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Developing a competence framework for nurses in pharmaceutical care: A Delphi study

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ABSTRACT

Background: Nurses play an important role in pharmaceutical care. They are involved in: detecting clinical change; communicating/discussing pharmacotherapy with patients, their advocates, and other healthcare professionals; proposing and implementing medication-related interventions; and ensuring follow-up of patients and medication regimens. To date, a framework of nurses' competences on knowledge, skills, and attitudes as to interprofessional pharmaceutical care tasks is missing.

Objectives: To reach agreement with experts about nurses' competences for tasks in interprofessional pharmaceutical care.

Methods: A two-phase study starting with a scoping review followed by five Delphi rounds was performed. Competences extracted from the literature were assessed by an expert panel on relevance by using the RAND/UCLA method. The experts (n = 22) involved were healthcare professionals, nurse researchers, and educators from 14 European countries with a specific interest in nurses' roles in interprofessional pharmaceutical care. Descriptive statistics supported the data analysis.

Results: The expert panel reached consensus on the relevance of 60 competences for 22 nursing tasks. Forty-one competences were related to 15 generic nursing tasks and 33 competences were related to seven specific nursing tasks.

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Conclusions: This study resulted in a competence framework for competency-based nurse education. Future research should focus on imbedding these competences in nurse education. A structured instrument should be developed to assess students' readiness to achieve competence in interprofessional pharmaceutical care in clinical practice.

1. Background

Nurses are healthcare professionals who play an important role in interprofessional pharmaceutical care. Pharmaceutical care has been defined by Hepler and Strand as "the responsible provision of drug therapy for the purpose of achieving definite outcomes that improve a patient's quality of life" (Hepler and Strand, 1989). The focus on interprofessional communication and collaboration by nurses, pharmacists, pharmacy (technicians), and physicians has been acknowledged as key to optimising this aspect of care (Choo et al., 2010; Council of Europe, 2020). In Europe, these healthcare professionals manage several tasks such as prescribing, dispensing, delivering, administering medication, providing patient education, and monitoring and evaluating the effectiveness and efficacy of the medicine, sometimes with distinct and sometimes with overlapping roles (Dilles et al., 2010; Kim and Parish, 2017; Lee et al., 2015; Stegemann et al., 2010). In other words, within pharmaceutical care, multiple professions have responsibilities; however, within this study the focus will be on nurses. In order to emphasize that pharmaceutical care is a responsibility of several professions, and to avoid ignoring other professions beyond nursing, the term "nurses' roles in interprofessional pharmaceutical care" is used hereafter. Nurses' roles in interprofessional pharmaceutical care has been studied previously. De Baetselier et al. (2020) divided nurses' roles into distinct responsibilities such as: providing patient education and information, monitoring medication adherence, adverse and therapeutic effects; and prescribing medicines (De Baetselier et al., 2020). Nurses' roles in pharmaceutical care are expected to contribute to improved medication use and patient outcomes (Ensing et al., 2015; Sino et al., 2013a; Sino et al., 2013b). In Europe, nurses' responsibilities depend on their educational level and national policies. In order to undertake interprofessional pharmaceutical care, nurses must be well educated. Education is an ongoing process focused on competence development, starting during nurse education and continuing in practice settings. A competence can be defined as "a coherent cluster of knowledge, skills, and attitudes which can be utilized in real performance contexts" (Mulder, 2014). Today, in Europe, a distinct and clear framework of nurse competences related to tasks in interprofessional pharmaceutical care is missing. This hinders adequate education and labour mobility of nurses in Europe, which could impact quality of care. In our study, a competence framework for nurses' competences in tasks in interprofessional pharmaceutical care will be developed. This study is part of the European DeMoPhaC project (Development of a Model for nurses' roles in interprofessional Pharmaceutical Care), an international collaboration to investigate nurses' roles in 14 countries. The model (Nurse and Pharmaceutical Care - European Union [NuPhaC-EU] model) with nurses' roles in interprofessional pharmaceutical care is in development. The model shows the ideal nursing roles and creates the opportunity to translate them into nurse education curricula. Accordingly, a competence framework is needed to focus on the expected roles and establish competence-oriented educational programs, fitted to the expectations of the labour market.

The aim of this study is to reach agreement with experts about nurses' competences for tasks in interprofessional pharmaceutical care.

2. Methods

2.1. Design

A two-phase study was performed to develop the competence framework, consisting of (1) searching for and creating an overview of relevant nurse competences regarding interprofessional pharmaceutical care by a scoping review and (2) a Delphi study consisting of five rounds with experts to reach agreement about nurses' competences (as developed in phase 1) for tasks in interprofessional pharmaceutical care by using the RAND/UCLA Appropriateness Method (RAM) (Fitch et al., 2001; Heiko, 2012; Nair et al., 2011). The steps are illustrated in Fig. 1 and are explained below.

2.2. The competence framework

In the competence framework, nurses' competences were assigned to nurses' tasks relating to their responsibilities in interprofessional pharmaceutical care as described in the NuPhaC-EU model. The model indicates seven responsibilities for nurses in pharmaceutical care (beyond preparation and administration of prescribed medicines) including: 1) management of therapeutic and adverse effects of medicines, 2) management of medication adherence, 3) management of medication self-management, 4) management of patient education and information, 5) prescription management, 6) patient safety management, and 7) (transitional) care coordination. For each of the responsibilities, several tasks were formulated, including for example: detecting clinical change, healthcare problems or assessing patient needs; communicating/discussing with patients and/or patient advocates; intervention in emergencies; inter-disciplinary communication; ensuring follow-up of patients in relation to their medication regimens; and (in)dependent or supplementary nurse prescribing (De Baetselier et al., 2020). No competences regarding preparation and administration of prescribed medicines were included in the competence framework, since the NuPhaC-EU model focuses on advanced roles in interprofessional pharmaceutical care. Competences were not linked to educational levels. Today, not all nurse educational levels are available in all countries and assignment of tasks to certain levels may not be comparable. Therefore, it was impossible to make a distinction in competences required by each education level.

