



Research article

Learning goals and content for wound care education in Finnish nursing education – A Delphi study

Emilia Kielo-Viljamaa^{a,b,*}, Jaakko Viljamaa^{c,d}, Riitta Suhonen^{a,c,e}, Leena Salminen^{a,c}, Minna Stolt^a

^a University of Turku, Department of Nursing Science, Finland

^b Novia University of Applied Sciences, Finland

^c Turku University Hospital, Finland

^d University of Turku, Finland

^e City of Turku, Welfare Division, Finland



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ABSTRACT

Background: Caring for patients with wounds requires diverse competences from nursing professionals. However, wound care education in undergraduate nursing education is often fragmented and lacks consistent learning goals and content.

Objectives: To create learning goals and content for wound care education in Bachelor's level nursing education in Finland and to assess the consensus relating to these learning goals and content among wound care experts.

Design: A consensus-building approach using the Delphi technique.

Settings: A Delphi panel of wound care experts built on an online platform.

Participants: The participants of the Delphi panel were registered nurses, authorised wound care nurses, nurse educators and physicians.

Methods: Learning goals and content for wound care education which had been formulated on the basis of previous focus-group interviews were presented to the Delphi panel. The data were collected in 2021 with two online Delphi rounds: 51 panellists participated in the first round and 36 in the second round. The data were analysed using statistical and qualitative analysis.

Results: Learning goals and content were divided into four competence areas: 1) Anatomy and physiology, 2) Care of chronic and acute wounds, 3) Wound management and care of a patient with a wound, 4) Values and attitudes. These competence areas comprised 26 learning goals and 29 pieces of content. The consensus between the panellists was high, at >90% in all competence areas.

Conclusions: The basis of registered nurses' wound care competence is built during their undergraduate nursing studies. The results of this study can be used to standardise wound care education by implementing consistent learning goals and content in Bachelor's level nursing education.

1. Introduction

Caring for patients with wounds is an essential part of nursing practice. Management and prevention of different types of wounds, however, require diverse competences from nursing professionals (Kielo et al., 2019a). According to recent studies, the wound care competence of graduating student nurses is limited (e.g., Welsh, 2018; Kielo-Viljamaa et al., 2021), and student nurses report that they do not receive enough wound care education during their studies (Kielo et al., 2019b).

Graduating student nurses have also described feelings of unpreparedness when caring for wounds (Ousey et al., 2013), though their attitudes towards wound care and prevention have been found to be mainly positive (Simonetti et al., 2015; Kielo et al., 2018).

Competence is a continuing process and is usually context-dependent (Lejonqvist et al., 2012). Previous studies have suggested that registered nurses' and student nurses' wound care competence can be improved with various educational interventions (Martinengo et al., 2020). Nonetheless, the strong basis of registered nurses' wound care

* Corresponding author at: Department of Nursing Science, 20014, University of Turku, Finland.

E-mail address: emilia.a.kielo@utu.fi (E. Kielo-Viljamaa).

URL: <http://t.co/EmiliaKielo> (E. Kielo-Viljamaa).

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competence is built during their undergraduate nursing studies, and with consistent learning goals and content, wound care education in undergraduate nursing education could be standardised. Standardised education could lead to better competence of registered nurses (WHO, 2009), which, in turn, could lead to improved patient outcomes and better patient safety (Church, 2016).

2. Background

In Finland, registered nurses are educated at universities of applied sciences, and the scope of Bachelor's level nursing studies is 210 ECTS (European Credit Transfer and Accumulation System), encompassing 3.5 years of full-time studies. According to the Finnish *Universities of Applied Sciences Act (932/2014)*, universities have autonomy in planning their curricula, but when educating licensed healthcare professionals, such as registered nurses, education is regulated by the *European Union Directives (2005/36/EC; European Union, 2013/55/EC)* on the recognition of professional qualifications. However, these directives only define general competence requirements and content for registered nurses; they do not impose any direct learning goals or health problem-specific content related to nursing education, leaving it to individual European Union countries to set out their own learning goals and content in relation to the education of specific clinical competences.

