



Content, implementation strategies and knowledge assessment tool on venous leg ulcers: An e-Delphi study

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ABSTRACT

Aim: To get consensus on the knowledge and skills that nursing students need to acquire regarding venous leg ulcer care, the strategies that can be applied during education and to design a first draft of a questionnaire to assess knowledge to be validated.

Background: Venous leg ulcers' care is included on undergraduate nursing education programmes but without specifying the content and training implementation strategies. Different tools have been validated to assess knowledge, but have been found inadequate.

Design: An e-Delphi study.

Methods: The participants were Chronic Wound Care expert nurses. Two questions were constructed and agreed on by the research team to define the problem. To answer the third question, a search was conducted for publications on venous leg ulcers, to help design the questionnaire. A 2-round e-Delphi study was conducted from January to March 2022. A panel of 17 experts participated in both rounds. The data were analysed using statistical and qualitative analysis.

Results: Content must fulfil knowledge-skill areas: epidemiology, venous pathophysiology and aetiology, classification scales, knowing how to determine a differential diagnosis, treatment, measures for prevention and care of the venous return circuit, quality-of-life scales. As implementation strategies, proposals were made in four areas: subject profile where training is to be acquired, theoretical teaching, practical teaching in the classroom and clinical practice. The average consensus of the questionnaire proposal was high (>86 %) both in relevance and clarity in both rounds. We thereby obtained a questionnaire with 72 items.

Conclusions: Seven categories and eight subcategories were created regarding knowledge/skills that nursing students should acquire. Four categories were recognised as strategies that can be implemented during education. A high level of consensus was reached on the items in the initial versions of the questionnaire.

1. Introduction

The primary endpoint of wound evolution is wound healing, a parameter that benefits from good wound assessment and management. This factor underlines the importance of acquiring and maintaining up-to-date knowledge regarding venous leg ulcers (VLU) care. In the context of nursing practice in Spain, it is striking that according to Martínez-Santos et al. (2019), 62 % of nurses have attended training courses on lower extremity injuries in the last 5 years. However, these

authors highlight that, despite the training received, the degree of knowledge acquired by the professionals was considered very low, low or medium. The lack of competence in the correct management of ulcers leads to a feeling of helplessness and anxiety among professionals when faced with the increasing expectations of patients, relatives and the health care system (Calne et al., 2008). At this point it is also relevant to consider how university pathways respond to the emerging needs of clinical practice. The time devoted to chronic wound education in undergraduate nursing curricula has been considered insufficient and

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inadequate (Abuleal, 2018; Moore and Clarke, 2011).

A scoping review carried out by Durán-Sáenz et al. (2022) has highlighted the lack of knowledge of nurses and nursing students about VLU care. According to Kielo et al. (2020), graduating nursing students have limited competence in chronic wound care, including VLUs, especially regarding practical competence.

Regarding the content of training programmes related to VLU care, in most nursing degrees in Spain, it is included in subjects under different nomenclatures. After the authors reviewed 112 teaching guides on Spanish university websites, in search of a compulsory subject addressing VLUs, different denominations have been found such as Nursing; Adult I or II, Adult Person I, Clinical I, II or III, Adult Clinical I, Advanced Clinical I, Adult Clinical I, Adult Clinical, Medical-Surgical I or II, Chronic, Advanced and Terminal Processes, Nursing Care in Health Alterations I, Adult Nursing Care, Adult Care, Adult Nursing Care, Adult Nursing Care, Nursing Care in Health Alterations I, Mechanisms and Processes of Disease I and Health Alterations I. Although no papers were found regarding content related to VLU care, Tobajas-Señor et al. (2017) and Romero-Collado et al. (2015) both published articles regarding curricula on chronic wounds (where VLU care should be included) in Spanish Nursing degrees and found that although the topic is taught in almost half of the universities, the number of hours is insufficient. For instance, Tobajas-Señor et al. (2017) found that 69.64 % of universities provide content in the second year, although it is worth less than 2 European Credits (ECTS).