2.3. Phase one: scoping review

A scoping review was performed to identify competences (May–October 2019). This review was guided by the methodological framework for scoping studies (Arksey and O'Malley, 2005). Competences were identified through searching the relevant literature in the databases PubMed and Education Resources Information Center (ERIC). A mix of Medical Subject Headings (MeSH-terms) and free text terms of the following key concepts was used for the search strategy: education, training, nursing, nurses, (professional/clinical) competence, responsibility, knowledge, skill, attitude, collaboration, cooperation, treatment adherence/compliance, pharmacotherapeutic, drug (prescription), medication, adherence, safety, process, and management (Appendix 1). Article types included were: (systematic) reviews, longitudinal studies, randomized controlled trials and cohort studies. Studies were selected if published between 2000 and 2020 and written in Dutch or English. Articles were first screened by title and abstract for relevance, followed by reading the full text by three researchers (NED; CGMS; JWvdB) independently. Afterwards the researchers discussed the title and abstract of the non-selected articles. If the title and abstract contained potential relevant key words about nurses' competences, the article was included. In addition, key journals were handsearched. The researchers read one third of the selected articles each.

The search identified 396 articles. After title and abstract screening, 312 were removed, since they contained no references to nursing

Fig. 1. Study design of the development of competence framework for nurses in interprofessional pharmaceutical care.

competences. In total, 84 articles met the criteria for full paper review. After reading the full text, another 16 articles were excluded. In the remaining 68 articles, a total of 23 competences, beyond preparation and administration of prescribed medicines, were found (Appendix 2).

The selection process and results are reported in a flow diagram according to the PRISMA reporting guidelines (Fig. 2) (Moher et al., 2009).

Competences were extracted from the articles and were categorised as knowledge, skill, or attitude (Appendix 2). Subsequently, the researchers (NED; CGMS) and an education specialist (BV) held a discussion about the completeness of the competences. The literature seemed to be limited to competences for all tasks in the NuPhaC-EU model and the framework was too limited to start the Delphi study. Therefore, 44 expected relevant competences based on nursing competence related literature were added (Appendix 3) (European Commission for Education and Culture, 2008; European Federation of Nurses Associations, 2016; Ličen and Plazar, 2019; Sasso et al., 2008). Subsequently, the researchers (NED; CGMS; BV) assigned the competences to tasks in the NuPhaC-EU model and reported them in an Excel file, which was the basis of the competence framework used for the Delphi study (Appendix 4). In the framework, tasks in the NuPhaC-EU model, together with related competences, were described. For each task, respondents marked whether or not the competence was expected to be relevant (green coloured cells indicated potentially relevant, according to the literature, and red that the competence was potentially irrelevant). In the Delphi rounds the relevancy of all coloured cells was discussed.

2.4. Phase two: Delphi study

2.4.1. Expert panel

In this Delphi study the 20 nurse leaders of the 14 participating countries of the DeMoPhaC project (Belgium, Czech Republic, Germany, Greece, Hungary, Italy, North-Macedonia, the Netherlands, Norway, Portugal, Slovenia, Slovakia, Spain, and United Kingdom [Wales]) could participate. The nurse leader could decide to participate or to ask one representative peer (with the same expertise). It was anticipated that about 20 professionals with a position in nurse education (for example as a teacher) and/or in clinical practice would constitute a representative group. All experts had participated in previous DeMoPhaC project studies. Because of the likely homogeneity of the professionals, a sample size of 15–30 respondents per panel was considered sufficient for the study's aim (de Villiers et al., 2005). Two nurse leaders opted for collaboration with a peer. They discussed this with the coordinators of the study (NED, EDB, TD, BVR, and CS), who agreed because the proposed peers met the inclusion criteria (expertise) of a panel member.

Experts were informed via an information letter and consented to participate before the start of the first Delphi round.

The Delphi study consisted of different phases of data collection and data analysis following an iterative process (McKenna, 1994). In total, five Delphi rounds were performed to reach consensus with experts on the relevant competences for nurses in interprofessional pharmaceutical care.

All documents and discussions in the Delphi rounds were held in English. Rounds one, two, four, and five were performed by completing an Excel file, while round three involved an online group discussion. When more than one expert participated in a country, one jointly completed Excel file was used.

This Delphi study was a modified version of a classic Delphi study (Humphrey-Murto et al., 2017; McKenna, 1994). More specifically, a face-to-face meeting with the experts was planned besides the sequential rounds with the Excel files. This was done to obtain experts' opinions on the relevance of competences, to discuss scores, to investigate areas of disagreement, and to gain more in-depth insights from the experts.

