incomplete passage of stool; passage of excessively hard, dry stool (ICNP)	14760008	1		
overweight (finding)	overweight among adults (18-70 years) exists as a body mass index (BMI) ≥25 (with BMI ≥30 obesity) in children is overweight diagnosed on the basis of four criteria: physique, ethnicity, puberty and fat distribution (http://www.voedingscentrum.nl/nl.aspx)	238131007	1		
pain (finding)	an unpleasant sensory and emotional experience, where the experience of pain is what a person experiencing the pain says it is and and is present whenever he/she says that it's present (NHG-Werkgroep Pijn. NHG-Standard pain. Primary care law 2015;58(9):472-85)	22253000	1		
permanently unable to perform work activities due to medical condition (finding)	ongoing problem with the extent and manner in which people participate in work (SNOMED CT hierarchy)	440584001			1
physical aggression (finding)	forceful demonstration of actions or unjust use of force or power with the purpose to injure or damage, mistreat or assault: Violent, assaulting, harmful, illegal or cultural prohibited actions toward something or someone else; state of power struggle or conflict (ICNP)	248004009	1		
poor long-term memory (finding)	problem with the ability to recall or remember past events or experiences (ICNP)	247588002		1	
poor short-term memory (finding)	problem with the ability to recall or remember recent events or experiences (ICNP)	247592009		1	
preoccupation (finding)	dominating and engrossing the mind to the exclusion of other thoughts or being mentally distracted (ICNP)	247632002		1	

Additional file 2. (Continued)

Snomed FSN	Text definition	Snomed ID	Match ICNP concept	Partial match with ICNP concept	No match with ICNP concept
pressure ulcer (disorder)	a localized damage to the skin and/or underlying tissue, mostly at the level of a bony prominence, as a result of pressure or pressure in combination with sliding force (National multidisciplinary guideline pressure ulcer prevention and treatment; V&VN, nov 2011)	399912005	1		
retention of urine (disorder)	involuntary accumulation of urine in bladder, incomplete emptying of bladder associated with a loss of muscle function in bladder, side effects of narcotics or damage to bladder (ICNP)	267064002	1		
self-injurious behavior (finding)	performing of self initiated activities with the purpose of hurting or damaging oneself, violence directed towards oneself (ICNP)	248062006	1		
sense of smell impaired (finding)	problem with the faculty of smelling due to responses to stimuli from olfactory organs, capacity to smell odours (ICNP)	83156004	1		
sexuality related problem (finding)	problem with the ability of participating in intimity and sexual intercourse; Sexuality includes all feelings, thoughts, beliefs, fantasies, desires and behaviors that are sexually oriented (ICNP)	106143002		1	
sleep pattern disturbance (finding)	problem with sleeping. Sleeping is defined by 'Recurring lowering of bodily activity marked by reduced consciousness, not awake accompanied with, not aware, depressed metabolism, immobile posture, diminished bodily activity, diminished but readily reversible sensitivity to external stimuli' (ICNP)	26677001	1		
swallowing problem (finding)	problem with the passage of fluids and decomposed food from mouth by movement of tongue and muscles through throat and oesophagus to stomach (ICNP)	399122003	1		
taste sense altered (finding)	problem with the faculty of t+asting due to responses to stimuli from gustatory organs, capacity to taste food and drink (ICNP)	271801002	1		
temporarily unable to perform work activities due to medical condition (finding)	temporarily problem with the extent and manner in which people participate in work (SNOMED CT hierarchy)	440337002			1
tobacco dependence syndrome (disorder)	misuse of tobacco for a non-therapeutic effect that may be harmful to health and may cause addiction (ICNP)	89765005		1	

Additional file 2. (Continued)

Snomed FSN	Text definition	Snomed ID	Match ICNP concept	Partial match with ICNP concept	No match with ICNP concept
undernourished (finding)	nutritional status in which there is a deficiency or imbalance of energy, protein, and/or other nutrients, which leads to measurable adverse effects on the body size and body composition, on the functioning and on clinical outcomes (Guideline screening and treatment of undernutrition, stuurgroep ondervoeding; juni 2011)	248325000			1
underweight (finding)	'Body Mass index' (BMI) ≤18,5 (patients ≥65 year: BMI ≤20) (Guideline screening and treatment of undernutrition, stuurgroep ondervoeding; juni 2011)	248342006	1		
urinary incontinence (finding)	involuntary passage of urine, failure of voluntary control over bladder and urethral sphincter (ICNP)	165232002	1		
verbal aggression (finding)	forceful, self-assertive action or attitude expressed verbally, physically or symbolically (ICNP)	248003003		1	
victim of abuse (finding)	victim of acts of physical, emotional and sexual assault, such as rape and mistreatment (ICNP beta 2)	386702006		1	
visual impairment (disorder)	problem with the ability to see as a result of response to stimuli of visual organs (SNOMED CT hierarchy)	7973008		1	
vomiting (disorder)	expulsion or bringing up of converted food or stomach content through the oesophagus and out of mouth (ICNP)	422400008	1		
walking disability (finding)	problem with moving body from one place to another by moving legs stepwise by self, capacity to bear weight of body and walk with effective gait within the range of speed from slow, moderate and fast pace, upstairs, downstairs, up inclines and down inclines (ICNP)	228158008	1		
wound of skin (disorder)	an interruption in the continuity of the skin, usually caused by external influences. Injury of the tissue, usually associated with physical or mechanical damage; sloughing and tunneling of the tissue (Guideline wound care, vereniging voor heelkunde; 2013)	262526004		1	
Total			**65**	**48**	**6**

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Chapter 7

Mapping the Dutch SNOMED CT subset to Omaha System, NANDA International and International Classification of Functioning, Disability and Health

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Abstract

Background

Nurses register data in electronic health records, which can use various terminology and coding systems. The net result is that information cannot be exchanged and reused properly, for example when a patient is transferred from one care setting to another. A nursing subset of patient problems was therefore developed in the Netherlands, based on comparable and exchangeable terms that are used throughout the healthcare sector and elsewhere (semantic interoperability).

The purpose of the current research is to develop a mapping between the subset of patient problems and three classifications in order to improve the exchangeability of data. Those classifications are the Omaha System, NANDA International, and ICF (the International Classification of Functioning, Disability and Health).

Method

Descriptive research using a unidirectional mapping strategy.

Results

Some 30%–39% of the 119 SNOMED CT patient problems can be mapped one-to-one from the subset onto each separate classification. Between 6% and 8% have been mapped partially to a related term. This is considered to be a one-to-one mapping, although the meanings do not correspond fully. Additionally, 23%–51% of the patient problems could be mapped n-to-one, i.e. more specifically than the classification. Some loss of information will always occur in such exchanges. Between 1% and 4% of the patient problems from the subset are defined less specifically than the problems within the individual classifications. Finally, it turns out that 9%–32% of the terms from the subset of patient problems could not be mapped onto a classification, either because they did not occur in the classification or because they could not be mapped at a higher level.

Conclusion

To promote the exchange of data, the subset of patient problems has been mapped onto three classifications. Loss of information occurs in most cases when the patient problems are transformed from the subset into a classification. This arises because the classifications are different in structure and in the degree of detail. Structural cooperation between suppliers, healthcare organisations and the experts involved is required in order to determine how the mapping should be used within the electronic health records, and whether it is usable in day-to-day practice.

Introduction

Various classifications are used in nursing practice for recording nursing data in the electronic health records [1,2], which means that problems or nursing diagnoses, interventions and results/outcomes are systematically grouped together, defined and encoded. The advantage is that nurses will be arranging their data in the same way and using the same language when data is recorded. This applies equally in Dutch nursing practice. For instance, 72 home care organisations and 22 software suppliers are members of the Omaha System Support foundation [3], which issues certificates determining whether the basic rules of the Omaha System have been met. There are also organisations and software suppliers that use the classifications for nursing diagnoses (from NANDA International; NANDA-I), interventions (the Nursing Intervention Classification; NIC) and nursing outcomes (Nursing Outcome Classification; NOC) (NNN) and the International Classification of Functioning, Disability and Health (ICF). However, is not known how many organisations have integrated these classifications into their electronic health records. This reveals that there is a diversity of nursing data [4].

Various reports have been published that discuss the consequences of this variability: information cannot be exchanged and reused properly, for example when a patient is transferred from one care setting to another [5,6]. The nursing transfer report is often still given to the patient in paper form. Even when data is transferred digitally, there is no direct integration into the electronic care file of the receiving care organisation: the data still has to be input manually [4,7,8]. Comparable findings have been observed in international studies into the transfer and reuse of data [9–12].

To help solve these problems, a nursing subset of 119 patient problems has been determined in the Netherlands: its purpose is to develop comparable terms that are used throughout the care sector and can therefore be exchanged [13]. The patient problems have been encoded using the SNOMED CT reference terminology [14]. The focus of this reference terminology is the use of the term and associated synonyms. Links to the classifications can be made, also known as ‘mapping’ [15]. A mapping process checks whether a term from one classification or terminology system matches or is comparable to a term in another classification or terminology system [16]. In this regard, a distinction is made between source terms and target terms. The source terms are the data that has been described and encoded using an encoding system from which the map is to be constructed. The target terms are the data of the encoding system into which mapping takes place.

The purpose of this investigation is to develop a mapping from the subset of patient problems to three classifications that are used in the Netherlands (the Omaha System, NANDA-I and ICF) to allow automated interchange of data and to increase the comparability of data. The 119 patient problems from the subset were the source terms and the problems or diagnoses of the classifications were the target terms.

Research questions

To what extent can the SNOMED CT subset of patient problems be mapped onto the:

- Omaha System?
- NANDA International diagnosis tables?
- ICF?

Method

Research design

Descriptive research using a unidirectional strategy based on manual semantic mapping.

A unidirectional strategy means that source terms are only mapped onto target terms [17,18]. Semantic mapping means that the meaning and definition of the terms are considered for similarities of certain features. If specific features correspond, the terms can be mapped onto one another [19–21]. Vomiting, retching and emesis are for instance associated terms, because their meaning is the same.

Sample, composition and data collection

Sample
The following source documents and releases were used for the mapping:

- Dutch subset of patient problems [Dutch and English version] (January 2017 release) (https://www.nictiz.nl/terminologiecentrum/ referentielijsten/nationale-kernset)
- SNOMED International browser (January 2017 release)
- The Omaha System [22] and Het Omaha System; Een introductie [23]
- NANDA International, English version, 2015–2017 edition [24] and Dutch translation of the 2012–2014 edition [25]
- ICF, Dutch translation (2007) [26] and ICF browser 2008–2016 [27]

The mapping was based on both the Dutch and English versions; the Dutch source documents were used for the Dutch mapping. The English versions of the classifications or terminologies were consulted for the associated encoding to make sure that the codes and associated terms corresponded.

Composition
Three separate expert groups were set up for the mapping process; one for each classification system. The experts involved met with the following requirements:

- a nursing, IT and/or scientific background
- extensive knowledge of at least one specific classification (NANDA-I, Omaha System, ICF, SNOMED CT terminology)

– involvement in the development of a classification or terminology and/or experts in the implementation of a classification or terminology in electronic medical records

Data collection

The mapping method was based on the ISO model 18104, which has been defined by the European Committee for Standardization (CEN). This model breaks patient problems down into (a) a clinical finding, such as pain or (b) a focus (drinking) with a judgement (difficulty) [28]. This detailing made it possible to objectify the similarities and differences between the terms to be mapped. The method was used in various studies and considered to be appropriate [29–31].

In order to structure the mapping process, an Excel file was set up in which three features were determined successively for the subset of patient problems and classifications: Dutch and English terms, the Dutch and English definitions and the associated codes (see Appendix A in Supplementary material).

Each classification has a hierarchy and an encoding system of its own that is decisive for the way that mapping could be done.

The Omaha System defines 42 areas of concern or problems that are mostly described neutrally, each with three possible different attributes: actual, potential or health-promotion. Each area of concern with the attribute 'actual' has a set of unique signs/symptoms for that state [22]. Patient problems were mapped by both actual and potential areas of concern. For each area of concern, the table (Appendix A in Supplementary material) states whether it is an actual (A) or potential (P) problem.

The NANDA-I classification comprises 148 concepts that are specified further into 235 standardised nursing diagnoses, grouped into 13 domains and 47 classes (2015–2017 edition). The domains and classes have not been encoded in the documentation used for this study. The nursing diagnoses are encoded and defined [24] and contain aetiological factors and the signs and symptoms or risk factors. The mapping onto the NANDA-I diagnoses was done at the level of the diagnosis labels, including determining whether the definition of the nursing diagnosis matched the definition of the patient problem.

The ICF has four domains, each of which is subdivided into seventeen chapters (categories). The chapters in turn are broken down into classes and sub-classes. All

these levels (domains, chapters, classes and sub-classes) are encoded and defined [26] and were used for the mapping. ICF does not use a status for 'potential' or 'risk of', which is why the mapping took place at three levels: 'impairment', 'participation restriction' or 'difficulty', quantified by a scale of 'mild', 'moderate', 'severe' or 'complete'.

The patient problems of the subset are based on SNOMED CT. The hierarchy and structure of the classifications were considered during the mapping, along with how they relate to the SNOMED CT hierarchy.

Data analysis

Two experts (EV and EG) determined which target terms from a classification matched the source terms of the subset. For this analysis the following mapping relationships were used [18]:

- one-to-one mapping: the meaning of the target term is entirely the same as the source term. The source and target terms are immediately exchangeable without any loss of information.
- partial mapping: the source and target terms are not exactly the same, but their meanings correspond partially and are related.
- one-to-n mapping: the source term is less detailed than the target term. More than one target term can be linked to the same source term.
- n-to-one mapping: the source term is more detailed than the target term. More than one source term can be linked to the same target term.
- one-to-none mapping: no target term is found for the source term.

The results were discussed with the third expert (RK) and recorded in an Excel file and was then sent by e-mail to the experts of the relevant classifications for an initial remote consultation round. After that, the experts were invited to attend face-to-face mapping meetings for each classification, at which each patient problem and its mapping proposal was discussed. The separate mapping meetings took place between September 2016 and January 2017.

After the meeting, the resulting table was presented by e-mail to the experts in question for review. The mappings were discussed until a consensus had been reached. In order to reach a consensus, it was possible to modify the patient problem term used within SNOMED CT, or to add further detail to the associated definition.

A colour code was given to the term after the consensus:

- one-to-one mapping
- partial mapping
- one-to-n mapping
- n-to-one mapping
- one-to-none mapping

Once the mapping had been approved by all experts, the separate tables were merged into a single table (Appendix A).

Table 1. Overview of the degree to which patient problems could be mapped onto classifications.

Vocabulary	**Total patient problems (subset) N = 119**				
	one-to-one mapping	partial mapping	one-to-n mapping	n-to-one mapping	one-to-none mapping
Omaha System	36 (30%)	7 (6%)	4 (3%)	61 (51%)	11 (9%)
NANDA-I diagnoses	42 (35%)	7 (6%)	5 (4%)	27 (23%)	38 (32%)
ICF	47 (39%)	9 (8%)	1 (1%)	50 (42%)	12 (10%)

Results

For each mapping type, Table 1 states how many of the 119 patient problems of the subset were semantically mapped onto the classifications. Appendix A in Supplementary material gives an explanation of the mapping results.