According to previous literature, learning goals, competence requirements and content have been created and implemented for registered nurses' wound care education at post-graduate level in Europe (Eskes et al., 2014; Pokorná et al., 2017; Probst et al., 2019). However, general learning goals and content for wound care education at undergraduate nursing education are missing, and wound care curricula are often fragmented (Kielo et al., 2019a; Kielo-Viljamaa et al., 2022) despite the fact that wound care is one of the basic competence areas in clinical nursing. In Finland, for example, wound care education in nursing education is often incorporated in broader clinical courses with multiple other clinical competences, leaving the learning goals and content related to wound care often unclear and abstract.

The undergraduate nursing curricula and the national examination for nurses in Finland are based on the new national competence requirements and content for general nurse education approved by all 21 universities of applied sciences that educate Bachelor's level nurses in Finland (Savonia, 2021). These competence requirements are divided into thirteen sub-areas, e.g., professionalism and ethics, clinical nursing, and patient and client safety. Clinical nursing includes certain competence requirements pertaining to wound care, but these are general and do not cover all previously identified competence areas in wound care (Kielo et al., 2019a; Kielo-Viljamaa et al., 2022). In addition, these competence requirements primarily serve curriculum planning rather than the planning of individual courses or learning modules.

The objectives of this study were to create learning goals and content for wound care education in Bachelor's level nursing education in Finland and to assess the consensus relating to these learning goals and content among wound care experts. The primary goal of the study was to provide evidence that can be used to unify wound care education in nursing education and to create standardised learning goals and content. Its secondary goal was to create standards for competence evaluation that could help student nurses to reach the needed competence during their studies and nurse educators to plan wound care education for Bachelor's level nursing education. The research questions were: 1) What are the learning goals and content for wound care education in Bachelor's level nursing education? 2) Is there a consensus related to these learning goals and content among wound care experts?

3. Methods

3.1. Design

A Delphi technique (Wilkes, 2015) was used to assess the consensus

between Finnish wound care experts relating to learning goals and content for wound care education in undergraduate nursing education.

3.2. Setting

The Delphi technique in this study was conducted using an online platform, accessed by the panellists separately.

3.3. Delphi structure

The Delphi panel was presented with learning goals and content for wound care that were based on previously identified competence areas for registered nurses providing chronic and acute wound care, obtained through focus-group interviews (Kielo et al., 2019a; Kielo-Viljamaa et al., 2022). The learning goals and content followed the definition of competence by Cowan et al. (2005) as a complex combination of knowledge, skills, performance, values and attitudes.

The learning goals and content were divided into four competence areas: 1) Anatomy and physiology, 2) Care of chronic and acute wounds, 3) Wound management and assessment, and 4) Values and attitudes. Each of these competence areas was divided into more specific learning goals and content according to previous findings by the research group (Kielo et al., 2019a; Kielo-Viljamaa et al., 2022). Each learning goal and piece of content was assessed for its clarity, relevance and importance using a four-point scale, e.g., 1 = not relevant at all, 2 = not very relevant, 3 = quite relevant, 4 = very relevant. In addition, the clarity, relevance and importance of each learning goal and piece of content could be commented on by the panellists. At the start of the study, there were a total of 25 learning goals and 28 main pieces of content, some of which were divided into two or more sub-sections of content. The Delphi platform was pilot tested with two wound care experts before the onset of the study.