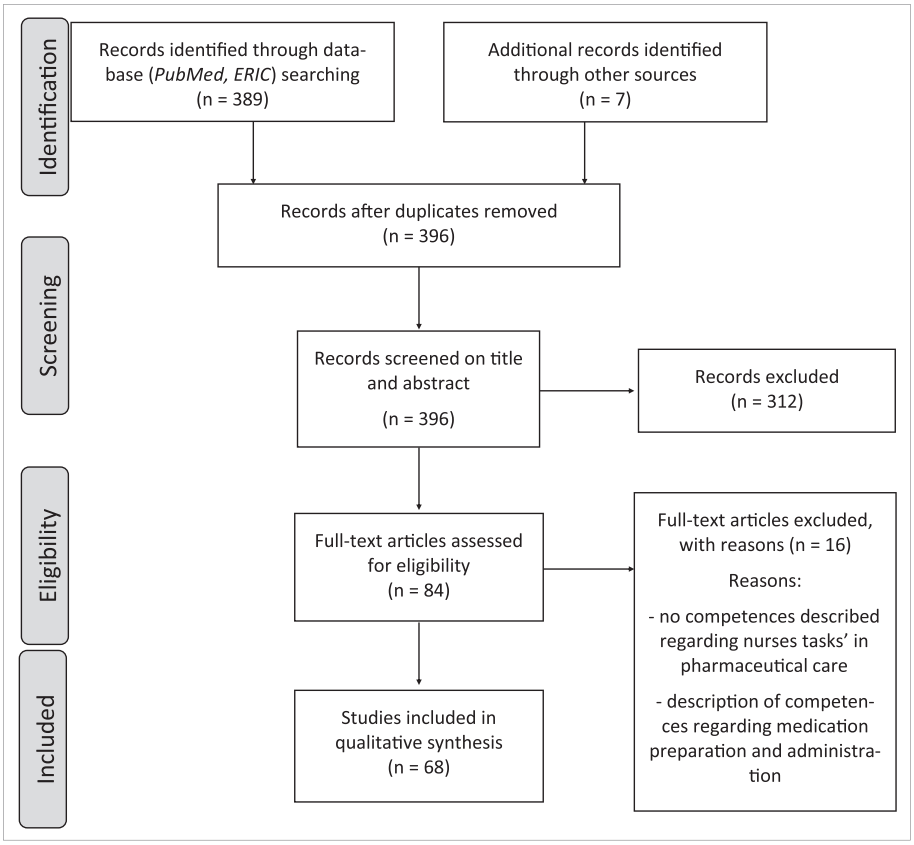

Fig. 2. Outcomes of scoping review on nurses' competences for interprofessional pharmaceutical care.

2.4.2. Round one: determining relevance of competences in the initial framework

The aim of the first round was to: (1) evaluate the relevance of competences defined in the first phase of this study and (2) to define other potentially relevant competences, followed by assigning them to tasks (February 2020). For this round, an Excel file with the content of phase one was presented to the experts (Appendix 4). The experts were asked to determine relevance for each competence on a 9-point Likert scale (1 = strongly disagree, 9 = strongly agree) as described in the RAND/UCLA Appropriateness Method (Fitch et al., 2001; Heiko, 2012; Nair et al., 2011). Additionally, the experts were asked which knowledge, skill, and/or attitude was missing in the framework and should be considered in the next Delphi round. The Excel file also contained background information about the study objective, user instructions, and questions regarding demographic characteristics (i.e. age, gender, country, and professional status).

Results were analysed using the RAM and the Interpercentile Range Adjusted for Symmetry method. First, for each outcome (score of 1–9 of each competence linked to a task) a group median was calculated to determine the degree of relevance. The disagreement index (DI) was calculated to determine the level of agreement. As described in the RAM, the DI is the ratio between the Interpercentile Range (IPR) and the IPR Adjusted for Symmetry, which has been calculated following the equation in Appendix 5 (Fitch et al., 2001). A DI <1 indicates agreement, with a score closer to zero indicating a stronger agreement. A median of 1–3 with agreement (DI < 1) indicates that the competence is not relevant, a group median of 4–6 with agreement (DI < 1) and medians with disagreement (DI ≥ 1) indicate that the relevance of the competence is uncertain, and any median of 7–9 with agreement (DI < 1) indicates that the competence is relevant (Fitch et al., 2001).

Competences that were rated as relevant, were included in the final framework. Scores were analysed using SPSS version 25 (IBM Corporation, Armonk, NY, USA). Competences rated as relevant were presented with a green coloured cell in the competence framework, competences rated as irrelevant were presented with a red coloured cell, and competences rated as uncertain were presented with an orange colour to be discussed in round three. Descriptive analysis was performed to analyse demographic characteristics.

2.4.3. Round two: determining relevance of additional competences

The second round started from the results of the first round, aiming to determine the relevance of competences that were added by the experts. Experts received an Excel file with the results of round one and the added competences. For each of the competences the same Likert-scale for relevance was used as in round one (April 2020). In addition, the experts had the opportunity to provide suggestions to improve the readability of the competence framework, such as resolving confusion in the wording. The analysis was as in round one. This resulted in an Excel file with one worksheet containing all competences assigned to tasks. For each competence the colour of the cell indicated the relevance score (green = relevant, orange = uncertainly relevant, and red = irrelevant).

2.4.4. Round three: group discussion about relevance scores

The results of the second round showed that a group discussion was desirable to address ambiguous interpretations of competences or tasks. During the third round, preliminary results and discrepancies were presented to discuss (1) ambiguities in relevance scores, (2) to discuss competences with missing relevance scores, and (3) comments and suggestions to improve the readability of competences or tasks.

A one-day group discussion in which experts should physically meet was proposed, however, due to COVID-19 pandemic (May 2020), a digital group discussion of 4.5 h was chosen. Before the meeting, the experts received the relevance outcomes of round one and two. They were asked to prepare questions on any ambiguities before the discussion. During the online meeting, experts had the opportunity to discuss individual views on ambiguities orally or through a chat function. The discussion for each competence ended in a voting round to determine if the relevance score needed to be changed or not. Researcher NED functioned as the chair of the meeting and TD functioned as a moderator. The group discussion was video recorded and in addition notes were taken. Notes and the video record were used to analyse the discussions and adjust relevance as discussed. Some suggested changes were related to multiple competences assigned to a certain task (e.g. motivational interviewing). Based on the discussion, all other scores were reviewed once more by the researchers (NED; CGMS) to find potentially ambiguous scores and to suggest any changes in scores or wording of competences, with explanations. The group discussion was also meant to discuss suggested changes to improve the readability of the framework. However, because of shortage of time, comments and suggestions of three experts (round 2) for improvement of readability could not be discussed, resulting in email responses concerning the improvements.