The Omaha System

Thirty-six of the 119 patient problems from the subset (30%) turned out to be synonymous with problems within the Omaha System (see Appendix A in Supplementary material, green colour codes). An example is "incontinence of faeces" (subset) and 'incontinent of stool' (Omaha System).

Additionally, the terms for seven patient problems (6%) partially matched. An example is 'diversional activity deficit' (subset) and 'minimal outside stimulation/leisure time activities', within 'social contact' as an actual problem (Omaha System). The problems overlap: both are issues involving leisure time, but leisure time activities can also refer to activities at home.

There are four (3%) patient problems that the Omaha System is more specific about than the subset (one-to-n mapping) (see Table 2).

Sixty-one out of the 119 patient problems from the subset (51%) are more specific than the areas of concern or signs/symptoms from the Omaha System. Thirty-seven out of these 61 patient problems have been mapped onto one area of concern. An example is 'dyspnoea' (subset) which has been mapped to the 'respiration' area of concern (Omaha System). Although that the patient problem is fully covered by the area of concern, it is neither identical nor included as a synonym within the Omaha System as a sign/symptom. In addition, 24 patient problems are part of a sign/symptom. Some patient problems have been mapped onto the same sign/symptom. For example, one of the signs/ symptoms within the 'skin' area of concern is a 'lesion/pressure ulcer'. Various types of wounds (such as burns to the skin and pressure sores) have been included in the subset, which are then all mapped using the same 'lesion/pressure ulcer' symptom. In these cases, the patient problems are more specific than the signs/ symptoms.

No suitable single area of concern or sign/symptom was found in the Omaha System for 11 patient problems (9%). These included 'inadequate social support', 'impaired home

maintenance management', 'difficulty coping' and 'low self-control' – see Appendix A in Supplementary material.

Table 2. Overview of one-to-n mapping.

	Subset	Omaha System
1.	problem with menstruation	abnormal menstrual pattern
2.	fertility problem	infertility
3.	difficulty performing dressing activities	difficulty dressing lower body/difficulty dressing upper body
4.	impaired touch discrimination	decreased sensation, increased sensation

The NANDA-I diagnoses

42 of the 119 patient problems (35%) turned out to be one-to-one comparable with a NANDA-I diagnosis, such as 'difficulty performing toileting activities' (subset) and 'toileting self-care deficit' (NANDA-I diagnosis).

A partial mapping for the NANDA-I A diagnosis was determined for 7 patient problems (6%). An example is 'victim of abuse' (subset) and 'risk of post traumatic syndrome' (NANDA-I diagnosis). Although being a victim of abuse is a risk factor for post-traumatic syndrome, it is not the same as the risk itself.

There are five patient problems (4%), such as 'urinary incontinence', 'fluid imbalance' and 'difficulty coping', where the NANDA-I diagnoses is more specific than the patient problems from the subset (see Appendix A in Supplementary material).

Additionally, 27 patient problems from the subset (23%) were mapped to a higher level (n-to-one mapping). One example is 'physical aggression' and 'verbal aggression' (subset) which are mapped using the same NANDA-I diagnosis, 'risk of violence directed at others'. Other comparable examples are the patient problems 'burn to the skin', 'eruption of the skin' and 'eczema'. These are all mapped using the 'impaired skin integrity' NANDA-I diagnosis.

No corresponding or related NANDA-I diagnoses were found for 38 (32%) of the patient problems. Examples are 'disorientated', 'manic mood', and 'housing problems'.

ICF

Forty-seven of the 119 patient problems (39%) turned out to be one-to-one comparable to an ICF target term. An example is ‘pain’.

Nine patient problems (8%) were mapped as ‘partial’. An example is ‘difficulty coping’ from the subset, which is linked to problems with ‘cognitive flexibility & handling stress and other psychological demands’ (ICF).

One patient problem (1%), ‘sexuality-related problem’ (subset), has been mapped into two more specific terms in the ICF, namely ‘sexual functions’ and ‘intimate relationships’ (see also Appendix A in Supplementary material).

Fifty patient problems from the subset (42%) are more specific than the problems from the ICF, such as ‘aphasia’ (subset) and ‘mental functions of language’ (ICF).

No corresponding terms were found for twelve of the patient problems (10%). Examples are: ‘feeling lonely’, ‘at risk of loneliness’, ‘at risk of undernutrition’ (see also Appendix A in Supplementary material).

Discussion

The purpose of this study was to develop a mapping between the SNOMED CT subset of patient problems onto three classification systems. This national mapping is important for nursing practice in order to improve the exchangeability of data. The patient problems have been mapped to the classifications using a unidirectional mapping. Various studies into mapping data have been performed [17,29,32–36], but to our knowledge, no validated national or international SNOMED CT mappings to an NANDA-I, Omaha System or ICF classification in either direction have been defined by the organisations involved (IHTSDO, Omaha System, NANDA-I and the World Health Organization (ICF)).

Our study shows that there is a lot of variation between classifications in structure and in the degree of detail. This influences whether or not terms from the subset of patient problems can be mapped. The highest percentage of one-to-one relationships was with the ICF at 39%, as against 30% for the Omaha System and 35% for the NANDA-I diagnoses. Despite these superficially comparable percentages of between 30% and 39%, in most cases a patient problem that has a one-to-one relationship in one classification does not in the other classifications. A total of six of the 119 patient problems (5%) were mapped one-to-one in all three classification systems. These are:

- abnormal body temperature
- difficulty performing toileting activities
- difficulty performing washing and drying activities
- difficulty transferring location
- incontinence of feces
- ineffective breathing pattern

Only these six patient problems can always be interchanged; information loss occurs in all other cases. If we look at studies about mapping data, comparable results are described: exchange is possible, but loss of information will occur [35,36].

Another finding is that various patient problems get mapped to a higher hierarchic level that is encoded as an 42 area of concern (Omaha System) or 17 chapters (ICF). The NANDA-I diagnoses are grouped into 13 domains and 47 classes. These domains and classes (2015–2017 edition), in the documentation used for this study, are not encoded. Therefore, it was not possible to map the patient problems of the subset to the higher hierarchic domains or classes. It is possible that this is the reason why the

percentage of patient problems one-to-none mapping is highest for the NANDA-I at 32%, as compared to the 9% for the Omaha System and 11% for ICF.

In our opinion, how these one-to-n or n-to-one relationships should be dealt with depends on the purpose of the mapping, namely data exchange: whatever is transferred from system A to system B must be interpreted correctly by the receiving party. That principle has guided the way the mapping has done. For example, if the sending party states that a 'sexuality-related problem' (subset) is involved, will the receiving party be able to translate this into one of the more specific terms 'ineffective sexuality pattern' and 'sexual dysfunction' (NANDA-I diagnoses)? It is important to determine, together with the suppliers and users, if any options are possible and practical for making sure data can be exchanged without interpretation errors. In addition, rules should be drawn up for suppliers and users when the mapping is used. For the quality of the mapping it is also important to evaluate those rules in terms of the risk of incorrect interpretation and loss of information. As far as we know, little research has been performed into implementing mapping in electronic medical records and the effects of mapping on data exchange.

Implications for nursing practice

This study showed how complex mapping between multiple classifications can be. In order to utilise the potential of this mapping, we believe that structural cooperation with suppliers, care organisations and the experts involved is required to ensure interchangeability of the data used by nurses in their day-to-day practice. It is also important to determine, together with nurses, whether further detailing is required and how this further detailing relates to other classifications. If, for instance, the various types of urinary incontinence (NANDA-I diagnoses) are added to the national subset, the addition will also affect the mapping to the Omaha System or the ICF. This is because these specifications are not included in those classifications. It is important to determine through practical research which patient problems are most frequently exchanged and which specifications are required.

Research strengths and limitations

A key strength of this study was that the experts involved had extensive knowledge of and also were involved in the development of at least one specific classification. Nevertheless, determining the mapping types is also a process between experts: between 6% and 8% of the patient problems were mapped partially as a result of

consensus between the experts. This could be a limitation. On the other hand, the method for mapping was based on ISO model 18104 [28], which made it possible to unravel patient problems so that the experts could determine the mapping as objectively as possible.

Although we have performed an extensive unidirectional mapping process, a bidirectional mapping is required in order to exchange information. This might be a possible limitation. Bidirectional mapping also reverses the process: the source terms become target terms and a map is constructed in the reverse direction too [17,18]. The advantage is that this makes exchanges possible in both directions. However, bidirectional mapping is complex as one-to-n relationships are involved in many situations. In these situations, the sender has to determine whether the target terms are interpreted correctly by the receiving party, or whether the source term should be retained. Therefore unidirectional mapping is necessary and an important first step in order to exchange data and to increase the comparability of data.

Conclusion

This study mapped the Dutch subset of patient problems onto three classifications in order to enable automated exchange of digital data. Information loss occurs in most cases if patient problems are exchanged without supplementary information being added. In total, only six of the 119 patient problems (5%) have been mapped one-to-one in all the classifications. This is because the classifications differ in terms of their structures and the degree of detail at various levels. Structural cooperation between the suppliers, nursing organisations and experts involved is therefore required in order to evaluate whether the mapping is usable in day-to-day practice.

Contributions by the authors

RK, EV and EG helped design the study, helped in the data collection and -analysis phase. HGW, CvG, NK and HtN helped collect and analyse the data, and have provided comments on the article. ALF and DD helped design the structure of the study and formulate the research questions, helped draw up the article and provided comments on it.

Statement on conflicts of interest

The authors declare that they have no conflicting interests. This study has not received

any specific subsidies from public, commercial or non-profit organisations.

Summary points

What do we know?

- Different terms in nursing practice and data cannot always be exchanged properly
- A Dutch SNOMED CT subset has been developed to make digital exchange possible
- A mapping is required if data is to be exchanged with systems using classifications
- What has been learned from this research?
- The results of mapping against SNOMED CT are different for each classification
- Only six of the patient problems are always exchangeable
- In most cases, information loss will occur
- Cooperation between suppliers, experts and nurses is required

Appendix A. Final mapping subset patient problems - classifications

Supplementary data associated with this article can be found, in the online version, at https://doi.org/10.1016/j.ijmedinf.2017.12.025.

Overview mapping totals (%)

Legend	Omaha System	Total (%)	Nanda-I	Total (%)	ICF	Total (%)
one-to-one mapping	one-to-one	36 (30%)	one-to-one	42 (35%)	one-to-one	47 (39%)
partial mapping	partial	7 (6%)	partial	7 (6%)	partial	9 (8%)
one-to-n mapping	one-to-n	4 (3%)	one-to-n	5 (4%)	one-to-n	1 (1%)
n-to-one mapping	n-to-one	61 (51%)	n-to-one	27 (23%)	n-to-one	50 (42%)
one-to-none mapping	one-to-none	11 (9%)	one-to-none	38 (32%)	one-to-none	12 (10%)
		119 (100%)		**119 (100%)**		**119 (100%)**

Results final mapping

Snomed FSN	Text definition	Snomed ID	Omaha System	Code	Nanda-I diagnoses	Domain and code	ICF	Code
abnormal body temperature (finding)	problem with the body temperature, measured in ° C (degrees Celsius). body temperature is defined by 'internal body heat related to body metabolism' (ICNP)	123979008	neuro-musculo-skeletal function: difficulty with thermoregulation	2715	ineffective thermoregulation	domain 11, class 6, 00008	body temperature	b5500
abnormal defecation (finding)	problem with movement and evacuation of stool through the bowel (ICNP)	179950008	bowel function	31 (A)			defecation functions	b525
acute confusion (finding)	image of acute and chronic change, often fluctuating which includes attention deficit disorder and consciousness and changes in cognition (memory, orientation, language) or observation (guideline delirium adults and elderly; NVKG 2013)	130987000	cognition	23 (A)	acute confusion	domain 5, class 4, 00128	consciousness functions orientation functions	b110 b114
acute pain (finding)	pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage (Guideline postoperative pain; 2012)	274663001	pain	24 (A)	acute pain	domain 12, class. 1, 00132	pain	b280
alcohol abuse (disorder)	misuse of alcohol for a non-therapeutic effect that may be harmful to health and may cause addiction (ICNP)	15167005	substance abuse: abuses alcohol	3902	risk-prone health behaviour	domain 1, class 2, 00188	craving maintaining one's health	b1303 d5702
altered body image (finding)	problem with the mental picture of one's own body in whole or in part, or of one's physical appearance (ICNP)	225507001			disturbed body image	domain 6, class 3, 00118	body image	b1801
anxiety (finding)	a sense of threat, danger or stress, without concrete content and not related to an object (ICNP)	48694002	mental health: apprehension/ undefined fear	1202	anxiety	domain 9, class 2, 00146	range of emotion	b1522

Snomed FSN	Text definition	Snomed ID	Omaha System	Code	Nanda-I diagnoses	Domain and code	ICF	Code
aphasia (finding)	defective or absent language function of using and understanding words together with damage to certain parts of the brain (ICNP)	87486003	speech and language; absent/ abnormal ability to speak/vocalize	2101	impaired verbal communication	domain 5, class 5, 00051	mental functions of language	b167
at risk for falls (finding)	an unintended change of the body position, which results in landing on the floor or any other lower level (Guideline prevention of fall incidents of elderly; CBO,2004)	129839007	neuro-musculo-skeletal function	27 (P)	risk for falls	domain 11, class 2, 00155		
at risk for infection (finding)	risk for infection. Infection is defined by 'an invasion of the body by pathogenic microorganisms that reproduce and multiply, causing disease by local cellular injury, secretion of toxin or antigen-antibody reaction' (ICNP)	78648007	communicable/ infectious condition: infection	50 (P)	risk for infection	domain 11, class 1, 00004		
at risk for suicide (finding)	risk for suicide. Suicide is defined by 'performing suicidal activities which lead to death of self' (ICNP)	225444004	mental health	12 (P)	risk for suicide	domain 11, class 3, 00150		
at risk of acute confusion (finding)	image of acute and chronic change, often fluctuating which includes attention deficit disorder and consciousness and changes in cognition (memory, orientation, language) or observation (guideline delirium adults and elderly; NVKG 2013)	423192007	cognition	23 (P)	at risk of acute confusion	domain 5, class 4, 00173		
at risk of constipation (finding)	risk for decrease in the frequency of defecation accompanied by difficulty or incomplete passage of stool; passage of excessively hard, dry stool (ICNP)	129691005	bowel function	31 (P)	at risk of constipation	domain 3, class 2, 00015		
at risk of loneliness (finding)	at risk for the subjective experience of a pleasurable or unacceptable lack of (quality of) certain social relationships (De Jong Gierveld, Tilburg; 2007/ Platform ouderenzorg)	129698004	mental health	12 (P)	at risk of loneliness	domain 6, class1, 00054		

Snomed FSN	Text definition	Snomed ID	Omaha System	Code	Nanda-I diagnoses	Domain and code	ICF	Code
at risk of pressure ulcer (finding)	at risk for a localized damage to the skin and/or underlying tissue, mostly at the level of a bony prominence, as a result of pressure or pressure in combination with sliding force (National multidisciplinary guideline pressure ulcer prevention and treatment; V&VN, nov 2011)	285304000	skin: lesion/pressure ulcer	26 (P)	at risk of pressure ulcer	domain 11 , class 2, 00249		
at risk of undernutrition (finding)	at risk for a nutritional status in which there is a deficiency or imbalance of energy, protein, and/or other nutrients, which leads to measurable adverse effects on the body size and body composition, on the functioning and on clinical outcomes (Guideline screening and treatment of undernutrition, stuurgroep ondervoeding; June 2011)	129845004	nutrition	35 (P)				
blood pressure alteration (finding)	problem with effects of fluctuating blood pressure. Blood pressure is defined by 'the force of circulating blood on blood vessel walls, or the hydrostatic pressure exerted by the blood on the vasculature of the arteries' (ICNP)	129899009	circulation: abnormal blood pressure reading	2908			maintenance of blood pressure	b4202
body temperature above reference range (finding)	decreased ability to change internal thermostat accompanied by increased body temperature, warm dry skin, drowsiness and headache associated with dysfunction of the central nervous system or endocrine system (ICNP)	50177009	neuro-musculo-skeletal function: difficulty with thermoregulation	2715	hyperthermia	domain 11, class 6, 00007	body temperature	b5500