3.4. Participants

The participants of the Delphi panel were registered nurses, authorised wound care nurses, nurse educators and physicians. The selection criteria for the panel was expertise in wound care through further education and/or experience in wound care. The registered nurses and physicians who participated in the panel were all experienced in wound care and in caring for patients with wounds, and most of them had further education in wound care as well. The authorised wound care nurses were registered nurses with a specific authorisation that is issued by the Finnish Wound Care Society, akin to that of tissue viability nurses in the United Kingdom. The nurse educators were teachers or senior lecturers who taught wound care in Bachelor's level nursing education. The participants represented the same professional groups as in the previous focus-group interviews (Kielo et al., 2019a; Kielo-Viljamaa et al., 2022), from which the competence areas used in this study had been identified. These professional groups were considered to have the best and most up-to-date knowledge on wound care and registered nurses' role in it in Finland.

3.5. Data collection

The data were collected between February and April 2021 using an online Delphi questionnaire administered with a Webropol 3.0 survey and reporting tool. The first Delphi round was held between February and March 2021, and the target sample was 50 wound care experts. A sample of 50 panellists was considered representative based on previous similar studies (e.g., Whitehead, 2008; Rauta et al., 2012) as there are no definitive rules on how to determine sample size for a Delphi study (Wilkes, 2015). The experts were recruited using purposeful and snowball sampling, and the corresponding author and the second author contacted potential wound care experts by using their professional networks in different organisations, such as hospitals, by either email or

phone. Nurse educators were also sought in a social media group for Finnish nurse educators. The authors invited wound care experts to join the Delphi panel and sent them an open link to the online questionnaire. The recruited panellists were also encouraged to tap into their own networks and share the link with their colleagues, to obtain a more representative sample for the study (Shorten and Moorley, 2014). The invitation to the first Delphi panel round was thus sent to an unknown number of recipients. The first Delphi round was open until the target sample of 50 panellists had been reached. The final number of panellists in the first round was 51, all of whom were invited to the second round using personalised links. Of them, 36 panellists participated in the second Delphi round, which was held in April 2021.

3.6. Data analysis

The data from both Delphi rounds were analysed using statistical and qualitative analysis. The means and confidence intervals (CI) for the clarity, relevance and importance of each learning goal and piece of content were calculated. As the distributions were highly skewed, the means were reported as 5% trimmed, and the CIs were calculated using bias controlled and accelerated (BCa) bootstrap intervals. The levels of agreement (LA) were calculated in the following manner. First, the number of panellists rating the clarity, relevance or importance of a given learning goal or piece of content as 3 or 4 was divided by the number of panellists in that round and multiplied by 100. The LA for each learning goal and piece of content was calculated separately for its clarity, relevance and importance. After that, an average LA was calculated from these three separate LAs for each learning goal and piece of content. The average LAs of all the learning goals and pieces of content in a given competence area were then averaged to give an overall LA for that competence area. A greater than 70% LA was considered as consensus prior to the data collection (Wilkes, 2015).

After the statistical analysis, the panellists' comments were reviewed by the corresponding author and any comments that suggested a revision were highlighted. The first two authors then discussed the highlighted comments and compared them with other comments in the same section (if applicable) in order to differentiate the learning goals and content that needed revising. The level of agreement was also considered when deciding whether revision was necessary.

3.7. Ethical considerations

This study was conducted in accordance with the guidelines of The Finnish National Board on Research Integrity (TENK, 2012). Ethical approval was obtained from the University ethics committee (18/2020) before the start of data collection. Participation in the study was voluntary. The participants were informed about the study and data processing and protection according to the EU general data privacy regulation (EU, 2016/679). If a participant agreed to participate in the study, they approved their participation by confirming their informed consent in the online Delphi panel questionnaire. They could withdraw from the study at any point without giving a reason for withdrawal. The participants cannot be identified from the study report.

4. Results

4.1. Study participants

Fifty-one wound care experts participated in the first Delphi round. Nearly two-thirds (61%) of the participants were registered nurses, and more than half (55%) were authorised wound care nurses. The physicians represented several different specialities that care for patients with wounds: plastic surgery, vascular surgery, orthopaedic surgery, dermatology, endocrinology, infectious diseases, internal medicine and geriatrics, and most of them (73%) had a special competence in wound care. Thirty-six (71%) of the participants continued on to the second Delphi

round. Two-thirds (67%) of the participants in the second round were registered nurses, most of them (63%) authorised wound care nurses. Most participants in both rounds worked in specialised care. (Table 1.)