2.4.5. Round four: agreement about competence overview

The fourth round (June 2020) aimed to reach agreement concerning changes the experts had disagreed in the previous Delphi round. The experts received the Excel file that was created after the analysis of round three. The experts could indicate any disagreements and their reasons in a comment field for each cell.

2.4.6. Round five: final agreement about competence framework

The fifth round (July 2020) aimed to reach final agreement with experts about suggested changes of round four. The experts were asked to indicate whether they agreed on the changes of round four (yes or no).

2.5. Ethics

This study was approved by the ethical review board of the University of Applied Sciences Utrecht, the Netherlands (reference number 102_000_2019). The ethical review board concluded that the study procedure was in compliance with all ethical requirements.

3. Results

3.1. Demographic characteristics

Demographic characteristics of the experts are presented in Table 1. In total, the same 22 experts participated in all rounds of the Delphi study except for round three, in which 18 experts participated (4 had other commitments that day).

3.2. Round one: determine relevance of competences of the initial framework

In Appendix 6 the relevance outcomes (the median scores and the disagreement index scores) of competences and the additionally formulated competences are presented. In total, 16 competences were added and assigned to tasks.

3.3. Round two: determine relevance of additional competences

In the second round, the 16 added competences of the first round were rated as relevant (Appendix 7). Three experts gave comments and suggestions to improve readability of competences and/or tasks.

3.4. Round three: group discussion about relevance scores

The discussion resulted in voting rounds in which experts voted unanimously if relevance outcomes of several competences needed to be changed (from relevant to irrelevant or vice versa) and if competences with missing relevance scores should be considered as relevant or irrelevant. Furthermore, 22 tasks were divided into 7 specific nursing

Table 1
General characteristics of the experts (n = 22).

	N (%)
Gender, female (%)	15 (68)
Age, [median, IQR years]	[46, 41–56]
Country	
Belgium	3
Czech Republic	1
Germany	1
Greece	2
Hungary	1
Italy	2
North-Macedonia	1
The Netherlands	1
Norway	2
Portugal	1
Slovakia	2
Slovenia	2
Spain	2
United Kingdom (Wales)	1
Professional status[a], (%)	
Working in clinical practice	
Nurse	5 (23)
Medical doctor	3 (14)
Researcher (PhD student, post-doc, [assistant] professor)	21 (96)
Working in nurse educational program	
Teacher	12 (55)
Director	3 (14)

Abbreviations: IQR = Interquartile range.
[a] Participants could indicate more than one professional status.

tasks and 15 general nursing tasks in interprofessional pharmaceutical care, three tasks were combined into one and renamed, one task was split up in two tasks, seven times two or more competences were combined, 18 competences were renamed, and five duplications of competences were checked and removed. The changes of this Delphi round are presented in Appendix 8.

3.5. Round four: agreement about competence overview

In the fourth round, the experts indicated whether they agreed or not with the suggested changes that resulted from round three. Six outcomes were changed (from relevant to irrelevant or vice versa) in the specific nursing tasks and five were changed in the general nursing tasks. Also, tasks were reformulated from passive to active voice sentences and three tasks were removed (i.e., 'medication review', 'medication reconciliation', and 'facilitation of medication management'). These tasks were removed because they were considered as processes containing several tasks, which were already included in the framework. Three competences that were related to these tasks only, were removed and another 15 competences were renamed. The changes of round four are presented in Appendix 9.

3.6. Round five: final agreement about competence framework

All experts agreed with the content of the competence framework, containing a total of 60 competences. Forty-one of the 60 competences were related to 15 generic nursing tasks in interprofessional pharmaceutical care (Fig. 3a) and 33 competences of the 60 competences were related to seven specific nursing tasks (Fig. 3b).

4. Discussion

This study resulted in a competence framework containing skills, knowledge, and attitudes designated for nurses to perform tasks in interprofessional pharmaceutical care. The framework fits nursing tasks in current clinical practice and can be used for competency-based education of nurses and nursing students. The competences were derived from existing literature combined with knowledge and expertise of international experts in the field of nursing and interprofessional pharmaceutical care. To our knowledge, such a framework has not been published.

In the first phase of this study, we concluded that literature about pharmaceutical care related nursing knowledge and attitudes fitting to our previously defined nursing tasks was scarce. On the one hand, existing research about nursing knowledge was mainly about drug prescribing (Abuzour et al., 2018b; Bradley et al., 2007; Earle et al., 2011; Hopia et al., 2017), patient education (Hollis et al., 2014; Marvanova and Henkel, 2018; Robinson et al., 2017; Sulosaari et al., 2014a), and shared decision making (Abuzour et al., 2018a; Davison and Cooke, 2015; Kendall et al., 2007; Sibley et al., 2011). On the other hand, literature regarding pharmaceutical care related attitudes was limited to 'adequate and consistent attitude based on knowledge' (Banning, 2003; Bradley et al., 2007) and 'confidence in own decision making' (Abuzour et al., 2018b). In our opinion attitudes regarding interprofessional collaboration with other health care professionals and attitudes to patients (e.g. respectfulness and responsiveness to patients' needs) were missing. These attitudes are essential in nursing care (European Federation of Nurses Associations, 2015; International Council of Nurses, 2012). A possible explanation for absence of these essential attitudes in our scoping review could be that research about such universal attitudes has been linked to nursing care in general, but not specifically to nurses' roles in interprofessional pharmaceutical care. Therefore, our search strategy did not detect these competences.