Furthermore, in EU Member States, training programmes must comply with the European Qualifications Framework (EQF), an 8-level, learning outcomes-based framework for all types of qualifications which serves as a tool to transpose different national qualifications frameworks. The EQF was set up in 2008 and later revised in 2017. Its revision has maintained the core objectives of creating transparency and mutual trust within qualifications in Europe (European Union, n.d.-a).

Therefore, it can be said that the nursing degree curricula in Spain are marked by European (European Union, 2013) and national (Ministry of Science and Innovation, 2008) regulations. Despite this, each university has the final decision on the contents of each plan, leading to heterogeneity (Ruiz-Rojo et al., 2022).

According to the teaching and learning methods, as well as assessment and evaluation methods, some documents, such as the wound curriculum for students' nurses by European Wound Management Association (EWMA), do not include specific details. It is recommended that these curricula should follow the structure used by the education provider while incorporating the content and learning objectives provided in this curriculum according to local legislation and procedures (law and accreditation processes) (Lindahl et al., 2021).

As said by Durán-Sáenz et al. (2022), it can be stated that there is no ideal assessment tool to quantify knowledge, skills, attitude, confidence and commitment in nursing students. None of the validated questionnaires assess knowledge and skills in the same tool. They focus on technical competencies and not on non-technical competencies such as decision-making, among others. The most recently validated tool (Ylönen et al., 2019) presents a question format of ambiguous statements and not whether the answers are Yes, No or Don't know, as recommended in the literature (DeVellis, 2012). In addition, there are few studies conducted with undergraduate nursing students.

There are studies that are investigating this issue in graduate nurses, but there is not enough research with robust designs. This evidence gap is greatest among student nurses. This is a point of particular relevance in contexts such as ours, where at the University we train generalist nurses who will have to respond to the VLU care.

The objectives of this study were to:

- 1) Get consensus on the knowledge and skills that undergraduate nursing students should acquire regarding VLU care.
- 2) Define strategies that can be implemented during university education to ensure that nursing students learn VLU care.

- 3) Design a draft questionnaire to assess knowledge related to VLU care to be further validated.

2. Methods

An e-Delphi technique was used to achieve consensus among Spanish wound care experts. The essential elements of the Delphi method (Donohoe et al., 2012; Wilkes, 2015) were carried out in online mode, as follows.

2.1. Identification of the research problem

The following questions were developed to define the research problem:

- "What should undergraduate nursing students know (knowledge) and know how to do (skill) regarding VLU care?"
- What strategies can be implemented during undergraduate education to ensure that nursing students learn how to care for people with venous ulcers?
- Which statements are appropriate to include in a VLU care knowledge questionnaire?

2.2. Initial questionnaire design

The first two questions used to define the problem were designed by agreement within the research team conducting this study. They were formulated according to their original design, as presented in the objective, as open-ended questions.

To answer the third question, a search for publications on VLU was conducted, with the aim of constructing the first version of a VLU knowledge questionnaire (Humphrey-Murto et al., 2016; Jorm, 2015). The search was conducted on the following web resources: European Wound Management Association (EWMA), World Union of Wound Healing Societies (WUWHS), Scottish Intercollegiate Guideline Network (SIGN), Wounds International, National Institute for Health and Care Excellence (NICE), National Group for the Study and Advice on Pressure Ulcers and Chronic Wounds (GNEAUPP), Spanish Vascular Nursing Association (AEEV), National Consensus Conference on Lower Extremity Ulcers (C.O.N.U.E.I.), Wounds UK, Wounds Canada, Wounds International and Cochrane.

The search found documents that contained chapters or monographs on VLU management. The full text of the publications was selected and obtained. The information was read, summarised (English-language documents were translated into Spanish) and grouped into the following areas: Epidemiology, Anatomy-Physiopathology, Diagnosis, Classification, Treatment and Prevention.

From this synthesis of information, a set of 77 items was drafted. It was drawn up by consensus within the research team composed of 4 professionals with experience in the field of chronic wound care.