Snomed FSN	Text definition	Snomed ID	Omaha System	Code	Nanda-I diagnoses	Domain and code	ICF	Code
burn of skin (disorder)	an injury due to the influence of heat on the skin for a certain period of time and above a certain critical temperature, above the critical temperature (+/- 40° C) occurs damage to the skin (Association of Dutch Burn Centres http://brandwondenstichting.nl/brandwonden-voorkomen/wat-zijn-brandwonden/)	284196006	skin: lesion/pressure ulcer	2601	impaired skin integrity impaired tissue integrity	domain 11, class 2, 00046 domain 11, class 2, 00044	protective functions of the skin structure of areas of skin	b810 s810
caregiver difficulty performing caretaking (finding)	problem with personal care; unpaid and often long-term care for sick family members or friends (more than eight hours per week and/or longer than three months) (https://www.rijksoverheid.nl/onderwerpen/mantelzorg)	705044006	caretaking/parenting	14 (A)	caregiver role strain	domain 7, class 1, 00061	immediate family extended family friends acquaintances, peers, colleagues, neighbours and community members	e310 e315 e320 e325
chronic pain (finding)	pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage (Concept care standard chronic pain; 2016)	82423001	pain	24 (A)	chronic pain	domain 12, class 1, 00133	pain	b280
obsessional thoughts (finding)	persistent thought or idea that the mind is constantly and involuntarily working on (http://www.psychischegezondheid.nl/)	67698009	mental health	12 (A)			control of thought	b1603
compulsive gambling (disorder)	extensively gambling with an effect that may be harmful to health (ICNP)	18085000	mental health	12 (A)	risk-prone health behaviour	domain 1, class 2, 00188	maintaining one's health	d5702
compulsive video gaming (disorder)	extensively gaming with an effect that may be harmful to health (ICNP)	12551000146107	mental health:	12 (A)	risk-prone health behaviour	domain 1, class 2, 00188	maintaining one's health	d5702

Snomed FSN	Text definition	Snomed ID	Omaha System	Code	Nanda-I diagnoses	Domain and code	ICF	Code
delusions (finding)	false sense of reality that cannot be corrected by reason, argument or persuasion or by evidence of one's own senses (ICNP)	2073000	mental health: delusions	1217			content of thought	b1602
depressed mood (finding)	feelings from sadness to melancholy with decreased concentration, loss of appetite and insomnia (ICNP)	366979004	mental health:	12 (A)	chronic sorrow	domain 9, class 2, 00137	emotional functions	b152
diarrhea (finding)	Passage of loose, liquid, unformed stool, increased frequency of elimination accompanied by increased bowel sounds, cramping and urgency of defecation (ICNP)	62315008	bowel function: abnormal frequency/ consistency of stool	3101	diarrhea	domain 3, class 2, 00013	defecation functions	b525
difficulty changing position (finding)	problem with getting into and out of a body position and moving from one location to another, such as getting up out of a chair to lie down on a bed, and getting into and out of positions of kneeling or squatting [ICF]	303387009	neuro-musculo-skeletal function	27 (A)	impaired physical mobility impaired bed mobility	domain 4, class 2, 00085 domain 4, class 2, 00091	changing basic body position	d410
difficulty complying with treatment (finding)	problem with performing activities to meet therapeutic health care requirements and conform to the prescribed treatment course of the caregiver and the healthcare provider (Time for better use of medicines; NPCF, 2008)	304900007	health care supervision	41 (A)	noncompliance	domain 1, class 2, 00079	maintaining one's health	d5702
difficulty coping (finding)	problem with managing stress and having a sense of control and increased psychological comfort (ICNP)	18232000			ineffective coping defensive coping	domain 9, class 2, 00069 domain 9, class 2, 00071	cognitive flexibility handling stress and other psychological demands	b1643 d240
difficulty drinking (finding)	problem with taking fluids during meals and during the day or when thirsty (ICNP)	288857007			feeding self-care deficit	domain 4, class 5, 00102	drinking	d560

Snomed FSN	Text definition	Snomed ID	Omaha System	Code	Nanda-I diagnoses	Domain and code	ICF	Code
difficulty establishing relationships (finding)	difficulty in starting an engagement with one or more persons (ICNP)	423238001	internal relationship; difficulty establishing/ maintaining relationships	901	impaired social interaction	domain 7, class 3, 00052	forming relationships	d7200
Self-feeding deficit (finding)	problem with bringing food to the mouth and feeding oneself until satisfied (ICNP)	7653001			feeding self-care deficit	domain 4, class 5, 00102	eating	d550
difficulty inferring meaning (finding)	problem to understand information with the mind, both verbally and nonverbally [ICF]	310825003	speech and language: absent/ abnormality to understand	2102			communicating - receiving	d310-d329
difficulty maintaining a position (finding)	staying in the same body position as required, such as remaining seated or remaining standing [ICF]	282851000	neuro-musculo-skeletal function:	27 (A)			maintaining a body position	d415
difficulty maintaining relationships (finding)	problem maintaining contact within a relationship with one or more persons under the social rules in the company (ICNP)	424573006	internal relationship; difficulty establishing/ maintaining relationships	901	ineffective relationship	domain 7, class 3, 00223	forming relationships	d7200
difficulty making conversation (finding)	problem with making a conversation or verbal communication between two or more persons (SNOMED CT hierarchy)	288638001	speech and language	21 (A)	impaired verbal communication	domain 5, class 5, 00051	conversation	d350
difficulty managing medication (finding)	problem with the independently use and administration of medication (ICNP)	285038001	medication	42 (A)	ineffective health management	domain 1, class 2, 0078	maintaining one's health	d5702
difficulty managing personal financial activities (finding)	problem with caring for and managing personal money/capital (ICNP)	300686005	income; difficulty with money management	103			economic life	d860- 879

Snomed FSN	Text definition	Snomed ID	Omaha System	Code	Nanda-I diagnoses	Domain and code	ICF	Code
difficulty performing dressing activities (finding)	problem with putting on or removing clothes (ICNP)	284972002	personal care: difficulty dressing lower body/ difficulty dressing upper body	3808 -3809	dressing self-care deficit	domain 4, class 5, 00109	dressing	d540
difficulty performing mouthcare activities (finding)	problem taking care of mouth and teeth/molars or dentures (SNOMED CT hierarchy)	289128002	personal care: difficulty brushing/ flossing/mouth care	3805	bathing self-care deficit	domain 4, class 5, 00108	caring for teeth	d5201
difficulty performing personal grooming activity (finding)	problem with brushing and in other ways look after and clean the hair and nails (ICNP)	704439001	personal care: difficulty shampooing/ combing hair	38 (A)	bathing self-care deficit	domain 4, class 5, 00108	caring for body parts	d520
difficulty performing shopping activities (finding)	problem with buying items necessary for maintaining daily life; purchasing, trading or bartering for items needed for the home (ICNP)	300723007			impaired home maintenance	domain 4, class 5, 00098	acquisition of goods and services	d6200
difficulty performing toileting activities (finding)	problem with carrying out toileting activities for urination and defecation (ICNP) and take care of oneselves	284905001	personal care: difficulty with toileting activities	3807	toileting self-care deficit	domain 4, class 5, 00110	toileting	d530
difficulty performing washing and drying activities (finding)	problem with the washing and drying of the entire body, or body parts, such as bathing, showering, washing of hands and feet, face and hair (ICNP)	288552005	personal care: difficulty with bathing	3802	bathing self-care deficit	domain 4, class 5, 00108	washing oneself	d510

Snomed FSN	Text definition	Snomed ID	Omaha System	Code	Nanda-I diagnoses	Domain and code	ICF	Code
difficulty preparing food for eating (finding)	problem with taking care of providing food and meals in terms of quantity and quality, processing of food, storing of food, serving and distribution of food necessary for maintaining daily life (ICNP)	286457005	nutrition: unable to obtain/prepare food	3514	impaired home maintenance	domain 4, class 5, 00098	preparing meals	d630
difficulty transferring location (finding)	problem with moving from one surface to another, such as sliding along a bench or moving from a bed to a chair, without changing body position [ICF]	714884000	neuro-musculo-skeletal function: difficulty transferring	2713	impaired transfer ability	domain 4, class 2, 00090	transferring oneself	d420
difficulty using self-expression (finding)	problem with specific mental functions necessary to produce meaningful messages in spoken, written, signed or other forms of language [ICF]	288742009	speech and language:	21 (A)			communicating - producing	d330-d349
disorientated (finding)	problem with ascertaining relationship to environment in terms of time; in terms of place at a given point in time and in terms of awareness of own identity and in terms of recognition of people around (ICNP)	62476001	cognition: disoriented to time/ place/person	2302			orientation functions	b114
disorientated in place (finding)	problem with ascertaining relationship to environment in terms of place at a given point in time such as country, province, city, workplace, home (ICNP)	72440003	cognition: disoriented to time/ place/person	2302			orientation to place	b1141
disorientated in time (finding)	problem with ascertaining relationship to environment in terms of time such as year, season, month, day, precise time (ICNP)	19657006	cognition: disoriented to time/ place/person	2302			orientation to time	b1140
disorientation for person (finding)	problem with ascertaining relationship to environment in terms of awareness of own identity such as age, date of birth and in terms of recognition of people around (ICNP)	62766000	cognition: disoriented to time/ place/person	2302			orientation to person	b1142

Snomed FSN	Text definition	Snomed ID	Omaha System	Code	Nanda-I diagnoses	Domain and code	ICF	Code
disturbance in role performance (finding)	problem with interacting according to implicit or explicit set of expectations, rules and standards of behaviour expected by others (ICNP)	27179007	role change	08 (A)	ineffective role performance	domain 7, class 3, 00055	interpersonal interactions and relationships	d7
disturbance in speech (finding)	problem with the production of various sounds by the passage of air through the larynx [ICF]	29164008	speech and language	21 (A)			voice functions	b310
disturbance of attention (finding)	focused attention and mental activity to store and recall knowledge (ICNP)	76039005	mental health; narrowed to scattered attention/ focus	1213			sustaining attention	b1400
disturbance of consciousness (finding)	problem with mental responsiveness to impressions from a combination of the senses, keeping the mind alert and sensitive to the external environment (ICNP)	3006004	consciousness	25 (A)			consciousness functions	b110
diversional activity deficit (finding)	problem with spending time on diversional activities like hobbies, sport, recreation (SNOMED CT hierarchy)	23935006	social contact: minimal outside stimulation/leisure time activities	703	deficient diversional activity	domain 1, class 1, 00097	recreation and leisure	d920
drug abuse (disorder)	misuse of drugs or medication for a non-therapeutic effect that may be harmful to health and may cause addiction (ICNP)	26416006	substance use: abuses over the counter/ prescription medications/ uses 'street' recreational drugs	3908 - 3909	risk-prone health behaviour	domain 1, class 2, 00188	craving maintaining one's health	b1303 d5703

Snomed FSN	Text definition	Snomed ID	Omaha System	Code	Nanda-I diagnoses	Domain and code	ICF	Code
dyspnea (finding)	conscious experience of a disruption of breathing, in other words the feeling of inadequate breathing, an unpleasant and particularly threatening and anxious feeling. The degree of the experienced dyspnea is not dependent on the severity of the underlying cause (Guideline dyspnoe, cough and rattle; IKZ, 2005; www.oncoline.nl)	267036007	respiration	28 (A)	ineffective breathing pattern impaired spontaneous ventilation	domain 4, class 4, 00032 domain 4, class 4, 00033	sensations associated with cardiovascular and respiratory functions	b460
eczema (disorder)	itchy, polymorphic skin with redness, edema, papules, vesicles, crusts, flakes and/or lichenification, as a result of a non-infectious inflammation of the skin, caused by intrinsic and/or environmental factors (https://www.nhg.org/standaarden/samenvatting/eczeem#idp19440)	43116000	skin: inflammation	2605	impaired skin integrity	domain 11, class 2, 00046	protective functions of the skin structure of areas of skin	b810 -b 849 s810
eruption of skin (disorder)	skin eruption of erythema of different colours and protuberance, local oedema, urticaria, vesicles and itching (ICNP)	271807003	skin: rash	2602	impaired skin integrity	domain 11, class 2, 00046	protective functions of the skin structure of areas of skin	b810 s810
fatigue (finding)	feelings of decreased strength or endurance, weariness, mental or physical tiredness, and listlessness with lower capacity of physical or mental work (ICNP)	84229001	mental health: somatic complaints/ fatigue	1210	fatigue	domain 4, class 3, 00093	fatiguability	b4552
feeling agitated (finding)	condition of purposeless psychomotor excitement, restless activity, pacing, releasing of nervous tension associated with anxiety, fear or mental stress (ICNP)	24199005	mental health	12 (A)			psychomotor control	b1470

Snomed FSN	Text definition	Snomed ID	Omaha System	Code	Nanda-I diagnoses	Domain and code	ICF	Code
feeling lonely (finding)	the subjective experience of a pleasurable or unacceptable lack of (quality of) certain social relationships (De Jong Gierveld, Tilburg; 2007/ Platform ouderenzorg)	267076002	mental health	12 (A)	social isolation	domain 12, class 3, 00053		
fertility problem (finding)	problem with capacity to participate in the conception of a live foetus that delivers as a viable child (ICNP)	27034006	reproductive function: infertility	4706			functions related to fertility	b6600
finding of speed of thought (finding)	problem with an accelerated or slowed thought process (SNOMED CT hierarchy)	365276007	cognition	23(A)			pace of thought	b1600
finding related to risk factor in pregnancy (finding)	risk of complications during pregnancy. Pregnancy is the condition of growing and nurturing a developing foetus in body lasting from approximately 266 days period to birth from the day of fertilisation (ICNP)	199312002	pregnancy	48 (P)	risk for ineffective childbearing process	domain 8, class 3, 00227	functions related to pregnancy	b6601
fine motor impairment (finding)	problem with the use of the hands and fingers for small movements, the grasping and manipulation of an object (http://www.fijne-motoriek.nl/)	228148009	neuro-musculo-skeletal function:	27 (A)			fine hand use	d440
fluid imbalance (disorder)	regulation of uptake and excretion of body fluids such as the quantity and balance of water and electrolytes in the body (ICNP)	190902006	digestion-hydration	30 (A)	deficient fluid volume excess fluid volume	domain 2, class 5, 00027 domain 2, class 5, 00026	water, mineral and electrolyte balance functions	b545