We believe that the online discussion meeting was important in our study and increased the reliability of the framework's content and its applicability for educational purposes. Discussion meetings are advised for Delphi studies (Donohoe et al., 2012), but are not structural applied. In 63% (49 out of 78) of the Delphi studies in healthcare reviewed, panel members met (Boulkedid et al., 2011). To illustrate the value of our online discussion meeting, the performance of the task 'motivational interviewing' also concerns the performance of the task 'patient communication'. As a consequence, the competences needed for patient communication are relevant for motivational interviewing as well. To develop a clear competence overview, however, only competences with a direct link to a task were rated as relevant. Without the discussion meeting, we would not have been able to detect some unnecessary competence-task links. Furthermore, the discussion resulted in the removal of all 'leadership' competences. Confusion and misinterpretation were presumed because leadership could be understood in different ways. In fact, leadership can be (mis)interpreted as the management process of planning, organizing, managing, and controlling within teams and organizations (Schermerhorn, 2002). This was not the meaning we intended within our competence framework. By leadership competences, we meant the attitudes which promote and encourage learning and create collaborative and facilitative environments inside an organization (Atwood et al., 2010). This meaning is related to nurses being patients' advocates. Patient advocacy involves taking the responsibility and a proactive attitude to perform task to improve patients' medication therapy (Water et al., 2016). This competence, however, already existed in the framework (attitudes) and hence, leadership competence was not included.

4.1. Implications for education, policy, and future research

Our competence framework can be used in educational programs to evaluate whether all pharmaceutical care related competences are integrated in nursing curricula or to redesign curricula so that the nurses' competences will be adequately addressed. Our framework was not split into the different nurse educational levels of the European Qualification Framework (EQF), because of differences in national legislation. Therefore, we advise nurse educators, using our competence framework, to only teach competences that fit with the legally allowed nursing tasks in their country. This can be challenging, knowing that several tasks (e.g. 'recognising and preventing DRPs' or 'self-care support and therapeutic

A

	Generic tasks of nurses related to interprofessional pharmaceutical care														
	Observing	Documenting	Assessing and addressing patients'/patient advocates' needs	Assessing patients competences	Decision making	Communicating/ discussing with patients/patient advocates	Applying evidence based practice	Ensuring follow-up	Ensuring inter/ intraprofessional referrals	Collegial mentoring	Ensuring transitional care communication, inter/ intraprofessional collaboration/communication (including reporting, advising, informing, alerting and discussing)	Advising patients, patient advocates and/or other healthcare professionals	Motivational interviewing	Intervening in case of emergency	Discharge/ transition of care planning
KNOWLEDGE, the nurse . . .															
Has knowledge of anatomy, physiology, pharmacokinetics and pharmacodynamics*															
Is familiar with protocols and able to act according to protocols*															
Has knowledge of national laws and legislation*															
Has knowledge of potential causes of drug-related problems*															
Understands that addressing patients'/patient advocates' needs is important*															
Has knowledge on how to assess patients' competences*															
Understands the importance to assess patients' competences*															
Understands the importance to communicate and discuss with patients, patient advocates, healthcare professionals*															
Understands the importance to use evidence based practice in clinical practice*															
Has the knowledge and understands the process of clinical reasoning*															
Understands the importance to follow-up issues/problems*															
Is aware of the importance of care coordination*															
Knows the role of each healthcare professional in case of referrals and care transitions*															
Is familiar with which healthcare professional should be contacted in case of referrals and care transitions*															
Knows when collegial mentoring is needed*															
Has basic theoretical knowledge of relevant social sciences and knows how to apply that knowledge in order to improve self-care*															
Has knowledge of ethics**															
Has knowledge of motivational interviewing theories/techniques**															
Understands the importance of sharing knowledge and medication-related information**															
SKILLS, the nurse . . .															
Is able to observe and recognize therapeutic effects and drug-related problems*															
Is able to observe patients' level of competences*															
Is able to communicate and discuss drug-related problems, referrals, changes in the medication therapy to patients/patient advocates/healthcare professionals clearly*															
Is able to recognize the needs and preferences in self-care of the patient and/or patient advocates*															
Is able to empower and involve the patient and/or patient advocates*															
Is able to act according to patients' level of competences*															
Is able to delegate medication tasks to patients/patient advocates/healthcare professionals*															
Is able to supervise colleagues and to provide ongoing feedback and is able to accept feedback from colleagues*															
Is able to promote critical self-reflection*															
Is able to apply clinical reasoning*															
Is able to apply shared-decision making*															
Is able to apply motivational interviewing techniques*															
Is able to recognize the level of emergency**															
Is able to document observations and potential risks*															
Is able to function effectively taking into account the different cultural backgrounds to work appropriately with patients (advocates) and healthcare providers from different cultural backgrounds**															
ATTITUDE, the nurse . . .															
Has self-confidence to perform a task*															
Takes the responsibility and a proactive attitude to perform a task in order to improve patients' medication therapy*															
Is able to respond to and respect patients' preferences*															
Takes the opportunity to mentor colleagues*															
Takes responsibility to document clinical change*															
Is able to collaborate inter/intraprofessionally, is aware of own shortcomings, identifies situations where interdisciplinary consultation is needed and recognizes chances to share expertise with other healthcare professionals**															
Takes the responsibility to jointly clarify relevant reasoning processes and construct common meaning through dialogical discourse with patients (advocates) and healthcare professionals**															

Relevant | Uncertain relevant | Irrelevant

*Competences are based on outcomes of phase one
**Competences were added in the second Delphi round