4.2. First Delphi round

The overall levels of agreement between the panellists in the first round varied between 93.2% and 96.8%. The overall level of agreement was highest in the Anatomy and physiology competence area and lowest in the Values and attitudes competence area. (Table 2.)

Even though the level of agreement was already high, there were several suggestions for revisions (Table 3). Most of these suggestions pertained to the Care of chronic and acute wounds competence area, where the panellists had hoped for better clarity of the learning goals and content. The Values and attitudes competence area also received some comments. Most were related to the relevance of the learning goals and content in this competence area, as some participants considered them too general and not particularly related to wound care.

Based on the panellists' comments, some changes to the terms and wording were made in the Anatomy and physiology competence area, chiefly with regard to the wound healing process. In the Care of chronic and acute wounds competence area, some sub-sections of content were added. In addition, atypical wounds were added to this competence area as a new learning goal and piece of content. In the Wound management and assessment competence area, nearly all the learning goals and content had their clarity adjusted. The most significant revisions were made to the content related to open wounds and wound beds, and to the learning goals related to wound care products. In addition, the name of this competence area was changed to Wound management and care of patients with a wound, because this competence area was perceived as a wider entity than one incorporating solely the management and assessment of wounds. Finally, in the Values and attitudes competence area, some of the learning goals were revised, and sub-sections of content were added to better delineate the context of wound care in values and attitudes. None of the learning goals or content was omitted after the first Delphi round, as the panellists' level of agreement on the relevance and importance of each goal and content had been good.

4.3. Second Delphi round

The revised learning goals and content were sent to the panellists with explanations of the revisions that had or had not been made. The overall levels of agreement between the panellists in the second round

Table 1
Demographic data for the participants.

	Round 1 (n = 51) n/ %	Round 2 (n = 36) n/ %
Profession		
Registered Nurse	31/61	24/67
Specialised in wound care ^a	10/32	7/29
Authorised wound care nurse ^b	17/55	15/63
Physician	15/29	10/28
Special competence in wound care ^c	11/73	6/60
Nurse Educator	5/10	2/5
Working sector ^d		
Primary care	12/24	7/19
Specialised care	35/69	26/72
Private sector	6/12	3/8
Educational institution	5/10	2/5

^a Further education in wound care (30 ECTS).

^b Wound care authorisation issued by the Finnish Wound Care Society (further education in wound care required).

^c A supplement to the official system of specialisation issued by the Finnish Medical Association (further education in wound care required).

^d Participants could choose one or more.

Table 2
Final learning goals and content and results of the Delphi rounds.