A 5-item Likert scale (Completely agree, Agree, Neither Agree nor disagree, Disagree, Completely disagree) was associated with each item (McMillan et al., 2016) to assess clarity and relevance. In addition, comments on the clarity and relevance of each item could be included via an open-ended response. Consensus on an item was considered when 70 % of experts responded that they "Completely agree" or "Agree" with that statement (Humphrey-Murto et al., 2017). The e-Delphi platform was pilot-tested with two independent researchers before the study began.

2.3. Selection of the panel of experts

The invitation to the first round of the e-Delphi expert panel was sent to 30 nurses and two physicians. The selection criteria for the panel were:

- a. More than 10 years of professional and committed care experience working with VLU patients at management, care, teaching and/or research level.
- b. Ability to provide comprehensive opinions and suggestions and
- c. High motivation and willingness to participate in the study.

The panel included individuals with an acknowledged track record as published authors and leaders in wound care, both nationally and internationally. Most of them had also received additional training on the topic of interest. The selected nursing professors taught undergraduate and postgraduate nursing care of VLU patients at university level. The experts were selected by considering representation from all autonomous communities in Spain.

2.4. Administration of the questionnaire

The e-Delphi panel was presented with two open questions. One to find out what they considered relevant to the knowledge and skills that undergraduate nursing students should acquire concerning care of VLU patients and the other about teaching strategies. The first version of the questionnaire to assess knowledge was also presented to reach a consensus on the questions.

The experts were recruited by purposive sampling and the first author contacted the panellists by email, following an internet search. He invited the experts to join the e-Delphi panel and was the only author who knew their identities.

Data were collected between January and March 2022 through an online questionnaire, administered with a survey and reporting tool, Google Forms (Google, n.d.). Panellists entered separately using a link and/or QR code sent in the email.

The first e-Delphi round was launched on 18 January 2022. To ensure the research process and the quality of the consultation, experts were required to complete the aforementioned information within 28 days; a reminder email was sent after 7 days. The target sample was 12–20 experts (Toronto, 2017), which was considered representative, as there are no definitive rules on how to determine sample size for a Delphi study (Wilkes, 2015).

2.5. Data analysis and panel feedback

The final number of panellists in the first round was 17, all of whom were informed of the first-round results and invited to the second round via personalised links (Jorm, 2015). Of these, 17 panellists participated in the second e-Delphi round, which started on 9 March 2022.

On this occasion, participants were asked to complete the information within 14 days; a reminder email was sent after 7 days. Data from the two e-Delphi rounds were analysed using qualitative and statistical analysis.

Responses to the two open-ended questions were pooled.

The response percentages "Completely agree and Agree" were calculated for the clarity and relevance of each questionnaire item. Levels of agreement (LA) were calculated as follows. First, the number of panellists who rated clarity and relevance as "Completely agree and Agree" was divided by the number of panellists in that round and multiplied by 100. The LA for each questionnaire item was calculated separately for clarity and relevance. The mean of these two LA was then calculated separately for each item. An LA above 70 % was considered to be consensus prior to data collection (Wilkes, 2015). After statistical analysis, the panellists' comments were reviewed by the corresponding author and comments suggesting revision were highlighted. The first two authors then discussed the highlighted comments and compared them to other comments in the same section (if applicable) to differentiate which items needed to be revised. The level of LA agreement was also taken into account to decide whether revision was necessary.

2.6. Report on results

A report with the results from the questions and how the items had evolved was prepared and sent to the panellists.

2.7. Ethical approval

This study was approved by the ethics committee of the University of the Basque Country (M10_2021_312), as part of the development of an educational intervention with nursing students. The panellists were informed about data processing and data protection in accordance with current Spanish and European (EU, 2016/679, 2016) privacy and data protection legislation (Organic Law 3/2018, of 5 December, on the Protection of Personal Data and the Guarantee of Digital Rights, 2018).

3. Results

3.1. Study participants

In both the first and second rounds, seventeen experts in Chronic Wound Care participated as panellists. All participants were nurses, of which nine (52.9 %) were male and eight (47.1 %) female, fifteen (88.2 %) had more than 20 years of work experience and two (11.8 %) between 11 and 20 years. Regarding the level of studies, eleven (64.7 %) reported having a PhD, three (17.6 %) an official university master's degree, two (11.8 %) a diploma/graduate degree/university degree and one (5.9 %) a postgraduate degree (expert/specialist/unofficial master's degree).