B

	Specific tasks of nurses related to interprofessional pharmaceutical care						
	Recognising, addressing and preventing DRPs	Supporting self-care and providing therapeutic education	Initiation of medication (reactive/proactive)	Prescribing/administering PRN (pro re nata, 'if needed' medication) and/or ensuring a standing prescription renewal order	Adapting doses (incl. dose titration) within the range prescribed by a prescriber	Determining type/dosage/route	Proposing or taking a decision on continuation and/or cessation of medication***
KNOWLEDGE, the nurse . . .							
Has knowledge of anatomy, physiology, pharmacokinetics and pharmacodynamics*							
Is familiar with protocols and able to act according to protocols*							
Has knowledge of national laws and legislation*							
Has knowledge of potential causes of drug-related problems*							
Has knowledge of interventions that aim to prevent DRPs and to support self-care*							
Knows the role of each healthcare professional in case of discussion of treatment choices/changes*							
Is familiar with which healthcare professional should be contacted in case of discussion of treatment choices/changes*							
Has knowledge of educational interventions*							
Knows how to receive the best possible medication history and current medication regimen*							
Has knowledge of the nurse independent/dependent prescribers' formulary *							
Has knowledge of (electronic) drug references and or prescribing software*							
Has basic theoretical knowledge of relevant social sciences and knows how to apply that knowledge in order to improve self-care*							
Has knowledge of ethics**							
has knowledge how to seek for medication-related information effectively to address DRPs**							
Understands the importance of sharing knowledge and medication-related information**							
SKILLS, the nurse . . .							
Is able to observe and recognize therapeutic effects and drug-related problems*							
Is able to propose and implement interventions that aim to prevent drug-related problems*							
Is able to apply interventions to optimize self-care*							
Is able to interview patients about the use of prescription medications and over-the-counter medications*							
Is able to obtain timely, accurate, and thorough medication histories*							
Is able to propose appropriate changes in the medication therapy*							
Is able to recognize the needs and preferences in self-care of the patient and/or patient advocates*							
Is able to empower and involve the patient and/or patient advocates*							
Is able to delegate medication tasks to patients/patient advocates/healthcare professionals*							
Is able to undertake safe storage, transportation and disposal of medicines for/with patients and/or patient advocates*							
Is able to (de)prescribe medication of the nurse (in)dependent prescribers' formulary*							
Has (technology) skills to work with (electronic) drug references and or prescribing software*							
Is able to seek for medication-related information effectively to address DRPs**							
Is able to order medication for/with patients and/or patient advocates*							
Is able to function effectively taking into account the different cultural backgrounds, to work appropriately with patients (advocates) and healthcare providers from different cultural backgrounds**							
ATTITUDE, the nurse . . .							
Has self-confidence to perform a task*							
Takes the responsibility and a proactive attitude to perform a task in order to improve patients' medication therapy**							
Is able to respond to and respect patients' preferences*							
Is able to verify patients' understanding of education/information*							

Relevant | Uncertain relevant | Irrelevant

*Competences are based on outcomes of phase one
**Competences were added in the second Delphi round
*** Also known as deprescribing

Fig. 3. a The competence framework with generic nurses tasks and related competences b The competence framework with specific nurses tasks and related competences.

education') can be performed by nurses of different levels. There is little evidence as to the impact of education programmes on patient outcomes (Jordan, 2000), and work is needed to map competencies to outcomes in practice. Therefore, nursing curricula should describe learning outcomes, which can exactly determine at what level of complexity nurses should master each competence, and how these will relate to patient care.

We want to address the need for universal agreement on interprofessional pharmaceutical care competences, for both equal and different levels of the EQF. Currently, there is no universal agreement regarding the tasks nurses should be able to perform, either between countries or within the different educational levels of the EQF (European Commission for Education and Culture, 2008). This hinders labour mobility of nurses between countries. To illustrate, a study in 13 European countries showed independent nurse prescribing is a task performed by nurses in 8/13 countries: Cyprus, Estonia, Ireland, the Netherlands, Norway, Spain, Sweden and the UK. In two of those countries, the Netherlands and Norway, not all level 6 nurses are allowed to prescribe, but nurse specialists are (Maier et al., 2018).

A universal agreement could create the opportunity to develop comparable nursing curricula per educational level throughout Europe. As a result, all European nursing students would be taught the same competences, facilitating international labour mobility. Comparisons between and within levels of education will enable national and international benchmarking between nurses and nursing schools. The content of educational programs differs significantly, even within countries, as was shown by Sulosaari et al., (2014b) in relation to the content of medication education in Finnish Bachelor nursing programs (Sulosaari et al., 2014b).

Further research is needed regarding assessment of nursing students' competences that can measure the readiness of students for clinical practice. In a recent European study in 6719 nurses, physicians, and pharmacists the quality of nurse competences in interprofessional pharmaceutical care was rated suboptimal (6.9/10) (De Baetselier et al., 2020), leaving a hiatus in care (Logan et al., 2020). Developing minimum educational and practice standards might facilitate the comparability and recognition of advanced nursing roles across borders and in increasingly connected labour markets (Maier and Aiken, 2016).

4.2. Limitations and strengths

Some limitations have to be acknowledged. Due to the COVID-19 pandemic, a one-day face-to-face group discussion was replaced by a digital discussion meeting of 4.5 h. The virtual distance may have reduced the spontaneous sharing of opinions. Due to the digital environment, the combination of chairing/moderating the discussing, observing non-verbal communication and managing the chat function was difficult. Nevertheless, we believe the different voting rounds gave the experts sufficient space to share their thoughts. The experts were identified from their publications and international research profiles and they collaborated in previous studies of the DeMoPhaC project. Their willingness to participate also leaves the findings vulnerable to self-selection bias. Further work is needed to confirm the findings' transferability into educational and clinical practice.

The digital Delphi meeting has several advantages compared to the traditional non digital Delphi meetings (Donohoe et al., 2012). For this study, the digital Delphi meeting provided the opportunity to continue the research during the COVID-19 pandemic in order to finalize the Delphi rounds.

A strength of our Delphi study was the involvement of a relevant international expert panel with important experience in clinical practice or nurse education. Their expertise allowed in-depth reflection on the relevance of nurse competences in interprofessional pharmaceutical care across Europe, which assured the generalizability of the results. The study provides useful insights in nursing competences related to tasks in interprofessional pharmaceutical care.