Snomed FSN	Text definition	Snomed ID	Omaha System	Code	Nanda-I diagnoses	Domain and code	ICF	Code
grief finding (finding)	feelings of sorrow associated with anticipatory or actual significant loss and death; Shock and disbelief, (Stage of Shock); Exhaustion, extreme tiredness and lethargy, mental anguish, reactions of bereavement and mourning, crying or sobbing, alarm, disbelief, denial, anger (Stage of Reaction); Adjustment, acceptance, reorientation, express feelings of loss, accept reality of loss, absence of somatic stress, express positive expectations about the future (Stage of acceptance) (ICNP)	224965009	grief	11 (A)	grieving	domain 9, class 2, 00136	emotional functions	b152
hallucinations (finding)	apparent registration of sensory stimuli which are not actually present, classified according to the senses, such as auditory, visual, olfactory, gustatory or tactile hallucinations (ICNP)	7011001	mental health: hallucinations/ illusions	1218			perceptual functions	b156
hearing problem (finding)	problem with faculty of hearing due to responses to stimuli from auditory organs, capacity to hear (ICNP)	300228004	hearing	19 (A)			hearing functions	b230
housing problems (finding)	problem with the residential building, constructed for human dwelling, residence and homes, shelter providing protections and space for humans, such as unsuited to limitations in mobility, poor housing, lack of space, moisture in the house (ICNP)	105531004	residence	3 (A)			design, construction and building products and technology of buildings for private use products and technology for personal indoor and outdoor mobility and transportation	e155 e120

Snomed FSN	Text definition	Snomed ID	Omaha System	Code	Nanda-I diagnoses	Domain and code	ICF	Code
hypomanic mood (finding)	a distinct period of abnormally and persistently elevated, expansive, or irritable mood [DSM-V]	281257007	mental health	12 (A)			emotional functions	b152
hypothermia (finding)	decreased ability to change internal thermostat, reduced body temperature, cool, pale and dry skin, shivering, slow capillary refill, tachycardia, cyanotic nail beds, hypertension, piloerection associated with prolonged exposure to cold, dysfunction of the central nervous system or endocrine system (ICNP)	386689009	neuro-musculo-skeletal function: difficulty with thermoregulation	2715	hypothermia	domain 11, class 6, 00006	body temperature	b5500
impaired ability to learn new material (finding)	problem with the process of acquiring knowledge or skill by means of systematic study, instruction, practice, training or experience (ICNP)	247617009	cognition:	23 (A)	deficient knowledge	domain 5. class 4 , 00126	learning and applying knowledge	d1
impaired home maintenance management (finding)	problem with practice of care for or proper attention to making environment or dwelling place comfortable, cosy; making oneself and others feel at home; providing a secure and well managed household (ICNP)	67175002			impaired home maintenance	domain 4, class 5, 00098	doing housework	d640
impaired insight in disease	problem with the realization that (or understanding that) a person has a disease or health problem, and what the significance for life is (http://mens-en-gezondheid.infonu.nl/ziekten/82477-ziekte-ziektebesef-en-betekenis.html)	12561000146105			ineffective self-health management	domain 1, class 2, 00078		
impaired social interaction (finding)	problem with behaviour of mutual social interchange, participation and social exchange among individuals and groups (ICNP)	88598008	social contact	7 (A)	impaired social interaction	domain 7, class 3, 00052	interpersonal interactions and relationships	d7

Snomed FSN	Text definition	Snomed ID	Omaha System	Code	Nanda-I diagnoses	Domain and code	ICF	Code
impaired touch discrimination (finding)	problem with the faculty of feeling due+ to responses to stimuli from tactile organs, capacity for orientation by touch and pressure from tactile organs in integument (ICNP)	299923005	neuro-musculo-skeletal function: decreased sensation, increase sensation	2706-2707			touch function	b265
impairment of mental alertness (finding)	problem with the level of watchfulness or vigilance, paying attention to something, ready to take action (ICNP)	704426000	mental health	12 (A)			quality of consciousness	b1102
inadequate social support (finding)	lack of social or psychological help from somebody to succeed, keep from failing and to bear the weight of and maintain in position, hold up [ICNP]	425022003					support and relationships	e3
incontinence of feces (finding)	involuntary, uncontrolled passage and expulsion of stool (ICNP)	72042002	bowel function: incontinent of stool	3107	bowel incontinence	domain 3, class 2, 00014	faecal continence	b5253
ineffective breathing pattern (finding)	difficulty with pattern of moving air into and out of the lungs with a certain respiratory rate and rhythm, depth of inspiration and strength of expiration [ICNP, indirect]	20573003	respiration: abnormal breath patterns	2801	ineffective breathing pattern	domain 4, class 4, 00032	respiration functions	b440
intertrigo (disorder)	a localized superficial skin disorder in the large skin folds, which is characterized by continued redness (erythema) on both sides of the fold. In addition, one or more of the following symptoms can occur: maceration (softening), fissures (cracks), erosions, a oozing skin or crust formation (National multidisciplinary guideline (intertrigo) prevention and treatment; V&VN, 2011)	58759008	skin: inflammation	2605	impaired skin integrity	domain 11, class 2, 00046	protective functions of the skin structure of areas of skin	b810 s810
itching of skin (finding)	sensation of annoying tingling, cutaneous feeling followed by impulse to scratch skin (ICNP)	418363000	skin: pruritus	2606	risk for impaired skin integrity	domain 11, class 2, 00047	sensation related to the skin	b840

Snomed FSN	Text definition	Snomed ID	Omaha System	Code	Nanda-I diagnoses	Domain and code	ICF	Code
low self-control (finding)	problem with disposition taken to take care of what is needed to maintain oneself, keeping oneself going, handle basic individual and intimate necessities and activities in life (ICNP)	705000008			ineffective health maintenance	domain 1, class 2, 00099		
manic mood (finding)	continued abnormally elevated disinhibited state of emotion/loss of inhibition, filled with positive vitality, negating concerns and decreased need for sleep [DSM-V]	405273008	mental health	12 (A)			emotional functions	b152
memory impairment (finding)	problem with mental acts by which sensations, impressions and ideas are stored and recalled (ICNP)	386807006	cognition: limited recall of recent events, limited recall of long past events	23 (A)	impaired memory	domain 5, class 4, 00131	memory functions	b144
menstruation finding (finding)	problem with the recurring cycle of shedding, re-growth and proliferating of the endometrium of the uterus as menstruation; average length of the menstrual cycle from first day of bleeding to first of another is 28 days; length; duration and quantity vary; menstrual cycle begins at menarche and ends at the menopause (ICNP)	32301000146106 (the link will be available in the SNOMED CT release of September 2017)	reproductive function: abnormal menstrual pattern	4702			menstruation functions	b650
mood swings (finding)	problem with a varying level of feelings and emotional tone (ICNP)	18963009	mental health: mood swings	1222	impaired mood regulation	domain 9, class 2, 00241	emotional functions	b152
nausea (finding)	sensation of feeling sick with an inclination to vomit, unpleasant sensation vaguely referred to the epigastrium and abdomen, offensive to taste or smell (ICNP)	422587007	digestion-hydration: nausea/vomiting	3001	nausea	domain 12, class 1, 00134	sensation of nausea	b5350

Snomed FSN	Text definition	Snomed ID	Omaha System	Code	Nanda-I diagnoses	Domain and code	ICF	Code
obstipation (disorder)	decrease in the frequency of defecation accompanied by difficulty or incomplete passage of stool; passage of excessively hard, dry stool (ICNP)	14760008	Bowel function: abnormal frequency/ consistency of stool	3101	constipation	domain 3, class 2, 00011	defecation functions	b525
overweight (finding)	overweight among adults (18-70 years) exists as a body mass index (BMI) ≥25 (with BMI ≥30 obesity) in children is overweight diagnosed on the basis of four criteria: physique, ethnicity, puberty and fat distribution (http://www.voedingscentrum.nl/nl.aspx)	238131007	nutrition: overweight: adult BMI 25.0 or more; child 95th percentile or more	3512	overweight	domain 2, class 1, 00233	weight maintenance functions	b530
pain (finding)	an unpleasant sensory and emotional experience, where the experience of pain is what a person experiencing the pain says it is and is present whenever he/she says that it's present (NHG-Werkgroep Pijn. NHG-Standard pain. Primary care law 2015;58(9):472-85)	22253000	pain	24 (A)			pain	b280
permanently unable to perform work activities due to medical condition (finding)	ongoing problem with the extent and manner in which people participate in work (SNOMED CT hierarchy)	440584001					acquiring, keeping and terminating a job	d845
physical aggression (finding)	forceful demonstration of actions or unjust use of force or power with the purpose to injure or damage, mistreat or assault: Violent, assaulting, harmful, illegal or cultural prohibited actions toward something or someone else; state of power struggle or conflict (ICNP)	248004009	mental health: irritable/agitated/ aggressive	1214	risk for other-directed violence	domain 11, class 3, 00138	regulating behaviours within interactions	d7202

Snomed FSN	Text definition	Snomed ID	Omaha System	Code	Nanda-I diagnoses	Domain and code	ICF	Code
poor long-term memory (finding)	problem with the ability to recall or remember past events or experiences (ICNP)	247588002	cognition: limited recall of long past events	2304	impaired memory	domain 5, class 4, 00131	long-term memory	b1441
poor short-term memory (finding)	problem with the ability to recall or remember recent events or experiences (ICNP)	247592009	cognition: limited recall of recent events	2303	impaired memory	domain 5, class 4, 00131	short-term memory	b1440
preoccupation (finding)	dominating and engrossing the mind to the exclusion of other thoughts or being mentally distracted (ICNP)	247632002	mental health	23 (A)			control of thought	b1603
pressure ulcer (disorder)	a localized damage to the skin and/or underlying tissue, mostly at the level of a bony prominence, as a result of pressure or pressure in combination with sliding force (National multidisciplinary guideline pressure ulcer prevention and treatment; V&VN, nov 2011)	399912005	skin: lesion/pressure ulcer	2601	impaired skin integrity	domain 11, class 2, 00046	protective functions of the skin structure of areas of skin	b810 s810
retention of urine (disorder)	involuntary accumulation of urine in bladder, incomplete emptying of bladder associated with a loss of muscle function in bladder, side effects of narcotics or damage to bladder (ICNP)	267064002	urinary function: difficulty emptying bladder	4605	urinary retention	domain 3, class 1, 00023	urination	b6200
self-injurious behaviour (finding)	performing of self initiated activities with the purpose of hurting or damaging oneself, violence directed towards oneself (ICNP)	248062006	Mental health: self-mutilation	1221	self-mutilation	domain 11, class 3, 00151	maintaining one's health	d5702
sense of smell impaired (finding)	problem with the faculty of smelling due to responses to stimuli from olfactory organs, capacity to smell odours (ICNP)	83156004	neuro-musculo-skeletal function:	27 (A)			smell function	b255

Snomed FSN	Text definition	Snomed ID	Omaha System	Code	Nanda-I diagnoses	Domain and code	ICF	Code
sexuality related problem (finding)	problem with the ability of participating in intimacy and sexual intercourse; Sexuality includes all feelings, thoughts, beliefs, fantasies, desires and behaviours that are sexually oriented (ICNP)	106143002	sexuality	13 (A)	ineffective sexuality pattern sexual dysfunction	domain 8, class 3, 00065 domain 8, class 3, 00059	sexual functions intimate relationships	b640 d770
sleep pattern disturbance (finding)	problem with sleeping. Sleeping is defined by 'Recurring lowering of bodily activity marked by reduced consciousness, not awake accompanied with, not aware, depressed metabolism, immobile posture, diminished bodily activity, diminished but readily reversible sensitivity to external stimuli' (ICNP)	26677001	sleep and rest patterns	36 (A)	disturbed sleep pattern	domain 4, class 1, 000198	sleep functions	b134
swallowing problem (finding)	problem with the passage of fluids and decomposed food from mouth by movement of tongue and muscles through throat and oesophagus to stomach (ICNP)	399122003	digestion-hydration: difficulty/inability to chew/ swallow/ digest	3002	impaired swallowing	domain 2, class 1, 00103	swallowing	b5105
taste sense altered (finding)	problem with the faculty of tasting due to responses to stimuli from gustatory organs, capacity to taste food and drink (ICNP)	271801002	neuro-musculo-skeletal function:	27 (A)			taste function	b250
temporarily unable to perform work activities due to medical condition (finding)	temporarily problem with the extent and manner in which people participate in work (SNOMED CT hierarchy)	440337002					acquiring, keeping and terminating a job	d859

Snomed FSN	Text definition	Snomed ID	Omaha System	Code	Nanda-I diagnoses	Domain and code	ICF	Code
tobacco dependence syndrome (disorder)	misuse of tobacco for a non-therapeutic effect that may be harmful to health and may cause addiction (ICNP)	89765005	substance use: smokes/ uses tobacco products	3903	risk-prone health behaviour	domain 1, class 2, 00188	craving maintaining one's health	b1303 d5704
undernourished (finding)	nutritional status in which there is a deficiency or imbalance of energy, protein, and/or other nutrients, which leads to measurable adverse effects on the body size and body composition, on the functioning and on clinical outcomes (Guideline screening and treatment of undernutrition, stuurgroep ondervoeding; juni 2011)	248325000	nutrition	35 (A)	imbalanced nutrition, less than body requirements	domain 2, class 1, 00002	ingestion functions managing diet and fitness	b510 d5701
underweight (finding)	'body Mass index' (BMI) ≤18,5 (patients ≥65 year: BMI ≤20) (Guideline screening and treatment of undernutrition, stuurgroep ondervoeding; June 2011)	248342006	nutrition: underweight adult, BMI ≤18,5; child BMI ≤5th percentile	3515			weight maintenance functions	b530
urinary incontinence (finding)	involuntary passage of urine, failure of voluntary control over bladder and urethral sphincter (ICNP)	165232002	urinary function: incontinent of urine	4602	impaired urinary elimination functional urinary incontinence reflex urinary incontinence overflow urinary incontinence stress urinary incontinence urge urinary incontinence	domain 3, class 1, 00016 domain 3, class 1, 00020 domain 3, class 1, 00018 domain 3, class 1, 00176 domain 3, class 1, 00017 domain 3, class 1, 00019	urinary continence	b6202

Snomed FSN	Text definition	Snomed ID	Omaha System	Code	Nanda-I diagnoses	Domain and code	ICF	Code
verbal aggression (finding)	forceful, self-assertive action or attitude expressed verbally, physically or symbolically (ICNP)	248003003	mental health: irritable/agitated/ aggressive	1214	risk for other-directed violence	domain 11, class 3, 00138	regulating behaviours within interactions	d7202
victim of abuse (finding)	victim of acts of physical, emotional and sexual assault, such as rape and mistreatment (ICNP beta 2)	386702006	abuse	16 (A)	risk for post traumatic syndrome	domain 9, class 1, 00145		
visual impairment (disorder)	problem with the ability to see as a result of response to stimuli of visual organs (SNOMED CT hierarchy)	7973008	vision	20 (A)			seeing functions	b210
vomiting (disorder)	expulsion or bringing up of converted food or stomach content through the oesophagus and out of mouth (ICNP)	422400008	digestion-hydration: nausea/vomiting	3001			regurgitation and vomiting	b5106
walking disability (finding)	problem with moving body from one place to another by moving legs stepwise by self, capacity to bear weight of body and walk with effective gait within the range of speed from slow, moderate and fast pace, upstairs, downstairs, up inclines and down inclines (ICNP)	228158008	neuro-musculo-skeletal function: gait/ambulation disturbance	2709	impaired walking	domain 4, class 2, 00088	walking	d450
wound of skin (disorder)	an interruption in the continuity of the skin, usually caused by external influences. Injury of the tissue, usually associated with physical or mechanical damage; sloughing and tunnelling of the tissue (Guideline wound care, vereniging voor heelkunde; 2013)	262526004	skin: lesion/pressure ulcer	2601	impaired tissue integrity	domain 11, class 2, 00044	protective functions of the skin structure of areas of skin	b849 s810

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Chapter 8

General discussion

This thesis highlights various aspects that can play a role in providing a clear picture of nursing care. The thesis consists of two parts that are each first summarised in this closing chapter (Section 1). Additionally, the observations from parts I and II are discussed individually and then together (Section 2). Finally, there is a methodological assessment (Section 3) and notes on the implications for nursing practice, policy and research (Section 4).