Regarding the field where they work, this was a multiple-choice answer: Research (7), Nursing education (11), Management (7) and Clinical practice (8).

3.2. First e-Delphi round

Expert responses to the two open-ended questions were collected. They were grouped and categorised as shown in Table 1 for the first question and then for the second one:

- **Subject profile where training is to be acquired:** Design and implement a specific subject on skin care, proposing that there should be a core subject or an optional subject in all universities.
- **Theoretical teaching:** Include/analyse in detail venous physiology and the fundamentals of compression during lectures.

Table 1

"What should undergraduate nursing students know about (knowledge) and know how to do (skill) regarding VLU care?".

Know about the epidemiology (prevalence/incidence)
Understand the venous pathophysiology and aetiology of VLUs
Understand the risk factors for developing VLUs.
Know about the classification scales
Know how to establish a differential diagnosis
Recognising common signs and symptoms
Have the ability to perform diagnostic tests: Peripheral pulse/ Ankle Brachial Index
Know about the treatment
Know about and understand the whole person approach and its complexities.
Assess the complexity of the VLU patient both at home and in the consulting room.
Know about and know how to assess the wound and perilesional skin.
Emphasise the use of the TIMERS approach acronym, especially moisture management and topical treatments.
Know about and know how to use compression therapy devices, both in prevention and treatment, to understand the difficulties of adherence to treatment.
Understand pharmacological treatments.
Know about the measures for prevention and care of the venous return circuit.
Know about and know how to give health advice to people with chronic venous insufficiency and VLU.
Know about quality-of-life scales
Venous Leg Ulcer (VLU)

The content should be taught by lecturers who are in contact with patients and who are very up to date.

Offer testimonials from real patients.

- **Practical teaching in the classroom:** Classroom practice (seminars, workshops) and include simulation as a teaching methodology (experiential simulations or simulation workshop).

The classroom practice content should include differential diagnosis, performance of ABPI and compressive therapy devices.

- **Clinical practice:** Specialised placements: in Primary Care, Vascular Surgery and Wound Units/Care Referrals. Practice tutors, especially in units or areas of work where many cases of VLU are seen, should have received training.

The responses to the 77 items for the questionnaire, reported an average of the minimum accepted consensus percentage ($\geq 70\%$). It was 89.07 % for relevance and 88.84 % for clarity. Two statements did not meet the minimum requirements for relevance and clarity. Another two statements did not reach the minimum for clarity. The results per statement can be seen in Figs. 1 and 2. The proposals in the open question on each statement were taken into account to create the 73 consultation items for the next round.

3.3. Second e-Delphi round

In terms of the first open question, the panellists offered new contributions to different categories, for instance, regarding knowledge of treatment, one panellist said:

“TIMERS instead of TIME should be included as an acronym for the approach. Knowledge of other acronyms, such as DOMINATE or HERIDEA”.

Knowledge of moisture management through dressings and topical treatments was particularly recommended. It was emphasised that therapeutic products, their technical data sheets and relevant information on their functions should be known. Other contributions included:

“Know the referral criteria and research on cell therapy and advanced techniques (laser, diathermy, shock waves, angiostimulation, platelet rich plasma, negative pressure therapy, punch grafting.)”.

Regarding the second open question, the "classroom teaching" subgroup added that the classroom practice content should include pulse palpation, culture sample collection skills, dressing selection and

debridement, as well as performing clinical cases.

Responses to the 73 items reported an average of the minimum accepted percentage of consensus ($< 70\%$). It was 88.92 % for relevance and 86.93 % for clarity. One statement did not meet the minimum requirements for clarity. The results per statement can be seen in Figs. 3 and 4. The proposals in the open question of each statement were considered to create the 72 final items of the questionnaire. Based on these recommendations, a set of items were listed, with a True, False or I don't know response format, following the methodological recommendations of (DeVellis, 2012): clear wording, avoid long items, avoid items with double ideas and with difficulty of understanding. Likewise, items were written about incorrect aspects, whose answer had to be True, to avoid all the items having a Yes answer. The items in the three questionnaire versions are shown in Annex 1.