		Round 1				Round 2			
		Clarity n ^a / LA ^b / mean ^c / median / CI ^d	Relevance n ^a / LA ^b / mean ^c / median / CI ^d	Importance n ^a / LA ^b / mean ^c / median / CI ^d	Average LA ^c (%)	Clarity n ^a / LA ^b / mean ^c / median / CI ^d	Relevance n ^a / LA ^b / mean ^c / median / CI ^d	Importance n ^a / LA ^b / mean ^c / median / CI ^d	Average LA ^c (%)
Anatomy and physiology									
Skin and tissues	Learning goal: Knows the anatomy and physiology of the skin and tissues beneath the skin	44 / 86.3 / 3.48 / 4.0 / 3.26–3.68	50 / 98.0 / 3.86 / 4.0 / 3.75–3.97	48 / 94.1 / 3.85 / 4.0 / 3.70–3.95	92.8	35 / 97.2 / 3.78 / 4.0 / 3.62–3.90	35 / 97.2 / 3.78 / 4.0 / 3.62–3.90	36 / 100 / 3.84 / 4.0 / 3.72–3.96	99.1
	Content: Skin and tissues beneath the skin ▪ Skin layers ▪ Function of the skin ▪ Other tissues	48 / 94.1 / 3.76 / 4.0 / 3.61–3.86	49 / 96.1 / 3.82 / 4.0 / 3.66–3.93	49 / 96.1 / 3.84 / 4.0 / 3.71–3.93	95.4	35 / 97.2 / 3.78 / 4.0 / 3.65–3.90	36 / 100 / 3.87 / 4.0 / 3.78–3.93	36 / 100 / 3.84 / 4.0 / 3.72–3.93	99.1
Circulation	Learning goal: Understands the importance of circulation in wound development and healing	49 / 96.1 / 3.88 / 4.0 / 3.73–3.97	51 / 100 / 4.00 / 4.0 / 4.00–4.00	51 / 100 / 4.00 / 4.0 / 4.00–4.00	98.7	35 / 97.2 / 3.90 / 4.0 / 3.78–3.99	35 / 97.2 / 3.96 / 4.0 / 3.87–4.00	36 / 100 / 3.99 / 4.0 / 3.93–4.00	98.1
	Learning goal: Knows the symptoms and findings of arterial and venous insufficiency	49 / 96.1 / 3.69 / 4.0 / 3.55–3.81	51 / 100 / 3.86 / 4.0 / 3.75–3.95	51 / 100 / 3.82 / 4.0 / 3.71–3.93	98.7	35 / 97.2 / 3.87 / 4.0 / 3.75–3.96	35 / 97.2 / 3.96 / 4.0 / 3.86–4.00	36 / 100 / 3.96 / 4.0 / 3.90–4.00	98.7
Wound healing process	Content: Circulation ▪ Arterial insufficiency ▪ Venous insufficiency	50 / 98.0 / 3.71 / 4.0 / 3.58–3.84	51 / 100 / 3.93 / 4.0 / 3.84–3.99	51 / 100 / 3.86 / 4.0 / 3.75–3.95	99.3	35 / 97.2 / 3.87 / 4.0 / 3.74–3.93	35 / 97.2 / 3.93 / 4.0 / 3.83–3.99	36 / 100 / 3.93 / 4.0 / 3.90–4.00	98.1
	Learning goal: Understands the importance of factors that affect wound healing Learning goal: Knows the wound healing phases and the factors that expose the wound to becoming chronic	48 / 96.1 / 3.75 / 4.0 / 3.62–3.85 45 / 88.2 / 3.55 / 4.0 / 3.33–3.72	51 / 100 / 3.97 / 4.0 / 3.90–4.00 50 / 98.0 / 3.75 / 4.0 / 3.64–3.86	51 / 100 / 3.97 / 4.0 / 3.90–4.00 50 / 98.0 / 3.71 / 4.0 / 3.58–3.82	98.7 94.7	34 / 94.4 / 3.83 / 4.0 / 3.65–3.96 34 / 94.4 / 3.80 / 4.0 / 3.62–3.93	36 / 100 / 3.93 / 4.0 / 3.84–4.00 35 / 97.2 / 3.90 / 4.0 / 3.77–3.99	36 / 100 / 3.99 / 4.0 / 3.93–4.00 35 / 97.2 / 3.90 / 4.0 / 3.77–3.99	98.1 96.3