General observations in Part I and Part II individually

Nurses should find out how and to what extent they contribute to outcomes that can be affected by the nursing care and also whether the care provided is in line with current professional, partly evidence-based, knowledge. A working environment in which nurses can improve their actions based on such outcome information and knowledge is essential. Part I focuses on how and to what extent nurses have influence over the quality of care. Additionally, the methodological quality of the methods used so far to gain an understanding of the quality of care has been investigated. Three sub-studies were carried out in Part I:

- The objective of the first sub-study (**Chapter 2**) was to find out from the perspective of nurses how the working environment influences patients' experiences. Patients' experiences are seen as a nursing-sensitive quality indicator because those experiences are influenced *inter alia* by the nursing care [1–3]. Nurses said that they were working in a context where the emphasis is on efficiency and productivity. Various tasks are being taken over by less qualified personnel, while the care is becoming increasingly complex. Patients are getting older and have multiple conditions at the same time. At the same time, patient-oriented care does get discussed in order to tailor care as far as possible to the needs and wishes of patients. Nurses see a distinct contradiction between providing patient-oriented care and efficiency and productivity. According to them, this is affecting the patients' experiences. They feel that they do not have much control and autonomy that would let them have an impact on this policy. Nurses record all kinds of data but hardly get any feedback about the results, making it difficult for nurses to make adjustments that would improve patients' experiences.

- Additionally, a sub-study (Chapter 3) investigated whether there is any similarity between the (subjective) perspectives of nurses on the quality of care they provide and the quantified outcomes of nursing-sensitive quality indicators for hospital care. Both perspectives give an indication of the quality of care, but it

was not known whether there was a relationship between the two. The study was carried out in six hospitals in the Netherlands, with quality indicators for screening delirium, malnourishment and pain used as objective measures. A composite score was calculated for each hospital in order to determine the general performance with regard to screening delirium, malnourishment and pain. This score ranged between 63 and 93% for the various hospitals. To investigate the subjective quality of care, nurses had to give a score on a scale from 0 to 10 as a response to the question "How would you rate the quality of the patient care at your hospital department?" where a quality figure of 1 means 'dangerously low' and 10 is 'high'. The majority (91%) of the 2338 nurses in the six hospitals were satisfied with the quality of the care and gave scores of ≥ 6. A high degree of similarity (rS = 0.94) was found between the two quality measures (objective versus subjective). This means that there is convergent validity of nursing quality indicators as a measurement for the quality of nursing care.

- Finally, a sub-study was set up to investigate the methodological quality of mandatory nursing-sensitive indicators for the quality or hospital care in the Netherlands (Chapter 4), including the quality indicators for wound care and screening for malnourishment, delirium and pain. First of all, a desk study was carried out to find publicly available documents and reports describing the development of these quality indicators. Subsequently, a validated tool for the assessment of indicators – the AIRE tool – was used to evaluate the methodological quality [4]. Although the objectives and the relevance of each individual quality indicator were described, there was no detailed information about the criteria for selecting these subjects. It was unclear which specific interested parties had participated in the development and how their input was used. No information was found about how the collection and compilation of scientific evidence was done. It was also unclear whether the usability of the quality indicators had been tested. For that reason, a question arose as to what extent the quality indicators are accurate and valid enough to identify changes or improve nursing practice.

The second part of the thesis focuses on the question of which patient problems should be defined and recorded at the source once to allow data to be exchanged and used multiple times. The sub-studies in this part of the thesis are based on the principle that nurses and patients must have unambiguous data that is usable as information about nursing-sensitive outcomes (shared decision-making) and nursing care quality (to learn and improve), performance, policy and regulation. Three sub-studies were carried out:

- **Chapter 5** maps out the patient problems that are commonest in care practice in the Netherlands and to what extent nurses feel they have an influence on preventing or reducing these patient problems. A total of 440 nurses were shown seventeen categories of problems that were then detailed further as specific patient problems. The respondents stated how often the specific patient problems occurred and how much influence they had on preventing or reducing these patient problems. The numbers of patient problems occurring were mapped out in a 2x2 matrix against the level of influence the nurses felt they had:

  - quadrant 1: common and a lot of influence
  - quadrant 2: common but little influence
  - quadrant 3: rare and a lot of influence
  - quadrant 4: rare but little influence

When looking at the patient problems in quadrants 1 and 3 (a lot of influence), it is noticeable that nurses felt that they exerted a lot of influence on all the patient problems related to six categories: skin and related structures; important aspects of life; general tasks and requirements; communication; mobility; and caring for themselves. On the other hand nurses felt that they did not have much influence (quadrants 2 and 4) on all the patient problems in three categories: voice and speech; functioning of the motor system; and social life and living in society. It is also striking that nurses felt that they exerted little influence over the majority of the patient problems in the mental functions category (such as problems with memory, orientation, attention and intellectual functions), although this category occurs every day according to the respondents. The results of this study gave a picture of relevant patient problems from a nursing perspective.

- In the following sub-study a core set of unambiguously labelled patient problems based on the reference terminology SNOMED CT was developed through a qualitative study (**Chapter 6**). The overview of the 84 patient problems from the previous study (**Chapter 5**) formed the foundation. Clarity is needed if information about patient problems is to be exchanged in a meaningful way, allowing it to be reused for information about nursing-sensitive outcomes and nursing care quality, performance, policy and regulation. Under the supervision of a medical terminologist and two experts for each of these 84 patient problems, potentially similar or best fitting SNOMED CT concepts (term)s were chosen. The terms and concepts chosen were submitted to 67 nurses from various care sectors who were split across seven focus groups. Each focus group discussed an average of

twelve patient problems and the associated SNOMED CT concepts. When the focus group had reached a consensus, the definitive concept was coded. The concepts on which no consensus was reached were discussed in the next focus group until a consensus was reached. Following that, the concepts were defined. Taking definitions from clinical guidelines was preferred, such as e.g. the definition of 'glitches' described in the guideline [5]. Where this was not possible, the definitions of the problems (diagnoses) described in the International Classification of Nursing Practice (ICNP) were used or, lastly, the definitions of the problems (diagnoses) in one of the classifications investigated. A striking finding was that only 20% of the patient problems could be defined based on a guideline. The definitive core set of defined and encoded patient problems contained 119 patient problems. A number of the 84 patient problems from Chapter 5 were specified further in more detailed patient problems. For example pain ('Pain and the sensation of pain') was specified as either acute pain or chronic pain.

- In the final sub-study (**Chapter 7**), a unidirectional mapping strategy was used to investigate how the core set of patient problems relates to the problems as described using three classifications, namely the Omaha System, NANDA International and ICF (the International Classification of Functioning, Disability and Health). These classifications are in fact built into the electronic health records so that nurses use the terms and definitions of patient problems in their documentation that were defined for these classifications. In this case, 'mapping' means that the meanings of the patient problems from the core set were examined to confirm that they correspond to the meanings of the patient problems from the relevant classifications [6,7]. Some 30 to 39% of the 119 patient problems can be mapped one-to-one from the core set onto each separate classification. Between 6 and 8% were mapped partially, to a related term. This is considered to be a one-to-one mapping, although the meanings do not correspond fully. Additionally, 23 to 51% of the patient problems could be mapped n-to-one, i.e. more specifically than the classification. Some loss of information will always occur in such exchanges in this case. Between 1 and 4% of the patient problems from the core set are defined less specifically than the problems within the individual classifications. Finally, it turns out that 9 to 32% of the terms from the core set of patient problems could not be mapped onto a classification, either because they did not occur in the classification or because they could not be mapped at a higher level.

The goal of such mapping was to make data exchanges possible: data about a patient problem is transferred from one electronic health record to another and the receiving

party has to be able to interpret it correctly. Further study of the mapped patient problems reveals that loss of information occurs in most cases when the patient problems are exchanged from the core set into a classification.

Reflections

The observations from Parts I and II are discussed individually (Sections a and b respectively) and then in conjunction (Section c).

a) Reflections for the general observations for Part I

The sub-studies answer the following two questions: 1) How and to what extent do nurses feel they have an influence on the quality of care? and 2) What is the methodological quality of the methods used so far to provide insights into the quality of care? In the sections below, the findings of the various sub-studies are discussed from the following perspectives:

– "Learning and improving" is insufficiently integrated into the working environment
– Nursing-sensitive quality indicators for regulation purpose

"Learning and improving" is insufficiently integrated into the working environment

The sub-study into how the working environment influences patient experiences **(Chapter 2)** showed that nurses are experiencing increasing work pressure. Pressure of work forces them to set priorities and they feel that they cannot always give patients the appropriate care and attention. Patients sometimes have to wait for the care that they are entitled to, according to nurses. Nurses do not always have time for the care they want to provide and sometimes it is difficult to tailor care to the wishes of the patient.

Another noteworthy finding is that nurses do not have a very good picture of patients' experiences during the care process. Nurses say that they get little or no feedback about the information collected for improving the quality of care, and as a result they are unable to focus on the outcomes achieved [8,9]. Apparently, focusing on patients' experiences (learning and improving) is not always properly integrated into organizations' quality policies or those of a department/team and it is not an integral part of nurses' work. "Learning and improving" (focusing on quality) means that

strategies must be used to achieve improvements and to guarantee that the levels achieved are maintained [10].

The study by Stalpers, Vos, Linden, Kaljouw and Schuurmans [11] shows that this can be promoted by clear policy and regulations that focus on monitoring nursing-sensitive outcomes. To improve the capacity to learn, it is important that healthcare providers commit to the importance of this, i.e. to the chosen approach and the results. Additionally, preconditions are needed – such as not only time and money but also IT support – to make sure that consistent data is available and that this data helps the process of learning and improving [10].

Nursing-sensitive quality indicators for regulation

At the national level, the Health and Youth Care Inspectorate uses nursing-sensitive quality indicators for regulating hospital care. These quality indicators are mainly structure and process indicators [12]. Structure indicators are related to the organization of care and its preconditions, such as the number of nurses or their qualifications. Process indicators give an indication of how the care process is progressing, such as whether or not to work with a clinical guideline or with pain measurements. Structure and process indicators are assumed to be related to the desired outcome and the influence that nurses have on it.

However, the sub-study of quality indicators from the basic set for inspection monitoring of hospital care shows that the foundations underpinning the quality indicators are not fully transparent (**Chapter 4**). As a result, it is unclear whether the chosen quality indicators are related to the desired outcome and what influence nurses have on it. Studies may have been used to support it, but that evidence has not been published.

It is clear that no agreement has been reached yet internationally about nursing-sensitive outcomes: for example, pain is seen as a nursing-sensitive outcome in Canada whereas in America it is not. Unlike in the Netherlands, malnourishment is not seen as a nursing-sensitive outcome in Canada or America; at least, malnourishment is not listed with the themes that are considered to be nursing-sensitive [1,13–15]. It is therefore important to be transparent about the way quality indicators are developed and about the underlying potential choices and considerations. That is the only way that critical scientific reflection can take place about the development and use of quality indicators.

In this context, the findings of the sub-study into the relationship between the

perceptions of nurses about the quality of care (which are subjective) and the outcomes of nursing-sensitive quality indicators (which are objective) are also interesting (**Chapter 3**). This sub-study showed a high degree of similarity (rS = 0.943) between the two types of quality measures. Although the sub-study was carried out in only six hospitals, the findings are valuable. When nurses gave the quality of care a high rating ('very satisfied'), the hospitals scored better on quality indicators aimed at screening delirium, malnourishment and pain. It could be a possible indication of a relationship between structure and process indicators and the outcome of nursing care. Follow-up research is needed to study the relationship between the two in more detail.

Conclusion and recommendations based on Part I

Part I of this thesis focuses on the question of how and to what extent nurses feel they can exert an influence on the quality of care. Additionally, the methodological quality of the methods used so far to provide insights into the quality of care has been examined.

The working environments of nurses seem to focus on control and productivity. One possible consequence may be that nurses feel that they do not get to provide the care that they want to. According to them, this is affecting the patients' experiences. Additionally, working on the quality of care in a targeted way seems to be insufficiently integrated into the working environment, so nurses cannot 'learn and improve' properly and focus on the quality of care. Insofar as nursing-sensitive quality indicators are used at a national level, they are mainly indicators that give an indication of the safety of care. The result is that measurements are mainly of what can go wrong rather than what goes well (the positive contributions nurses make to their patients' health and quality of life). Additionally, structure and process indicators are used for which it is unclear whether they are related to the desired outcome and what influence nurses have on it. The methodological quality of the quality indicators that have been adopted and the reporting on them can be improved. Accordingly, quantifying the unique contribution of nursing care to outcomes of care that are relevant for the patients is a challenge for the nursing profession.

Statements about the quality of care require not only that the quality indicators are valid and reliable but also that the data gathered is unambiguous and consistent. The data is after all the source from which the outcomes of the quality indicators are derived. However, data is recorded in electronic health records in various ways and is consequently unambiguous or incomplete. This is an important bottleneck. It is desirable that data is recorded unambiguously to guarantee consistency in the supply

of data used for quality indicators, without additional data recording overheads. A fundamental and scientific approach is needed to develop unambiguous data for nursing practice. This must be unambiguous data that can be used for various purposes: for information about nursing-sensitive outcomes (shared decision-making) and nursing care quality (to learn and improve), performance, policy and regulation. Part II of this thesis is focused on that aspect, meaning that three sub-studies have been set up that created a scientific foundation for the recording and usage of unambiguous data in nursing practice. The findings from Part II are explained in the following section.

b) Reflections for the general observations for Part II

The above-mentioned sub-studies are based on the principle that nurses must have unambiguous data that is usable for information about nursing-sensitive outcomes, nursing care quality (to learn and improve), performance, policy and regulation. In the sections below, the findings of the various sub-studies are discussed from the following perspectives:

– Cohesion between data (including patient problems), guidelines and quality indicators
– From diversity to clarity

The cohesion between data (including patient problems), guidelines and quality indicators

Chapter 5 showed that nurses feel they have a lot of influence on patient problems in the categories of 'caring for themselves', 'mobility', 'skin and related structures', 'important aspects of life', 'general tasks and requirements' and 'communication'. It is important that nurses develop knowledge backed by sufficient scientific evidence about these categories and then convert that knowledge into clinical guidelines.

Chapter 6 showed that definitions were found in the various guidelines of 24 (20%) of the 119 patient problems listed. No clinical guidelines have been developed for the majority of patient problems (such as caring for themselves) or the guideline was insufficiently well specified for nursing care (e.g. because no nursing patient problems were listed). This finding is striking and raises the question of how much scientifically backed knowledge there is either for the interventions that nurses use or for the nursing-sensitive outcomes. These findings could also be a reason for closer consideration of the relationship between recording data – in this case, patient problems – and guidelines

and quality indicators.