4. Discussion

The first objective of this study was to reach a consensus on which content is relevant in teaching and learning about VLU care. Within the experts' open-ended responses, seven main areas were highlighted: 1) Epidemiology; 2) Aetiopathophysiology; 3) Classification of chronic venous insufficiency using scales; 4) Differential diagnosis of lower extremity ulcers; 5) Treatment of VLU; 6) Preventive measures; and 7) Quality of life. Contributions in some subcategories stand out: within the "differential diagnosis" subcategory, it was suggested that the usual leg ulcer symptomatology should be recognised and the skills to perform the different diagnostic tests should be presented. Within the "knowledge of treatment" subcategory, it was suggested that a nurse should know about and know how to formulate a comprehensive approach to the person, assessment and local approach using VLU acronyms, use of the different compressive therapy devices and knowledge of pharmacological treatments.

In the document produced by the authors following the publications review, the areas recognised were definition, epidemiology, pathophysiology, diagnosis, classification, treatment, prevention and quality of life. Thus, the areas were recognised according to those cited and extracted from the literature review. The results of this study match studies that also identified areas of competence in VLU management, e. g., the Wound Curriculum for Student Nurses, in line with European qualification framework level 4 (Lindahl et al., 2021). In addition to this discussion, we can take into account present curricula heterogeneity and

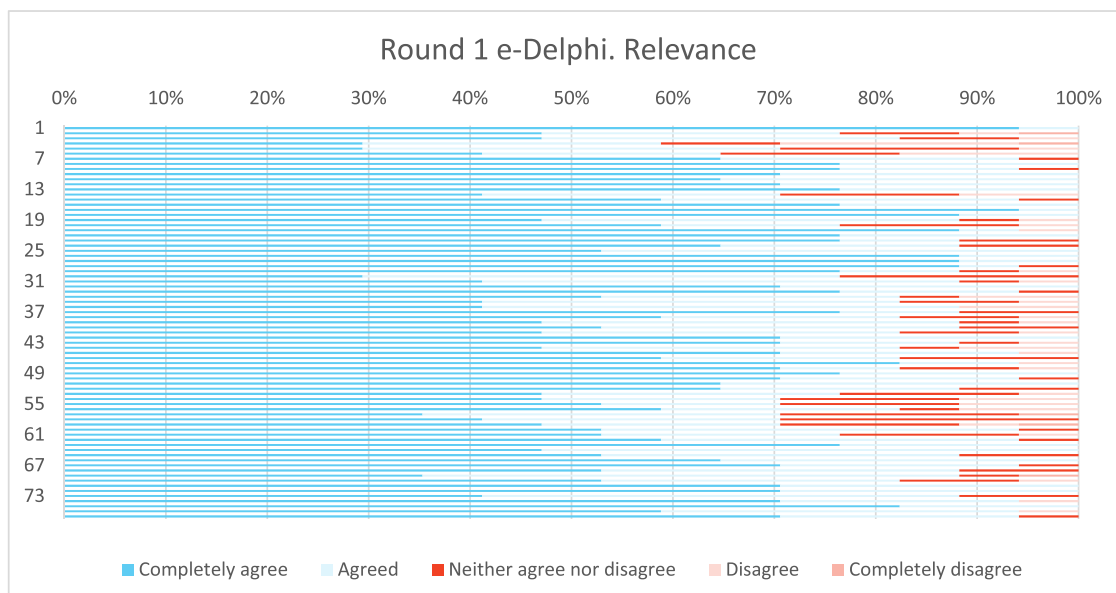


Fig. 1. First round e-Delphi. Relevance.