5. Conclusions

After five Delphi rounds concerning nurses' competences needed for the performance of essential tasks in interprofessional pharmaceutical care, 22 experts reached consensus on the relevance of 60 competences within 22 nursing tasks. Forty-one competences were related to 15 generic tasks and 33 competences were related to seven specific tasks. The study resulted in a competence framework that can be used in competency-based education to prepare nursing students for clinical practice. Assessment strategies to measure students' readiness for processing competences relating to interprofessional pharmaceutical care in clinical practice are needed. Future research should focus on embedding these competences in nursing curricula and how they impact patient outcomes.

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CRediT authorship contribution statement

Nienke E Dijkstra, Elyne de Baetselier: Conceptualization, Methodology, Formal analysis, Investigation, Writing - Original Draft, Visualization, Project administration, Funding acquisition.

Tinne Dilles, Bart Van Rompaey, Carolien GM Sino,: Conceptualization, Methodology, Writing - Review & Editing, Supervision, Project administration, Funding acquisition, Final approval of the version to be submitted.

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Declaration of competing interest

None.

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References

Abuzour, et al., 2018a. Factors influencing secondary care pharmacist and nurse independent prescribers' clinical reasoning: an interprofessional analysis. J. Interprofessional Care 32 (2), 160–168. https://doi.org/10.1080/13561820.2017.1394279.