	Content: Wound healing process ▪ Factors that affect wound healing ▪ Wound healing phases ▪ Wound becoming chronic	47 / 94.1 / 3.72 / 4.0 / 3.52–3.86	50 / 98.0 / 3.86 / 4.0 / 3.75–3.95	49 / 96.1 / 3.84 / 4.0 / 3.72–3.93	96.1	35 / 97.2 / 3.87 / 4.0 / 3.74–3.99	36 / 100 / 3.96 / 4.0 / 3.89–4.00	36 / 100 / 3.96 / 4.0 / 3.89–4.00	96.3
	Overall level of agreement^f				96.8	Overall level of agreement^f			98.0
Care of chronic and acute wounds									
Chronic wounds	Learning goal: Knows the aetiology and characteristics of the most common chronic wounds and knows the principles of their prevention and care	49 / 96.1 / 3.69 / 4.0 / 3.53–3.79	50 / 98.0 / 3.84 / 4.0 / 3.72–3.95	49 / 96.1 / 3.84 / 4.0 / 3.72–3.93	96.7	34 / 94.4 / 3.74 / 4.0 / 3.56–3.87	36 / 100 / 3.93 / 4.0 / 3.84–4.00	36 / 100 / 3.96 / 4.0 / 3.87–4.00	98.1
	Learning goal: Knows the aetiology and characteristics of the most common atypical wounds	N/A	N/A	N/A	N/A	33 / 91.7 / 3.56 / 4.0 / 3.34–3.74	35 / 97.2 / 3.69 / 4.0 / 3.56–3.81	34 / 94.4 / 3.56 / 4.0 / 3.37–3.69	94.4
	Content: Venous leg ulcer ▪ Oedema assessment ▪ Compression therapy	49 / 96.1 / 3.79 / 4.0 / 3.68–3.89	51 / 100 / 3.95 / 4.0 / 3.88–4.00	50 / 98.0 / 3.90 / 4.0 / 3.81–3.99	98.0	35 / 97.2 / 3.87 / 4.0 / 3.74–3.92	36 / 100 / 3.99 / 4.0 / 3.93–4.00	36 / 100 / 4.00 / 4.0 / 4.00–4.00	99.1
	Content: Arterial leg ulcer ▪ Assessment of arterial circulation	46 / 90.2 / 3.65 / 4.0 / 3.46–3.82	48 / 94.1 / 3.78 / 4.0 / 3.63–3.90	48 / 94.1 / 3.81 / 4.0 / 3.65–3.93	92.8	34 / 94.4 / 3.86 / 4.0 / 3.68–3.96	36 / 100 / 3.96 / 4.0 / 3.87–4.00	36 / 100 / 3.93 / 4.0 / 3.84–4.00	98.1
	Content: Diabetic foot ulcer ▪ Assessment and examination of diabetic foot ▪ Principles of offloading	47 / 92.2 / 3.61 / 4.0 / 3.41–3.77	47 / 92.2 / 3.72 / 4.0 / 3.52–3.88	48 / 94.1 / 3.81 / 4.0 / 3.63–3.93	92.8	34 / 94.4 / 3.77 / 4.0 / 3.55–3.90	36 / 100 / 3.93 / 4.0 / 3.84–4.00	36 / 100 / 3.93 / 4.0 / 3.84–4.00	98.1
	Content: Pressure ulcer/injury ▪ Risk assessment ▪ Pressure and friction relief ▪ Skin care and protection	49 / 96.1 / 3.84 / 4.0 / 3.73–3.88	51 / 100 / 3.99 / 4.0 / 3.95–4.00	51 / 100 / 4.00 / 4.0 / 4.00–4.00	98.7	36 / 100 / 3.90 / 4.0 / 3.81–3.99	36 / 100 / 3.99 / 4.0 / 3.93–4.00	36 / 100 / 3.99 / 4.0 / 3.93–4.00	100
	Content: Atypical wounds	N/A	N/A	N/A	N/A	31 / 86.1 / 3.49 / 4.0 / 3.25–3.71	33 / 91.7 / 3.62 / 4.0 / 3.40–3.78	35 / 97.2 / 3.45 / 3.0 / 3.31–3.56	91.7