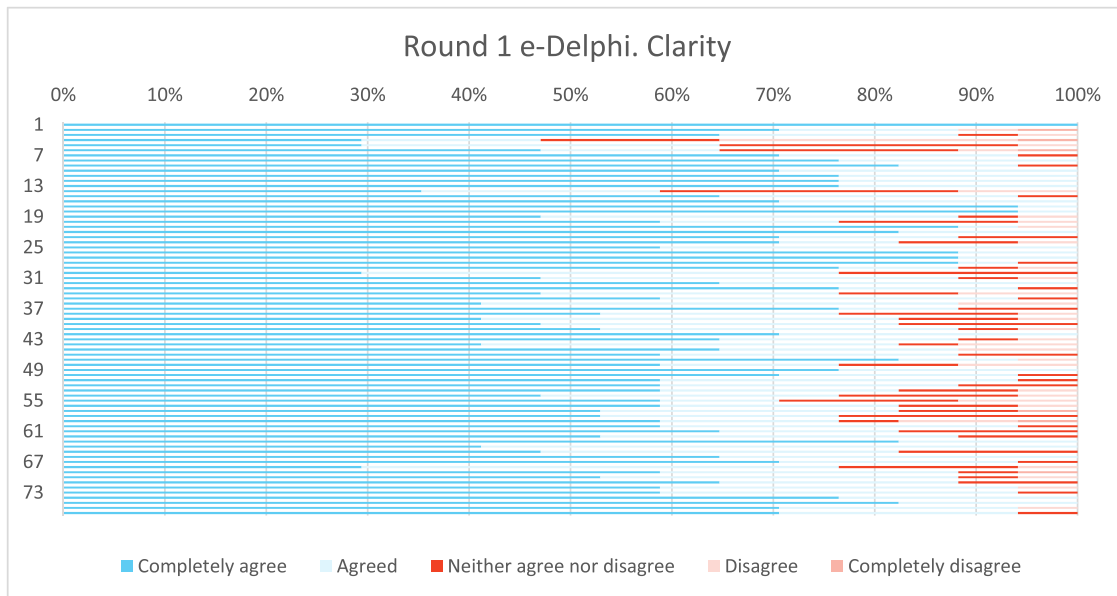


Fig. 2. First round e-Delphi. Clarity.

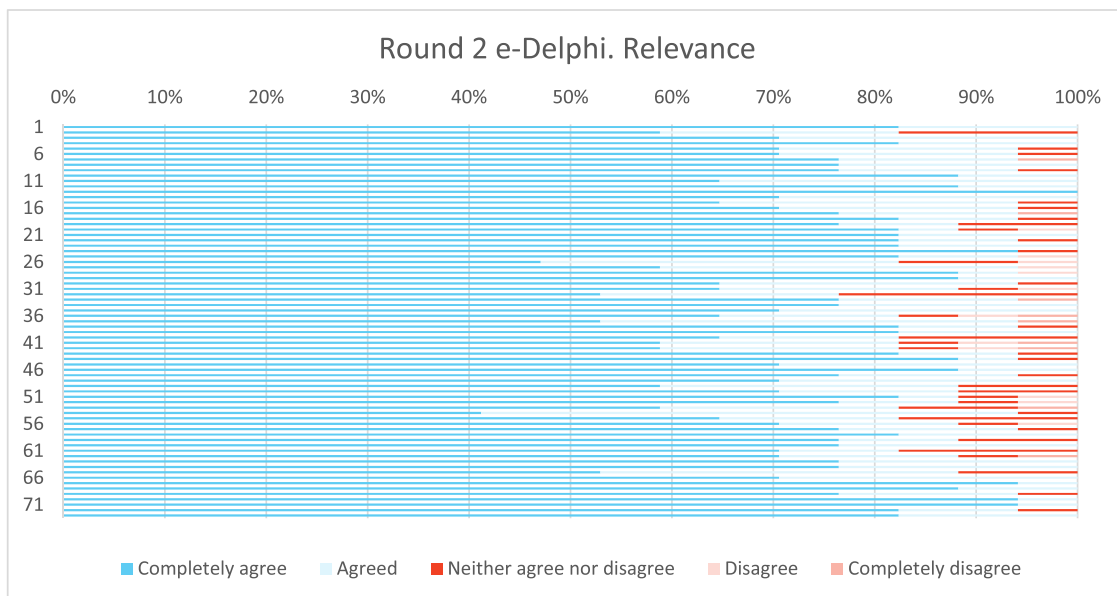


Fig. 3. Second round e-Delphi. Relevance.

that it is difficult to ascertain concrete content in teaching, (Romerio-Collado et al., 2015; Ruiz-Rojo et al., 2022; Tobajas-Señor et al., 2017) so it is not possible to check whether all contributions from the expert panel are actually included in student nurses' training. The second consultation objective was intended to receive input on what strategies can be implemented during university education to ensure that nursing students learn how to care for people with VLU.