Nurses are increasingly expected to provide care based on the best available evidence and the knowledge and experience of nurses, as well as the values and preferences of the individual patient. A guideline usually describes the most recent scientific knowledge. Using nursing-sensitive quality indicators, which should ideally be listed in clinical guidelines, an indication can also be given of whether the interventions and actions of nurses are appropriate for the evidence-based recommendations from those guidelines. Scores for such nursing-sensitive quality indicators are based on data collected and recorded by nurses. To prevent additional data recording overheads, it must be possible to extract this data from the electronic health records or from specific data systems (such as incident and risk management systems). This data can be used to gain an understanding of the extent to which nurses affect the nursing-sensitive outcomes for individuals and populations.

The relationship between guidelines and quality indicators

The sub-study in **Chapter 6** implies that there is little scientific basis for nursing practice. That finding supports a recent manifesto called 'Quality of care, now and in the future' [16] that has received backing from prominent nurses, researchers, policy makers and managers in the Netherlands. This manifest takes a practical perspective and aims to draw attention to structural investment and ways of creating a scientific basis for nursing practice. If nurses want to evaluate the care they provide and increase their level of knowledge, it is important that they have the right information to be able to learn and further improve patient care. This makes the relationship between guidelines and quality indicators visible. This relationship does not yet look as good as it should. Although quality indicators have been included in guidelines, there is – as far as is known – little or no structural use of them to allow learning and improvement as a professional group at the national level **(see Chapter 1)**.

Quality indicators and data to be documented

Quality indicators can be used for various purposes. In the Netherlands, the basic set of quality indicators is used at a national level by the inspectorate to monitor the nursing profession. However, the sub-study in **Chapter 4** shows that the methodological quality of these nursing-sensitive quality indicators is below optimum. For example, it is unclear what scientific knowledge the development of these quality indicators is based on. Even so, the scores are used for determining whether policy and regulation needs to be defined to improve the quality of care. That requires quality indicators that are reliable and valid.

There is a relationship between recording data and evaluating care using quality indicators: the scores of the quality indicators are generally derived from data that nursing staff record in the electronic health record. When nurses have to supply data about e.g. malnourishment, not only do different definitions of malnourishment get used (**Chapter 4**) but the data recorded is also not unambiguous (**Chapter 7**).

The unidirectional mapping strategy study shows that there is a large diversity of terms and definitions for patient problems. The majority of the documented patient problems are not comparable one-to-one or directly exchangeable. For instance, the patient problem 'pain' is not included as a NANDA-I diagnosis. In this case, nursing staff will have to add the data to the electronic health record manually. The system they are working with does not recognize the patient problem.

As a result, differences in interpretation and loss of information can arise in situations where information has to be exchanged between professionals. This begs the question of whether the data is suitable for showing whether nurses are acting according to clinical guidelines and providing safe care. Documentation of data about patient problems in daily care practice does not yet seem to be properly connected to the secondary use of that data for monitoring and accountability (based on the scores of quality indicators).

Data and guidelines

If nurses want to evaluate the care they provide and increase their level of knowledge, it is important that they have unambiguous patient data. Such data can provide insights into the extent to which nurses contribute positively to outcomes that are relevant to patients. It can also determine to what extent nursing practice matches current professional knowledge, as embodied in the clinical guidelines. Studying the data that nurses document in the daily practice makes it possible to determine whether a guideline should be revised or has certain gaps, for example when nurses deviate from the guideline or use other interventions. This relationship between data and guidelines is not yet obvious. Nurses in fact use a wide variety of terms (**Chapter 7**) and the clinical guidelines for nursing practice often give little scientific basis for the patient problems described (**Chapter 6**). Data that nurses use as a source in daily practice, to determine whether the recommendations of guidelines are followed, is not yet common nursing practice in the Netherlands. That is because there is no national database of nursing data that can be used to perform such a study. Moreover, unambiguous data is not yet used in daily practice, which makes it more difficult to determine whether the recommendations of guidelines are being followed.

From diversity to clarity

As is described in the introduction to this thesis (**Chapter 1**), work is being done at the national level on a sustainable information system. Among other things, this means that an information model for developing, managing and maintaining unambiguous data is being set up. The foundation of this information model comprises *inter alia*:

- Health Care Information Models (HCIMs)[4] where agreements have been made on what data has to be recorded in what way [17] (**see Chapter 1**);
- Defining data that has an unambiguous meaning via the SNOMED CT terminology (**see Chapter 1**) [18].

This thesis has provided an impulse for the development of unambiguous terminology for relevant patient problems, taking account of the underpinnings of the information model used (see **Chapter 6**). This has created a scientific basis for transforming the diversity of data into clarity for nursing use.

However, the standardization that this demands is no simple matter. The study by Hovenga and Grain [19] discusses how software suppliers traditionally control and manage the data in electronic health records that they brought onto the market. There was little coordination between the various software suppliers' health records about the terminology used and the associated definitions of the data that were built into them [19]. This resulted in a diversity of data in electronic health records: each software supplier used its own method, in consultation with its own users, to record and work out data (and terminology), without looking at compatibility and exchangeability between systems. There are also knowledge shortfalls, not only among nurses but also among board members and managers of healthcare providers about the importance of unambiguous data for nurses [9,20,21].

Conclusion and recommendations based on Part II

Part II of this thesis is focused on the question of which patient problems should be defined at the source once to enable multiple use and exchange of data without loss of information. The knowledge and understanding gained from these studies will help improve the quality of data significantly, thereby creating the scientific foundations for a future-proof nursing information model for nurses and carers in the Netherlands.

4 More information can be found at Health Care Information Models.

Although the importance of working towards unambiguous data is increasingly being recognized, there are still various challenges with regard to its implementation, such as involving the software suppliers and the knowledge gap about the importance of unambiguous data among the professional group, policy makers and management.

Further research is needed, not just to define the development of unambiguous patient problems within the nursing care context in the Netherlands. It is also conceivable that there is diversity of nursing interventions and outcomes. The development and implementation of unambiguous data for nursing should be continued so that the effects become visible in daily practice.

c) General conclusions and reflections based on Parts I and II

The knowledge and insights that were gained through the sub-studies in Part II of the thesis should help improve the quality of the data that nurses document at the 'source', namely in the care for individual patients. This then helps build the scientific foundations for a future-proof nursing information model for nurses and carers in the Netherlands. Part II is essentially a foundation for solving the problems that were identified in Part I of this thesis. If nurses want to focus on the quality of care, they will have to work in environments where efforts to improve the quality of care are integrated into the culture of the working environment. Unambiguous data is the source from which the outcomes of the quality indicators are derived. Unambiguous data also guarantees a qualitatively better and consistent supply of data for quality indicators that can be used for various purposes (for example information about nursing care quality to learn and improve), without additional data recording overheads. This creates a broader framework that allows better quantification of the unique contribution of nursing care makes to outcomes of care that are relevant to patients, instead of – as is happening now – primarily investigating what could possibly go wrong.

Methodological issues

This thesis uses various research methods. The majority of the studies are qualitative, descriptive and exploratory in nature.

Chapter 2, part of Part I of the thesis, describes a qualitative study based on focus group interviews with nurses from various care sectors. A heterogeneous perspective is important because every care sector has its own context and dynamics. Covering the views of nurses from different care sectors let us get a general idea of the experiences of the participants. At the same time, one limitation is that only a relatively small number of nurses participated from each care sector. However, we did reach data saturation; the point at which no new information or themes are observed in the data when collecting new data [22].

The studies in **Chapter 3** and **Chapter 4** focus on the hospital sector. Based a cross-sectional study, **Chapter 3** describes the relationship between the perceptions of nurses on the quality of care (which are subjective) and the outcomes of nursing-sensitive quality indicators (which are objective) in six hospitals. Although a relationship was found between types of quality indicators, research in more settings is needed to support these findings.

Chapter 4 describes a descriptive exploratory study where the methodological quality of nursing-sensitive quality indicators has been assessed. Strong points are that a scientifically recognised tool (the AIRE tool) was used for assessing the methodological quality and that scores on that tool were assessed independently by the four experts. We have measured the inter-rater reliability and determined that the reliability of the assessments was reasonable or sufficient.

One restriction is that the sub-studies from Chapter 3 and Chapter 4 only took place in hospital settings and might possibly not be generalizable to nurses who do not work in hospitals. However, these findings can give input for the development and assessment of indicator sets for other care sectors.

Part I is based on various types of studies (qualitative research, a cross-sectional study and descriptive exploratory research) and different sources. As a result, we could relate the findings from these studies from Part I to each other using the same general question, namely which factors or mechanisms in the working environment play a role in providing an understanding of nursing care. As a result, we increased the likelihood

of reaching valid and useful conclusions.

In Part II of this thesis, we have also used a variety of research methods, namely exploratory online survey research (**Chapter 5**), qualitative focus groups (**Chapter 6**) and descriptive research using a unidirectional mapping strategy (**Chapter 7**). It was known from the literature that the methods for developing unambiguous patient problems definitions have not yet crystallized fully [23–27]. We have chosen sub-studies and methods in which the nursing profession is extensively involved. This is an advantage because nurses were able to give input and discuss how the various patient problems should be specified. This also gave us a picture of the day-to-day practice and how nurses document patient problems. A disadvantage was that the development of an unambiguous core set of patient problems (**Chapters 6 and 7**) was an intensive exercise.

Nurses from the various care sectors were intensively involved in the sub-studies into the development of clearly described patient problems (**Chapters 5 and 6**). 440 nurses from a range of care sectors participated in the sub-study to find out what patient problems nurses encounter in their day-to-day practice and to what degree they feel they can exert an influence on the prevention or reduction of these patient problems (**Chapter 5**). Additionally, 67 nurses from various care sectors were involved in making the nursing-sensitive patient problems clear (**Chapter 6**). That means that nurses from various care sectors determined whether patient problems (**Chapter 5**) retain the same meaning, so that nurses understand what they mean and the terms can be used or reused in their day-to-day practice. If nurses understand each other, it will not only be easier for them to exchange information and communicate about it but also to determine as a profession what the effects are, to learn from each other and to increase their level of knowledge.

A core set of patient problems gives handles and possibilities for working together and getting a clear picture of what data is relevant beyond the boundaries of their own care institution or care sector and that they should document in their day-to-day practice. Although we involved nurses from various sectors in developing the core set of patient problems, it is conceivable that the core set of patient problems cannot encapsulate nursing practice in its entirety. Take patient problems that occur rarely or insufficiently in specific care situations, for instance (e.g. care for people without a fixed place of residence). This requires further investigation.

Finally, another possible restriction could be that the PhD researcher did research in

the field where she works as a representative of V&VN (the association for nurses & health carers in the Netherlands), where she is a programme leader responsible for the standardization of nursing data. This could potentially lead to a conflict of interest or bias. However, the risk of bias due to conflicts of interest was mitigated through repeatedly discussing the findings and interpretations with the PhD supervisors, who primarily adopted a scientific perspective.

Future perspective

Implications for professional nursing practice

Working at a national level on cohesion between clinical guidelines, unambiguous data and quality indicators

This thesis shows that improvement is possible in the cohesion between clinical guidelines, data that nurses must document and quality indicators. Greater cohesion will also be beneficial for the ability of nurses to professionalize.

First of all, the coherence between clinical guidelines and the data needs clear documentation can be coordinated better, structurally. Since 2016, the professional association V&VN, together with Netherlands Organization for Health Research and Development (ZonMw), has had control of the development of clinical guidelines that fit the nursing domain[5]. This is an important step forwards because clinical guidelines structurally allow nurses to keep up with knowledge and support them in their professional work. Clinical guidelines give recommendations about what is needed to ensure the quality of care. A clinical guideline has systematic summaries of scientific research and considerations of the various care options, in order to justify why certain recommendations are made. This could for instance cover nursing diagnostics, the use of interventions and which outcomes are being aimed for related in various areas, such as pain or intertrigo. Clinical guidelines also often state quality indicators that are consistent with the content of the guideline and for which nurses should document data.

To ensure that nurses create the right documentation about nursing diagnostics, implementation, interventions and outcomes of care, agreements are needed about what data should be documented and how. These agreements are bundled in an information standard (see boxed text).

5 https://www.zonmw.nl/nl/onderzoek-resultaten/kwaliteit-van-zorg/programmas/programma-detail/kwaliteit-van-zorg-ontwikkeling-kwaliteitsstandaarden/

Information standard

An information standard determines a dataset for a specific care situation, so that data for this specific care situation is specified clearly. A nursing information standard is made up of a selection of care information building blocks and SNOMED CT that are built into the electronic health records. For more information about information standards, please refer to https://www.nictiz.nl/standaardisatie/informatiestandaarden/.

Although information standards have until now barely been part of clinical guidelines for nurses, the necessary relationship between the two is recognized. This has for example been described in the 'Guideline for the development of quality standards' as the 'Assessment framework quality standards, information standards and measuring instruments' [28,29].

Nevertheless, the development and implementation of information standards are only getting started slowly. One possible explanation could be that the governance for the development, implementation and management of information standards takes time and the structural financing has not yet taken shape. Furthermore, the supervision on and enforcement of information standards has not yet crystallized out fully, so it is not clear what the consequences are if parties do not conform to the information standard. It is important that these aspects are detailed in collaboration with national parties, so that nurses can further improve the way in which they document the care they give.

On the positive side, the professional association V&VN and various other national parties have taken the lead in developing information standards. The first information standard, which has now been realized, focuses on the transfer of nursing information: the eOverdracht (eTransfer)[6]. This information standard describes what set of data is relevant for the transfer of nursing information and how it should be built into the electronic health record by software suppliers. The core set of patient problems and associated mapping, as described in Chapters 6 and 7, is part of this information standard. The development and implementation of the eTransfer information standard is important. This is not only because it is a first step towards improving the cohesion between clinical guidelines and data that nurses have to document, but also because it gives opportunities to turn the fragmentation and diversity of nursing data around and create clarity.

6 More information can be found at https://www.nictiz.nl/standaarden/eoverdracht/

In addition, cohesion between unambiguous data that nurses document about the care they give and quality indicators demands that the professional group discusses whether the data is of the right level of quality to be used for other purposes. Together with the healthcare providers, care insurers, the governmental authorities and patient associations, the focus can then be on whether quality indicators can be used (and if so, which) for e.g. information about nursing-sensitive outcomes and nursing care quality for performance, policy and regulation purposes.

That cohesion between clinical guidelines, the data that nurses have to document in care practice and quality indicators will not come about overnight. It is important that nurses get the time and space to create scientific foundations for nursing care and get the reports and associated data in order. It also means that appropriate quality indicators must be developed if nurses want to be able to demonstrate the effects of their actions on the quality of care. An associated governance structure and structural financing for developing and implementing clinical guidelines, data and quality indicators is a precondition.

Implications for policy

Nationwide control is needed to achieve standardization

The differing approaches and interests of healthcare providers and software suppliers regarding the realization of electronic health records have led to a diversity of nursing data [19,21,30–33]. This thesis confirms the diversity of terms for patient problems and substantiates the importance of moving toward unambiguous (i.e. standardized) data. Whether the core set of patient problems and mapping as developed are consistent with the practice and/or whether further detailing or supplementary data is needed must be determined together with nurses, taking account of the fact that nurses have to deal with a variety of settings and patient groups.