Acute wounds	Learning goal: Knows the aetiology and characteristics of the most common acute wounds and knows the principles of their first aid and care	51 / 100 / 3.82 / 4.0 / 3.69–3.93	51 / 100 / 3.84 / 4.0 / 3.73–3.95	51 / 100 / 3.84 / 4.0 / 3.73–3.95	100	36 / 100 / 3.81 / 4.0 / 3.69–3.93	36 / 100 / 3.84 / 4.0 / 3.72–3.93	36 / 100 / 3.84 / 4.0 / 3.72–3.93	100
	Content: Surgical wound ▪ Sterile and clean techniques ▪ Complications of surgical wound ▪ Care and removal of wound drains ▪ Removal of sutures/staples	50 / 98.0 / 3.88 / 4.0 / 3.77–3.97	51 / 100 / 3.90 / 4.0 / 3.82–3.99	51 / 100 / 3.93 / 4.0 / 3.84–4.00	99.3	36 / 100 / 3.96 / 4.0 / 3.90–4.00	36 / 100 / 3.96 / 4.0 / 3.90–4.00	36 / 100 / 3.99 / 4.0 / 3.93–4.00	100
	Content: Skin transplantation ▪ Care of recipient site ▪ Care of donor site	50 / 98.0 / 3.71 / 4.0 / 3.58–3.81	49 / 96.1 / 3.69 / 4.0 / 3.55–3.82	48 / 94.1 / 3.63 / 4.0 / 3.48–3.72	96.1	36 / 100 / 3.81 / 4.0 / 3.69–3.93	36 / 100 / 3.78 / 4.0 / 3.65–3.90	36 / 100 / 3.81 / 4.0 / 3.69–3.93	100
	Content: Traumatic wound ▪ First aid ▪ Assessment ▪ Care	49 / 96.1 / 3.77 / 4.0 / 3.63–3.88	49 / 96.1 / 3.84 / 4.0 / 3.72–3.95	50 / 98.0 / 3.84 / 4.0 / 3.72–3.95	96.7	35 / 97.2 / 3.84 / 4.0 / 3.71–3.96	36 / 100 / 3.90 / 4.0 / 3.81–3.99	36 / 100 / 3.98 / 4.0 / 3.81–3.99	99.1
	Content: Burn injury ▪ First aid ▪ Degree and size ▪ Care	51 / 100 / 3.88 / 4.0 / 3.77–3.97	51 / 100 / 3.88 / 4.0 / 3.79–3.97	51 / 100 / 3.86 / 4.0 / 3.71–3.95	100	36 / 100 / 3.84 / 4.0 / 3.72–3.69	35 / 97.2 / 3.87 / 4.0 / 3.75–3.96	36 / 100 / 3.90 / 4.0 / 3.81–3.99	99.1
	Content: Frostbite ▪ First aid ▪ Degree and size ▪ Care	48 / 94.1 / 3.83 / 4.0 / 3.68–3.94	48 / 94.1 / 3.72 / 4.0 / 3.57–3.84	46 / 90.2 / 3.65 / 4.0 / 3.48–3.82	92.8	36 / 100 / 3.84 / 4.0 / 3.72–3.96	35 / 97.2 / 3.84 / 4.0 / 3.71–3.96	35 / 97.2 / 3.87 / 4.0 / 3.75–3.96	98.1
Overall level of agreement^f				96.7	Overall level of agreement^f			98.1	
Wound management and care of a patient with a wound									
Asepsis	Learning goal: Knows the principles of working aseptically in wound management	51 / 100 / 4.00 / 4.0 / 4.00–4.00	51 / 100 / 4.00 / 4.0 / 4.00–4.00	51 / 100 / 4.00 / 4.0 / 4.00–4.00	100	36 / 100 / 3.93 / 4.0 / 3.84–4.00	36 / 100 / 4.00 / 4.0 / 4.00–4.00	36 / 100 / 4.00 / 4.0 / 4.00–4.00	100
	Content: Asepsis and environment ▪ Procedure preparation ▪ Personal protective equipment ▪ Aseptic working and order	50 / 98.0 / 3.99 / 4.0 / 3.93–4.00	50 / 98.0 / 3.99 / 4.0 / 3.94–4.00	50 / 98.0 / 3.99 / 4.0 / 3.94–4.00	98.0	36 / 100 / 4.00 / 4.0 / 4.00–4.00	36 / 100 / 4.00 / 4.0 / 4.00–4.00	36 / 100 / 4.00 / 4.0 / 4.00–4.00	100