In relation to 1) "Subject profile where training can be acquired", it was proposed that a specific subject on skin care should be designed and implemented in the university nursing degree. This subject is proposed to be compulsory on the syllabus (Soldevilla-Agreda et al., 2022). If not, it should be offered as an optional subject. This proposal would require legislative changes, modifying Order CIN/2134/2008, of 3 July (Ministry of Science and Innovation, 2008), which sets the requirements to verify official university degrees that enable the practice of the nursing profession. On the other hand, the proposal to implement an optional

subject is more achievable since this depends on the Nursing Degree curriculum from the autonomous communities and the regulations for each university centre.

In relation to 2) "Theoretical teaching", the consensus proposals were that venous physiopathology, and the fundamentals of compression should be included/further analysed in lectures. It was also proposed that the content should be taught by teachers who are in contact with the students and who are very up to date on the matter. One contribution suggested providing testimonials from real patients. Modifications at this teaching level are achievable due to the teaching staff's freedom to programme the subject.

Concerning 3) "Practical teaching", it was proposed that this should include seminars and workshops. The classroom practice content should contain activities related to differential diagnosis, performing the ankle-brachial index and compressive therapy devices. The panellists proposed to include teaching methodologies such as simulation (experiential

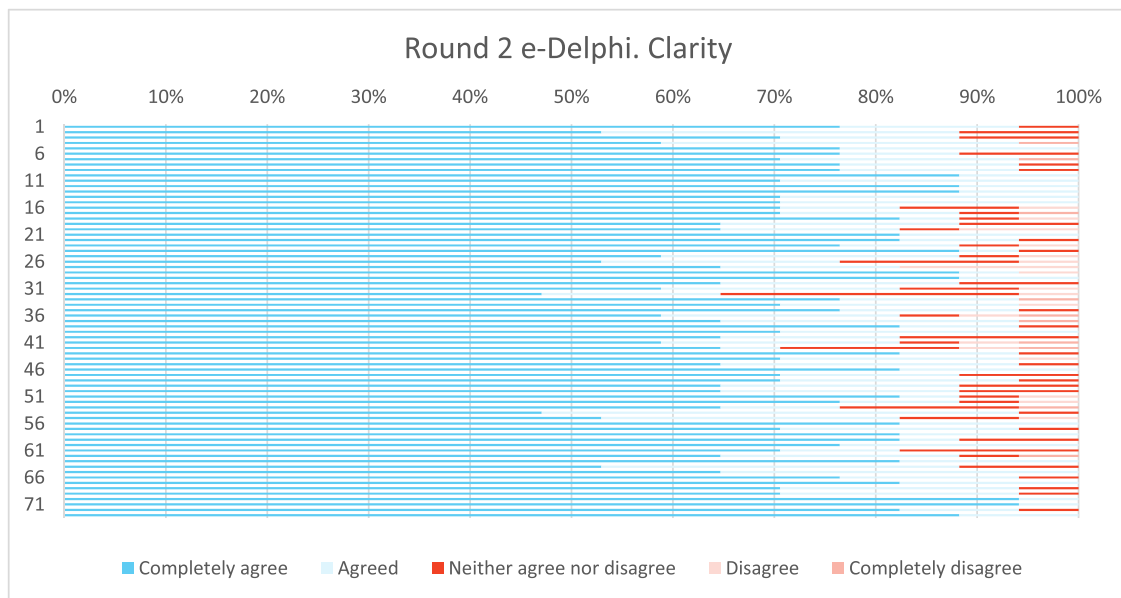


Fig. 4. Second round e-Delphi. Clarity.

simulations or simulation workshop). This contribution should be accepted and analysed with caution. According to (Gomes Silva et al., 2020), clinical simulation is effective in developing clinical reasoning in wound assessment and treatment, although there is no significant effect on knowledge acquisition.