Structural collaboration with not only nurses but also software suppliers is needed in order to make the core set of patient problems (including mapping) future-proof and integrate them into the various software systems, as well as to convert the existing diversity of terms into a standardized form, so that comparability and exchange become possible [19]. However, this is not easy due to the existing divisions in care, the variety of interests and the lack of knowledge that is responsible for the fragmented and incomplete way that data is recorded and collected [34].

The advantages that standardization can give in day-to-day practice have, as far as known, not yet been proven. This may possibly restrict the implementation: developing unambiguous data needs a thorough methodological and conceptual exercise. Little knowledge or experience is as yet available about the development and implementation of unambiguous data and the effects this has on day-to-day nursing practice [21].

Although the approach for achieving unambiguous data internationally has not yet crystallized out fully, the importance for the nursing profession is recognized internationally. The American Nurses Association (ANA) has adopted the position that SNOMED CT terminology must be used when nurses want to exchange data [35]. In Canada and elsewhere, a national programme has been set up under the leadership of the Canadian professional association (CNA) to work towards unambiguous data for nursing reports, the 'Canadian Health Outcomes for Better Information and Care – C-Hobic' programme [36], again using SNOMED CT.

This thesis (**Chapter 6**) also uses that standpoint. On the positive side, there is commitment among national parties in the Netherlands (including V&VN, the Ministry

of Health, Welfare and Sport and healthcare providers) for converting the diversity in the existing electronic health records into unambiguous data via the SNOMED CT terminology [17,18], see also **Chapter 1**. A structured (nationwide) approach involving software suppliers, professionals and healthcare providers will be needed [21]. In addition, the Minster of Health, Welfare and Sport has announced a legal obligation for digital exchange of data and unity of language use (via SNOMED CT) that is binding for professionals, healthcare providers and software suppliers [37,38]. This announcement can lead to the necessary acceleration of the development and implementation of unambiguous data.

In parallel with the development and implementation of unambiguous data, the healthcare providers, and professionals should keep an eye on the underlying interests, namely that nurses are given the opportunity to learn and improve and make the effects of their actions on the quality of care visible. That means not only that unambiguous nursing reports should be used but that nurses should work in working environments where learning and improving are encouraged. If nurses can share knowledge, learn and improve, they also can justify their actions better to patients and others.

Focus on working environments where continuous learning and improvement are key

If nurses are to decide for themselves how to monitor the quality of their care and the quality improvements, the working environment must take this into consideration. This thesis shows that focusing on the quality of care is still not sufficiently well integrated into nurses' local working environments. The working environment seems to focus more on control and productivity. For instance, nurses rarely get feedback on the results of measurements of patients' experiences. Apparently, hardly any learning and improvement cycles have been set up that use quality information collected by or for nurses.

One positive development is that various quality frameworks have been established at the national level in a number of care sectors, such as the Intellectual Disability Care Quality Framework, District Nursing Quality Framework, Nursing Home Care Quality Framework [39–41]. Those quality frameworks describe what clients can expect of proper care at home, in nursing homes, in hospitals or in the intellectual disability care sector. Learning and improving are an important part of these quality frameworks. This is a good development because it shows that there is commitment to the importance, approach and results for improving the capacity to learn in healthcare institutions, as

well as in the sectoral and umbrella organizations. Nurses have to learn from their own care context and care dynamics how to provide an understanding of their care, using the best available evidence and information.

Nurses and policymakers will have to start a dialogue about how working environments that focus on control and productivity can be changed into working environments that prioritize thinking about and working on the quality of care more. It is important that nurses develop a policy together with policymakers for 'learning and improving' within their own organizations. If possible, this should be aligned with national policy with regard to clinical guidelines, unambiguous data and quality indicators. The healthcare providers should take care of the necessary preconditions – such as not only time and money but also IT support – to make sure that clear control information is available and that it benefits 'learning and improving'.

At the same time, it is important to take the keystone for learning and improving into consideration, namely unambiguous data. To prevent fragmentation and diversity in the data that nurses document (fragmentation between organizations, sectors and software systems), it is important to have a nationwide approach that involves the professional, sectoral and umbrella organizations.

Implications for research

Encourage scientific research on the development, implementation and management of unambiguous data

This thesis shows that documenting scientifically supported nursing-sensitive outcomes of care is a challenge for the nursing profession. A process started in the Netherlands in the 1980s that was aimed at giving nursing practice a scientific basis. That development had begun several decades earlier in the Anglo-Saxon countries. This shows that nursing research is a relatively young field. It is important to gather more scientific knowledge about the development of unambiguous data about patient problems (the diagnostics), interventions and outcomes from a nursing perspective. The scientific development, implementation and repeated use (including use for research) of unambiguous data should go hand in hand with a reduction in the data recording overheads for nurses and more efficient organization of the care processes. This is also relevant because of the current shortage of staff in the healthcare sector. This is an important task for scientists and nursing science specialists.

In addition, technological innovations and the amount of available data, photos and images are only going to keep on increasing. These generate a stream of available data that cannot be stopped. This 'multifaceted' data can be very valuable to the nursing profession and nursing practice. Artificial intelligence – meaning the use of technology that allows systems to 'reason' and/or 'learn' – will play an increasingly important role in healthcare and therefore also in nursing practice. 'Big Data', i.e. the large amount of available data that is often routinely registered by care professionals in daily practice, will be reused for e.g. new insights into patient problems, interventions and realized outcomes. This is important for the nursing profession, especially for obtaining a clear picture of the quality of care and determining the effectiveness of nursing actions [42]. A key precondition is that the data should be high quality [42,43].

Digitizing data in electronic health records is now an essential part of nurses' day-to-day practice. The value of digital data and the possibilities for reusing it are only going to grow over the coming years. It is also important to think about the impact and possibilities of these developments for nursing practice, to improve care processes or make them more efficient. Digital data, technological innovations and their impact on nursing practice should be given a prominent position in research.

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Summary

Summary

One goal of this thesis is to obtain a proper picture of how the quality of nursing care can be made clear. Part I of this thesis describes three sub-studies that address how and to what extent nurses have an influence on the quality of care (Chapters 2 and 3). Additionally, the methodological quality has been investigated for the quality indicators used so far to obtain a picture of the quality of nursing care (Chapter 4). The insights from Part I are relevant because they contribute to a 'learn and improve' approach to the quality of nursing care.

Part II of this thesis describes sub-studies focused on describing unambiguous patient problems (Chapters 5, 6 and 7). These sub-studies help improve the quality of the data that nurses document in the electronic health record. Data that is less ambiguous will let nurses monitor the care process for individual patients and this data can also be used for other purposes such as quality control, performance, policy and regulation information. The knowledge and insights gained from this will help create a picture of nursing care without the quality of the data being called into question.

We have summarized the results for each chapter below.

In **Chapter 1** we outline the background and reason for this thesis. Nurses are expected to use their knowledge, skills and expertise to provide good quality of care to a variety of patients. For that reason, it is important that nursing care is supported by scientific proof so that patients receive the most appropriate care. Increasingly, healthcare is all about by transparency and an environment of accountability. Accordingly, nurses are faced with the challenge of quantifying the unique way that nursing care helps achieve outcomes that are relevant to patients. A problem with this is that opinions about nursing knowledge as a domain are not always unambiguous. There are international and national variations in the chosen nursing-sensitive outcomes and their associated quality indicators and records. One possible explanation is that nurses are not particularly capable of indicating how they can achieve nursing-sensitive outcomes in terms of the functioning and well-being of patients.

If nurses want to focus on nursing-sensitive outcomes, they must be given control and autonomy in their working environment to develop knowledge, share it, learn and improve, thereby being able to justify their actions better to patients and others. However, there is little knowledge available in the Netherlands on how the working environment helps nurses understand these nursing-sensitive outcomes and lets them

learn and improve as a professional group. Moreover, the quality of (digital) data that nurses record in electronic health records leaves a lot to be desired: data is recorded in a variety of ways and is unambiguous or incomplete. This means that it is hard to make statements about the quality of nursing care or to make comparisons between care providers.

In **Chapter 2**, we describe a qualitative study of the experiences of nurses about how their work and their working environment influence the patients' experiences. We spoke to a total of 26 nurses from various care sectors in four focus groups. Nurses said they worked in contexts where the emphasis is on efficiency and productivity. Various tasks are being taken over by less qualified personnel, while care is becoming increasingly complex. Patients are getting older and have multiple conditions at the same time. Nurses record all kinds of data, but hardly get any feedback about the results. They are experiencing increasing data recording overheads. These factors do not contribute to positive patient experiences. Elements that can have a positive influence on the patient experiences (according to nurses) are professional knowledge, good cooperation between the various disciplines, being able to act autonomously, proper staffing, control over nursing practice, management support and a patient-oriented care culture. Nurses see a certain contradiction between the pursuit of patient-oriented care and the focus on efficiency and productivity. They feel that they have little control or autonomy that lets them have an impact on this contradiction.

Chapter 3 presents a cross-sectional study on how nurses perceive the quality of care they provide and the quality indicators. The study took place in six Dutch academic hospitals. For the subjective (experienced) quality of care, nurses had to give scores on a scale of 1 to 10 (from 'dangerously low quality' to 'high quality'). The outcomes of the quality indicators (screening for delirium, malnourishment and pain) were used as an objective measure. A high degree of similarity ($rS = 0.943$, $p = 0.005$) was found between the two quality measures (subjective versus objective). This means that the convergent validity of nursing quality indicators is confirmed to be a measure of the quality of nursing care: there is a connection between the two measurements.

Chapter 4 reports on exploratory research into the methodological quality of quality indicators used for supervision by the Dutch Health and Youth Care Inspectorate at hospitals in the Netherlands. This includes quality indicators that say something about the prevalence of pain, wound care, malnourishment and delirium. First of all, a desk study was carried out into the publicly available documents and reports that describe the development of the quality indicators included in this study. Subsequently, a validated

tool for the assessment of indicators was used (known as the AIRE tool) to evaluate the methodological quality. Although the objective and the relevance of each individual quality indicator were described in the documents that were studied, the criteria for selecting the subjects of the quality indicators, the interested parties involved and their input were usually not. No information was found about the scientific evidence for the quality indicators. It is unclear whether and to what degree the usability of the quality indicators was tested. The methodological quality of the quality indicators that are used in hospitals in the Netherlands is not strong, which raises the question of whether the indicators are accurate enough for identifying changes or improving nursing practice. Moreover, quality indicators are used in particular to test whether safe care is being provided. The result is that measurements are mainly of what can go wrong rather than what goes well (the positive contributions nurses make to their patients' health and quality of life).

Statements about the quality of care require not only that the quality indicators are valid and reliable but also that the data documented by nurses is unambiguous and consistent. To lay proper foundations to underpin the data about nursing-sensitive outcomes, the patient problems that are relevant for nurses must first be determined.

That is why **Chapter 5** describes an online survey to find out what patient problems nurses encounter in their day-to-day practice and to what degree they feel they can exert influence on the preventing or reducing these patient problems. A total of 440 nurses who work in various care settings completed the questionnaire. The respondents were shown 17 categories of problems, derived from the International Classification of Functioning, Disability and Health (ICF). This meant that items in the survey about patient problems could be ordered systematically into categories related to human functioning, activities and participation. Within each category, respondents were asked what specific patient problems occurred and how much influence nurses had on the prevention or reduction of these patient problems. The six patient problems that nurses said they had a lot of influence over were the categories 'skin and related structures', 'important aspects of life', 'general tasks and requirements', 'communication', 'mobility' and 'caring for themselves'. On the other hand, nurses felt they had little influence on patient problems in the three categories of 'voice and speech', 'functioning of the motor system' and 'social life and living in society'. It is also striking that nurses felt that they had little influence on the majority of patient issues in the mental functions category (such as problems with memory, orientation, attention and intellectual capacities), although this category occurs every day according to the respondents.

The patient problems identified were used as the starting point for developing a core set of unambiguously formulated, comparable and digitally exchangeable patient problems. This development is described in **Chapter 6**. This study opted to use qualitative focus group research. This development process consisted of various phases: 1) determining the scope; 2) design and planning; 3) development; 4) distribution; 5) implementation and use; and 6) maintenance.

For each of the patient problems (84 in total) from the previous study (Chapter 5), a possibly suitable or best fitting SNOMED CT concept (term) was chosen. SNOMED CT is a terminology set comprising a large collection of medical terms, such as symptoms, complaints, circumstances, diagnoses, interventions or results and decision making.

These concepts (terms) were submitted to 67 nurses from various care sectors who were divided across seven focus groups. Each focus group discussed an average of twelve patient problems and the associated SNOMED CT concepts until a consensus was reached. The concepts on which there was no consensus were discussed in the next focus group until a consensus was achieved.

Each concept (term) was defined, i.e. the meaning of the concept (term) was described. These definitions were preferably taken from clinical guidelines. Where that could not be done, a definition from the International Classification of Nursing Practice (ICNP), was used or a definition from a classification was chosen, namely the International Classification of Functioning, Disability and Health (ICF). The definitive set with defined and coded patient problems (version 2.0) had 119 patient problems. All focus group participants agreed and stated that the core set accurately reflects nursing practice and that the terms were unambiguous and understandable.

Chapter 7 Describes the similarities and differences between the patient problems that were defined in the previous sub-study using three classifications: the Omaha System, NANDA International, and ICF (the International Classification of Functioning, Disability and Health). Determining whether patient problems from different classifications correspond and are interchangeable is also called ‘mapping’. A unidirectional mapping strategy was for example used for investigating whether there are ‘glitches’ in any of the said classifications and what term is suitable (matches entirely) or most suitable (matches partially). The goal of such mapping is to make data exchanges possible: a patient problem is transferred from electronic health record A to file B and the receiving party has to be able to interpret it correctly. The mapping was carried out with experts who have extensive knowledge of a certain classification (NANDA-I diagnoses and/or

the Omaha System and/or the ICF) and/or of the SNOMED CT terminology.

Some 30 to 39% of the core set of 119 patient problems are directly comparable one-to-one with the terms of a separate classification. Between 6 and 8% were mapped partially, to a related term. This is considered to be a one-to-one mapping, although the meanings do not correspond fully. Additionally, in 23 to 51% of patient problems, the terms of the core set are more specific than the terms of the classification. Some loss of information will always occur in such exchanges in this case. Between 1 and 4% of the core set patient problems were defined less specifically than the problems within the individual classifications. Finally, it transpired that 9% to 32% of the terms from the core set of patient problems could not be mapped onto terms from one or more classifications, either because they did not occur in the classification or because they could not be mapped at a higher level. This diversity of terms within classifications means, in the current situation, that data about patient problems cannot be documented unambiguously.

Chapter 8 of this thesis reflects on the observations. The following recommendations are made:

- The professional group must ensure greater coherence between clinical guidelines, unambiguous data and quality indicators;
- National policy under the management of professional organisations, umbrella organisations and sector organisations resulting in the implementation of unambiguous data that can be recorded and exchanged by nurses at the source. This means that structural collaboration with nurses and software suppliers is needed in order to integrate unambiguous data (including the patient problems) into the various software systems.
- If nurses want to focus on the quality of care themselves, a working environment must be created in which continual learning and improvement are key;
- Finally, further research is recommended, focused on developing, implementing and managing unambiguous data about nursing actions in cases of patient problems and the outcomes of such issues that can be affected by the nursing strategy.