Abuzour, et al., 2018b. A qualitative study exploring how pharmacist and nurse independent prescribers make clinical decisions. J. Adv. Nurs. 74 (1), 65–74. https://doi.org/10.1111/jan.13375.
Arksey, O'Malley, 2005. Scoping studies: towards a methodological framework. Int. J. Soc. Res. Methodol. 8 (1), 19–32. https://doi.org/10.1080/1364557032000119616.
Atwood, et al., 2010. Learning to lead: evaluating leadership and organizational learning. Leadersh. Organ. Dev. J. 31 (7), 576–595.
Banning, M., 2003. Pharmacology education: a theoretical framework of applied pharmacology and therapeutics. Nurse Educ. Today 23 (6), 459–466. https://doi.org/10.1016/s0260-6917(03)00064-9.
Boulkedid, et al., 2011. Using and reporting the delphi method for selecting healthcare quality indicators: a systematic review. PLoS One 6 (6), e20476. https://doi.org/10.1371/journal.pone.0020476.
Bradley, et al., 2007. Nurse prescribing: reflections on safety in practice. Soc. Sci. Med. 65 (3), 599–609 doi:S0277-9536(07)00177-3.
Choo, et al., 2010. Nurses' role in medication safety. J. Nurs. Manag. 18 (7), 853–861. https://doi.org/10.1111/j.1365-2834.2010.01164.x.
Council of Europe, 2020. Resolution CM/res(2020)3 on the implementation of pharmaceutical care for the benefit of patients and health services. Retrieved from. www.pcne.org/upload/files/400_Council_of_Europe_CM-Res20203_-_Final_-_EN.pdf.
Davison, Cooke, 2015. How nurses' attitudes and actions can influence shared care. J. Ren. Care 41 (2), 96–103. https://doi.org/10.1111/jorc.12105.
De Baetselier, et al., 2020. EUPRON: Nurses' practice in interprofessional pharmaceutical care in europe. A cross-sectional survey in 17 countries. BMJ Open. https://doi.org/10.1136/bmjopen-2019-036269.
de Villiers, et al., 2005. The delphi technique in health sciences education research. Med. Teach. 27 (7), 639–643 doi:U052W43552GT064M [pii].
Dilles, et al., 2010. Nurses' practices in pharmacotherapy and their association with educational level. J. Adv. Nurs. 66 (5), 1072–1079. https://doi.org/10.1111/j.1365-2648.2010.05268.x.
Donohoe, et al., 2012. Advantages and limitations of the e-delphi technique: implications for health education researchers. Am. J. Health Educ. 43 (1), 38–46.
Ensing, H. T., Stuijt, C. C., van den Bemt, B. J., van Dooren, A. A., Karapinar-Çarkit, F., Koster, E. S., & Bouvy, M. L. (2015). Identifying the optimal role for pharmacists in care transitions: a systematic review. J. Manage. Care Specialty Pharm., 21(8), 614–636. doi:2015(21)8: 614–636.
European Commission for Education and Culture, 2008. The european qualifications framework for lifelong learning (EQF). Retrieved from. www.ecompetences.eu/wp-content/uploads/2013/11/EQF_broch_2008_en.pdf.
European Federation of Nurses Associations, 2015. EFN guideline for the implementation of article 31 of the mutual recognition of professional qualifications directive 2005/36/EC, amended by directive 2013/55/EU. Retrieved from. http://www.efnweb.be/wp-content/uploads/EFN-Competency-Framework-19-05-2015.pdf.
European Federation of Nurses Associations, 2016. EFN Workforce matrix 3+1 executive summary. Retrieved from. www.efnweb.be/wp-content/uploads/EFN-Workforce-Matrix-31-Executive-Summary-May-2017.pdf.
Fitch, et al., 2001. The RAND/UCLA appropriateness method user's manual (no. RAND/MR-1269-DG-XII/RE). RAND CORP SANTA MONICA CA. Retrieved from. www.rand.org/content/dam/rand/pubs/monograph_reports/2011/MR1269.pdf.
Heiko, A., 2012. Consensus measurement in delphi studies: review and implications for future quality assurance. Technol. Forecast. Soc. Chang. 79 (8), 1525–1536. https://doi.org/10.1016/j.techfore.2012.04.013.
Hepler and Strand. (1989). Opportunities and responsibilities in pharmaceutical care. Am. J. Pharm. Educ., 53, *7S–15S.*
Hollis, et al., 2014. Do practice nurses have the knowledge to provide diabetes self-management education? Contemp. Nurse 46 (2), 234–241. https://doi.org/10.5172/conu.2014.46.2.234.
Hopia, et al., 2017. Growth of nurse prescribing competence: facilitators and barriers during education. J. Clin. Nurs. 26 (19–20), 3164–3173. https://doi.org/10.1111/jocn.13665.
Humphrey-Murto, et al., 2017. Using consensus group methods such as delphi and nominal group in medical education research. Med. Teach. 39 (1), 14–19. https://doi.org/10.1080/0142159X.2017.1245856.
International Council of Nurses, 2012. The ICN code of ethics for nurses. The icn code of ethics for nurses. Retrieved from. www.icn.ch/sites/default/files/inline-files/2012_ICN_Codeofethicsfornurses_%20eng.pdf.
Jordan, S. (2000). Educational input and patient outcomes: exploring the gap. J. Adv. Nurs., 31(2), 461–471. doi:jan1279 [pii].
Kendall, et al., 2007. Nurses' attitudes toward their role in patient discharge medication education and toward collaboration with hospital pharmacists: a staff development issue. J. Nurses Staff Dev. 23 (4), 173–179 doi:00124645-200707000-00005.
Kim, J., Parish, A.L., 2017. Polypharmacy and medication management in older adults. Nurs. Clin. N. Am. 52 (3), 457–468 doi:S0029-6465(17)30058-0.
Ličen, Plazar, 2019. Developing a universal nursing competencies framework for registered nurses: a mixed-methods approach. J. Nurs. Scholarsh. 51 (4), 459–469. https://doi.org/10.1111/jnu.12483.
Logan, et al., 2020. Did we Do Everything we Could Have? nurses' Contributions to Medicines Optimization: A Mixed-Methods Study. Nursing Open.
Maier, Aiken, 2016. Task shifting from physicians to nurses in primary care in 39 countries: a cross-country comparative study. Eur. J. Pub. Health 26 (6), 927–934. https://doi.org/10.1093/eurpub/ckw098.
Maier et al. (2018). Task shifting between physicians and nurses in acute care hospitals: cross-sectional study in nine countries. Hum. Resour. Health, 16(1), 24–018–0285-9. doi:https://doi.org/10.1186/s12960-018-0285-9.
Marvanova, Henkel, 2018. Collaborating on medication errors in nursing. Clin. Teach. 15 (2), 163–168. https://doi.org/10.1111/tct.12655.
McKenna, H.P., 1994. The delphi technique: a worthwhile research approach for nursing? J. Adv. Nurs. 19 (6), 1221–1225. https://doi.org/10.1111/j.1365-2648.1994.tb01207.x.
Moher, et al., 2009. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. PLoS Med. 6 (7) https://doi.org/10.1371/journal.pmed1000097.
Mulder, M., 2014. Conceptions of professional competence. In: International Handbook of Research in Professional and Practice. Springer, Dordrecht.
Nair, et al., 2011. Methods of formal consensus in classification/diagnostic criteria and guideline development. Semin. Arthritis Rheum. 41 (2), 95–105. https://doi.org/10.1016/j.semarthrit.2010.12.001.
Robinson, et al., 2017. A national survey of nurse training: confidence and competence in educating patients commencing methotrexate therapy. Musculoskelet. Care 15 (3), 281–292. https://doi.org/10.1002/msc.1212.
Sasso, et al., 2008. Code of ethics and conduct for european nursing. Nurs. Ethics 15 (6), 821–836. https://doi.org/10.1177/0969733008095390.
Schermerhorn, J., 2002. *Management* Den Haag: Sdu Uitgevers bv.
Sibley, et al., 2011. Medication discussion between nurse prescribers and people with diabetes: an analysis of content and participation using MEDICODE. J. Adv. Nurs. 67 (11), 2323–2336. https://doi.org/10.1111/j.1365-2648.2011.05686.x.
Sino, et al., 2013a. Recognition of drug related problems by home healthcare employees: a dutch observational study with self reports. J. Nurs. Educ. Pract. 3 (8), 41. https://doi.org/10.5430/jnep.v3n8p41.
Sino, C.G., Bouvy, M.L., Jansen, P.A., Schop, I.M., Egberts, T.C., Schuurmans, M.J., 2013b. Signs and symptoms indicative of potential adverse drug reactions in homecare patients. J. Am. Med. Dir. Assoc. 14 (12), 920–925. https://doi.org/10.1016/j.jamda.2013.09.014.
Stegemann, S., Ecker, F., Maio, M., Kraahs, P., Wohlfart, R., Breitkreutz, J., Broegmann, B., 2010. Geriatric drug therapy: neglecting the inevitable majority. Ageing Res. Rev. 9 (4), 384–398. https://doi.org/10.1016/j.arr.2010.04.005.
Sulosaari, et al., 2014a. Medication education in nursing programmes in Finland–findings from a national survey. Collegian 21 (4), 327–335. https://doi.org/10.1016/j.colegn.2013.08.003.
Sulosaari, V., Huupponen, R., Torniainen, K., Hupli, M., Puukka, P., Leino-Kilpi, H., 2014b. Medication education in nursing programmes in Finland–findings from a national survey. Collegian (Royal College of Nursing, Australia) *21* (4), 327–335. https://doi.org/10.1016/j.colegn.2013.08.003.
Water, et al., 2016. Patient advocacy by nurses - past, present and future. Contemp. Nurse 52 (6), 696–709. https://doi.org/10.1080/10376178.2016.1235981.
Earle, et al., 2011. Nurse prescribing in specialist mental health (part 2): the views and experiences of psychiatrists and health professionals. J. Psychiatr. Ment. Health Nurs. 18 (4), 281–287. https://doi.org/10.1111/j.1365-2850.2009.01517.x.
Lee, et al., 2015. Optimizing pharmacotherapy in elderly patients: the role of pharmacists. Integ. Pharm. Res. Pract. 4, 101–111. https://doi.org/10.2147/IPRP.S70404.