With regard to 4) "Practical training in health care", rotation was planned in areas specialising in VLU treatment in areas such as: Primary Care, Vascular Surgery and Wound Units/Care Referral Units. The training period in these services is regulated by each university's internal regulations, as students follow a work placement itinerary. The rotation of students in wound units or with referring nurses is subject to including these services or figures in the care environment where the placement takes place. The number of such units in Spain is currently low (González de La Torre et al., 2017).

The third and final objective of the consultation was to reach a consensus on creating a questionnaire to assess knowledge about VLU. The average consensus was high (>86 %) concerning both relevance and clarity in both rounds. In the first round, four statements were eliminated as they did not reach the required minimum score of 70 %. In the second round, one had to be eliminated as it did not achieve minimum consensus. The panel's input improved the description of several statements in the final version. Therefore, we obtained a questionnaire with 72 items that will be subject to validity analysis, although its items have obtained acceptability scores in terms of relevance and clarity.

5. Limitations

The expert panel was recruited through purposive sampling. There is a chance that not all potential experts in the field were reached. As a strength, recruitment included nurses from the four main roles described in the International Council of Nurses code of ethics for the nursing profession. The panel members had roles in more than one field. In addition, they were heterogeneous both organisationally and geographically, which reduced impact. Also, 64.7 % of panellists had roles as nurse educators. This makes the results more valid, as the consultation focused on teaching-learning.

The Delphi panel was conducted in an online environment and the panellists participated in it separately. However, online Delphi panels allow for larger samples, as well as participant anonymity, which promotes honesty and reduces the risk of dominant or high-profile participants controlling the discussion (Barrett and Heale, 2020). Although we

initially invited 30 persons, the response rate was eventually 56.6 % (17 persons). Nevertheless, panellists from the first round also participated in the second round, which increased the validity of the study.

This study was conducted in Spain, which means that the results cannot be directly extrapolated to other countries, as university curricula vary between countries.

However, nursing education in Spain is regulated by the European Union Directives (Ministry of Science and Innovation, 2008; Ministry of the Presidency and for Territorial Administrations, 2017) on recognition of professional qualifications. Therefore, the results of this study should also apply to other European countries, at least at some level.

6. Conclusion

Seven categories and eight subcategories of knowledge/skills were devised to be acquired by Nursing Degree students regarding caring for people with a VLU. Four categories were recognised as strategies that can be implemented during undergraduate education to ensure that nursing students learn to care for people with venous ulcers. A high level of consensus was reached on the items in the initial versions of a VLU knowledge questionnaire. Relevant content, implementation strategies and questionnaire items were evaluated by a Delphi panel of wound care experts and consensus among the experts was high, suggesting that the results were clinically valid. The results of this consultation can be used as a reference to be considered in teaching and learning about caring for people with VLU. The consensus on the relevance and clarity of the questionnaire items after two rounds of consultation makes it valid for further research on its validity and future research.

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Iván Durán-Sáenz: Conceptualization, Methodology, Software, Validation, Formal analysis, Investigation, Resources, Data Curation, Writing - Original Draft, Writing - Review & Editing, Visualization, Supervision, Jose Verdú-Soriano: Conceptualization, Methodology, Software, Validation, Formal analysis, Investigation, Resources, Data

Curation, Writing - Original Draft, Writing - Review & Editing, Visualization, Supervision, Pablo López-Casanova: Conceptualization, Methodology, Writing - Review & Editing, Visualization, Susana Cariñanos-Ayala: Conceptualization, Methodology, Writing - Review & Editing, Supervision., Miriam Berenguer-Pérez: Conceptualization, Methodology, Writing - Review & Editing, Visualization,

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at [doi:10.1016/j.nepr.2023.103602](https://doi.org/10.1016/j.nepr.2023.103602).

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