Samenvatting

Samenvatting

Een doel van dit proefschrift is inzicht geven in hoe de kwaliteit van verpleegkundige zorg inzichtelijk gemaakt kan worden. Deel I van dit proefschrift beschrijft drie deelonderzoeken, die zich richten op hoe en in welke mate verpleegkundige invloed hebben op de kwaliteit van zorg (hoofdstukken 2, 3). Daarnaast is de methodologische kwaliteit van de tot nu toe gebruikte kwaliteitsindicatoren voor het inzichtelijk maken van de kwaliteit van verpleegkundige zorg onderzocht (hoofdstuk 4). De inzichten uit deel I zijn relevant, omdat ze bijdragen aan 'leren en verbeteren' van kwaliteit van zorg.

Deel II van dit proefschrift beschrijft deelonderzoeken gericht op het beschrijven van eenduidige patiëntproblemen (hoofdstukken 5, 6 en 7). Via deze deelonderzoeken wordt een bijdrage geleverd aan het verbeteren van de kwaliteit van de gegevens die verpleegkundigen documenteren in het elektronisch zorgdossier. Door meer eenduidige gegevens kunnen verpleegkundigen het zorgproces van de individuele patiënt monitoren en kunnen deze gegevens ook gebruikt worden voor andere doeleinden zoals sturings-, keuze- en beleidsinformatie. De kennis en inzichten die hiermee wordt opgedaan, dragen bij aan het inzichtelijk maken van verpleegkundige zorg, zonder dat de kwaliteit van de gegevens ter discussie staat.

We vatten hieronder de resultaten per hoofdstuk samen.

In **hoofdstuk 1** schetsen we de achtergrond en aanleiding voor dit proefschrift. Van verpleegkundigen wordt verwacht dat zij hun kennis, vaardigheden en deskundigheid gebruiken om goede kwaliteit van zorg te bieden aan diverse patiënten. Het is dan ook belangrijk dat verpleegkundige zorg wordt onderbouwd met wetenschappelijk bewijs, zodat patiënten de best passende zorg krijgen. De gezondheidszorg wordt in toenemende mate gekenmerkt door transparantie en een verantwoordingsklimaat. Verpleegkundigen staan dan ook voor de uitdaging om de unieke bijdrage van verpleegkundige zorg aan patiëntrelevante uitkomsten te kwantificeren. Een probleem daarbij is dat de opvattingen over het verpleegkundig kennisdomein niet altijd eenduidig zijn. Er zijn internationale en nationale variaties in de gekozen uitkomsten en daaraan verbonden kwaliteitsindicatoren en bijbehorende registraties. Een mogelijke verklaring kan zijn dat verpleegkundigen minder goed in staat zijn om aan te geven wat zij kunnen bereiken of bijdragen aan uitkomsten van zorg met betrekking tot het functioneren en welbevinden van patiënten.

Als verpleegkundigen willen sturen op verpleegsensitieve uitkomsten, dan moeten

zij in hun werkomgeving de zeggenschap en de autonomie krijgen om zorg te bieden passend bij de wensen en behoeften van patiënten. Er is in Nederland echter weinig kennis beschikbaar over hoe de werkomgeving bijdraagt aan het inzichtelijk maken van verpleegsensitieve uitkomsten en het kunnen leren & verbeteren als beroepsgroep. Bovendien laat de kwaliteit van (digitale) gegevens die verpleegkundigen vastleggen in het zorgdossier ten wensen over: gegevens worden op verschillende manieren vastgelegd en niet eenduidig of incompleet aangeleverd. Hierdoor is het lastig om uitspraken te doen over de kwaliteit van verpleegkundige zorg of om vergelijkingen uit te voeren tussen zorgaanbieders.

In **hoofdstuk 2** beschrijven we een kwalitatief onderzoek naar de ervaringen van verpleegkundigen over hoe hun werk en hun werkomgeving van invloed is op patiëntervaringen. In totaal spraken wij 26 verpleegkundigen uit diverse zorgsectoren in vier focusgroepen. Verpleegkundigen gaven aan te werken in een context waarin de nadruk op efficiëntie en productiviteit ligt. Verschillende taken worden overgenomen door lager gekwalificeerd personeel, terwijl zorg toenemend complexer wordt. Patiënten worden steeds ouder en hebben tegelijkertijd verschillende aandoeningen. Verpleegkundigen registreren bovendien allerlei gegevens, maar krijgen de resultaten nauwelijks teruggekoppeld. Zij ervaren dan ook een toenemende registratielast. Deze factoren dragen niet bij aan positieve patiëntervaringen. Elementen die volgens verpleegkundigen wel een positieve invloed hebben op patiëntervaringen, zijn vakbekwaamheid, goede samenwerking met verschillende disciplines, autonoom kunnen handelen, een adequate personeelsbezetting, zeggenschap over de verpleegkundige beroepsuitoefening, ondersteuning van het management en een patiëntgerichte zorgcultuur. Verpleegkundigen zien een zekere tegenstrijdigheid tussen het streven naar patiëntgerichte zorg en de nadruk op efficiëntie en productiviteit. Zij ervaren weinig zeggenschap en autonomie om invloed uit te oefenen op deze tegenstrijdigheid.

Hoofdstuk 3 presenteert een cross-sectioneel onderzoek naar hoe verpleegkundigen hun kwaliteit van zorg ervaren en kwaliteitsindicatoren. Het onderzoek vond plaats in zes Nederlandse opleidingsziekenhuizen. Voor de subjectieve (ervaren) kwaliteit van zorg, moesten verpleegkundigen scores geven op een schaal van 1 tot 10 aangeven (lopend van ‘gevaarlijk lage kwaliteit’ tot ‘hoge kwaliteit’). De uitkomsten van de kwaliteitsindicatoren, screening van delier, ondervoeding en pijn, werden gebruikt als objectieve maat. Er werd een hoge mate van overeenkomst ($rS = 0.943$, $p = 0.005$) gevonden tussen de twee kwaliteitsmaten (subjectief versus objectief). Dit betekent dat de convergente validiteit van verpleegkundige kwaliteitsindicatoren als maat voor

de kwaliteit van verpleegkundige zorg bevestigd is: er bestaat een samenhang tussen beide metingen.

Hoofdstuk 4 rapporteert over exploratief onderzoek naar de methodologische kwaliteit van kwaliteitsindicatoren gebruikt voor toezicht van de Inspectie voor de Gezondheidszorg en Jeugd op de Nederlandse ziekenhuizen. Het gaat daarbij om kwaliteitsindicatoren die iets zeggen over de prevalentie van pijn, wondzorg, ondervoeding en delier. Allereerst werd een deskresearch uitgevoerd naar de openbaar beschikbare documenten en rapporten die de ontwikkeling beschrijven van de kwaliteitsindicatoren die in dit onderzoek zijn opgenomen. Vervolgens werd een gevalideerd instrument voor de beoordeling van indicatoren gebruikt (het zogeheten AIRE-instrument) om de methodologische kwaliteit te evalueren. Hoewel het doel en de relevantie van elke afzonderlijke kwaliteitsindicator in de bestudeerde documenten waren beschreven, waren de criteria voor het selecteren van de onderwerpen van de kwaliteitsindicatoren, de betrokken belanghebbenden en hun inbreng veelal niet beschreven. Evenmin werd informatie gevonden over het wetenschappelijk bewijs voor de kwaliteitsindicatoren. Het is ook onduidelijk of en in welke mate de bruikbaarheid van de kwaliteitsindicatoren zijn getest. De methodologische kwaliteit van kwaliteitsindicatoren die worden gebruikt in Nederlandse ziekenhuizen is dus niet sterk, wat ook de vraag oproept of de indicatoren voldoende nauwkeurig zijn om veranderingen te identificeren of de verpleegkundige praktijk te verbeteren. Er worden bovendien met name kwaliteitsindicatoren ingezet om te toetsen of veilige zorg wordt geboden. Het gevolg daarvan is dat er vooral wordt gemeten wat er mis kan gaan en minder wat er goed gaat (welke positieve bijdrage verpleegkundigen leveren aan de gezondheid en kwaliteit van leven van hun patiënten).

Om uitspraken te kunnen doen over de kwaliteit van zorg, moeten niet alleen kwaliteitsindicatoren valide en betrouwbaar zijn; ook de gegevens die verpleegkundigen documenteren moeten eenduidig en consistent zijn. Om een goed fundament onder de gegevens over verpleegsensitieve uitkomsten te leggen, moet eerst worden vastgesteld welke patiëntproblemen voor verpleegkundigen relevant zijn.

Hoofdstuk 5 beschrijft daarom een online survey research om te achterhalen welke patiëntproblemen verpleegkundigen in de dagelijkse praktijk tegenkomen en in welke mate zij invloed ervaren op het voorkomen of verminderen van deze patiëntproblemen. In totaal hebben 440 verpleegkundigen werkzaam in verschillende zorgsettingen de survey vragenlijst ingevuld. De respondenten kregen 17 categorieën van problemen te zien, afgeleid van de International Classification of Functioning, Disability and

Health (ICF). Daardoor konden de items over patiëntproblemen binnen de survey systematisch geordend worden in categorieën met betrekking tot het menselijk functioneren, activiteiten en participatie. Binnen elke categorie werd gevraagd welke specifieke patiëntproblemen voorkwamen en hoeveel invloed verpleegkundigen op het voorkomen of verminderen van deze patiëntproblemen hadden. De zes patiëntproblemen waarop verpleegkundigen veel invloed zeggen te hebben, vallen in de volgende categorieën: 'huid en verwante structuren', 'belangrijke levensgebieden', 'algemene taken en eisen', 'communicatie', 'mobiliteit', 'zelfverzorging' relatief veel invloed ervaren. Verpleegkundigen ervaren daarentegen weinig invloed op patiëntproblemen binnen de volgende drie categorieën: 'stem en spraak', 'functie van het bewegingssysteem', 'maatschappelijk, sociaal en burgerlijk leven'. Opvallend is daarnaast dat verpleegkundigen weinig invloed ervaren op het merendeel van de patiëntproblemen binnen de categorie mentale functies, zoals problemen met het geheugen, oriëntatie, aandacht, intellectuele functies; terwijl deze categorie volgens de respondenten elke werkdag voorkomt.

De geïdentificeerde patiëntproblemen vormden het uitgangspunt voor de ontwikkeling van een kernset van eenduidig geformuleerde, vergelijkbare en digitaal uitwisselbare patiëntproblemen. Deze ontwikkeling wordt beschreven in **hoofdstuk 6**. In dit onderzoek is gekozen voor kwalitatief focusgroeponderzoek. Dit ontwikkelproces bestond uit verschillende fasen: 1) bepalen scope; 2) ontwerp/planning; 3) ontwikkeling; 4) distributie 5) uitvoering en gebruik; 6) onderhoud.

Voor elk (van de in totaal 84) patiëntproblemen uit het vorige onderzoek (hoofdstuk 5) is een mogelijk overeenkomstig of meest passende SNOMED CT concept (term) gekozen. SNOMED CT is een terminologie waarin een grote verzameling medische termen zijn opgenomen, zoals symptomen, klachten, omstandigheden, diagnosen, interventies of resultaten en besluitvorming.

Deze concepten (termen) werden voorgelegd aan 67 verpleegkundigen uit diverse zorgsectoren, die waren verdeeld over zeven focusgroepen. Iedere focusgroep bediscussieerde gemiddeld twaalf patiëntproblemen en de bijbehorende SNOMED CT concepten tot consensus was bereikt. De concepten waarover geen consensus was, werden in de volgende focusgroep bediscussieerd tot consensus was bereikt.

Elk concept (term) werd gedefinieerd: de betekenis van het concept (term) werd beschreven. De definities werden bij voorkeur uit een klinische richtlijn gehaald. Anders werd een definitie van de International Classification of Nursing Practice (ICNP)

aangehouden of een definitie van een classificatie gekozen, de International Classification of Functioning, Disability and Health (ICF). De definitieve set met gedefinieerde en gecodeerde patiëntproblemen (versie 2.0) bestond uit 119 patiëntproblemen. Alle deelnemers aan de focusgroepen hebben ingestemd en aangegeven dat de kernset de verpleegkundige praktijk accuraat reflecteerde en dat de termen eenduidig en begrijpelijk waren.

Hoofdstuk 7 beschrijft de overeenkomsten en verschillen tussen de patiëntproblemen die in het vorige deelonderzoek benoemd werden binnen de classificaties Omaha System, NANDA International, en ICF (the International Classification of Functioning, Disability and Health). Het bepalen of patiëntproblemen van verschillende classificaties met elkaar overeenkomen en daarmee uitwisselbaar zijn, wordt ook wel een mapping genoemd. Via een unidirectional mapping strategie is bijvoorbeeld onderzocht of 'smetten' voorkomt in één van de genoemde classificaties en welke term hiervoor passend (geheel overeenkomt) of het meest passend is (gedeeltelijk overeenkomt). Het doel van deze mapping is om gegevensuitwisseling tot stand te brengen: een patiëntprobleem wordt overgedragen van het elektronisch zorgdossier A naar B, waarbij een juiste interpretatie moet worden gemaakt door de ontvangende partij. De mapping is uitgevoerd met deskundigen die een uitgebreide kennis hebben van een bepaalde classificatie (NANDA-I diagnoses en/of Omaha System en/of de ICF) en/of de terminologie SNOMED CT.

Van de 119 kernset-patiëntproblemen was 30%-39% 'één op één' vergelijkbaar met de termen van een afzonderlijke classificatie. Tussen de 6%-8% was 'één op verwant' gemapt. Deze mapping wordt beschouwd als één op één mapping, hoewel de betekenis niet geheel overeenkomt. Daarnaast bleek dat bij 23%-51% van de patiëntproblemen de termen van de kernset specifieker zijn dan de termen van de classificatie. Bij uitwisseling zal in dit geval altijd informatieverlies optreden. Tussen de 1%-4% van de kernset-patiëntproblemen waren minder specifiek, dan de problemen binnen de afzonderlijke classificaties. Tot slot bleek dat 9%-32% van de termen uit de kernset patiëntproblemen niet gemapt kon worden met termen uit een of meerdere classificaties, omdat deze ofwel niet in de classificaties voorkomen of niet naar een hoger niveau gemapt konden worden. Deze diversiteit aan termen binnen classificaties betekent dat in de huidige situatie gegevens over patiëntproblemen niet eenduidig kunnen worden gedocumenteerd.

In het **hoofdstuk 8** van dit proefschrift wordt gereflecteerd op de bevindingen en worden de volgende aanbevelingen gedaan:

- De beroepsgroep moet zorgen voor meer samenhang tussen klinische richtlijnen, eenduidige gegevens en kwaliteitsindicatoren;
- Landelijk beleid onder regie van beroeps-, koepel- en brancheorganisaties om te komen tot de implementatie van eenduidige gegevens die door verpleegkundigen aan de bron worden vastgelegd en uitgewisseld. Dit betekent dat structurele samenwerking met verpleegkundigen en softwareleveranciers nodig is om eenduidige gegevens (zoals patiëntproblemen) te integreren in de verschillende softwaresystemen.
- Als verpleegkundigen zelf willen sturen op kwaliteit van zorg, dan moet een werkomgeving gecreëerd worden waarin continu leren en verbeteren centraal staat;
- Ten slotte wordt nader onderzoek aanbevolen, gericht op het ontwikkelen, implementeren en beheren van eenduidige gegevens over verpleegkundige handelingen bij patiëntproblemen en de verpleegsensitieve uitkomsten daarvan.

Dankwoord

DANKWOORD

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