Open wound	Learning goal: Knows the principles of care of an open wound	48 / 94.1 / 3.81 / 4.0 / 3.65–3.93	51 / 100 / 3.95 / 4.0 / 3.86–4.00	51 / 100 / 3.97 / 4.0 / 3.90–4.00	98.0	34 / 94.4 / 3.86 / 4.0 / 3.71–3.99	36 / 100 / 3.99 / 4.0 / 3.93–4.00	36 / 100 / 3.99 / 4.0 / 3.93–4.00	98.1
	Content: Open wound and wound bed ▪ Colour and tissue types ▪ Optimal environment for wound healing ▪ Assessment and care of the skin surrounding the wound	44 / 86.3 / 3.59 / 4.0 / 3.35–3.82	49 / 96.1 / 3.84 / 4.0 / 3.71–3.95	49 / 96.1 / 3.75 / 4.0 / 3.61–3.86	92.8	33 / 91.7 / 3.80 / 4.0 / 3.62–3.96	36 / 100 / 3.93 / 4.0 / 3.84–4.00	36 / 100 / 3.93 / 4.0 / 3.84–4.00	97.2
Wound infections	Learning goal: Knows the principles of care of an infected wound	50 / 98.0 / 3.77 / 4.0 / 3.64–3.89	51 / 100 / 3.86 / 4.0 / 3.75–3.97	51 / 100 / 3.90 / 4.0 / 3.82–3.99	99.3	35 / 97.2 / 3.87 / 4.0 / 3.75–3.96	36 / 100 / 3.96 / 4.0 / 3.90–4.00	36 / 100 / 3.96 / 4.0 / 3.90–4.00	99.1
	Content: Wound infection ▪ Signs and classification of an infection ▪ Bacterial sample ▪ Care of an infected wound	51 / 100 / 3.88 / 4.0 / 3.79–3.97	51 / 100 / 3.95 / 4.0 / 3.86–4.00	51 / 100 / 3.95 / 4.0 / 3.88–4.00	100	34 / 94.4 / 3.90 / 4.0 / 3.71–3.99	36 / 100 / 3.96 / 4.0 / 3.87–4.00	36 / 100 / 3.99 / 4.0 / 3.93–4.00	98.1
Debridement	Learning goal: Knows and can use different wound debridement methods and instruments	49 / 96.1 / 3.73 / 4.0 / 3.61–3.84	50 / 98.0 / 3.84 / 4.0 / 3.73–3.95	50 / 98.0 / 3.82 / 4.0 / 3.71–3.93	97.4	34 / 94.4 / 3.77 / 4.0 / 3.62–3.87	36 / 100 / 3.93 / 4.0 / 3.84–3.99	36 / 100 / 3.93 / 4.0 / 3.84–3.99	98.1
	Content: Debridement ▪ Methods, products and instruments	49 / 96.1 / 3.75 / 4.0 / 3.63–3.84	50 / 98.0 / 3.88 / 4.0 / 3.79–3.97	50 / 98.0 / 3.86 / 4.0 / 3.75–3.95	97.4	34 / 94.4 / 3.83 / 4.0 / 3.67–3.93	36 / 100 / 3.96 / 4.0 / 3.90–4.00	36 / 100 / 3.96 / 4.0 / 3.90–4.00	98.1
Wound care products	Learning goal: Knows the generic groups of wound products and their function, and can use products of each group correctly	44 / 86.3 / 3.39 / 3.0 / 3.20–3.57	47 / 92.2 / 3.61 / 4.0 / 3.44–3.76	45 / 88.2 / 3.59 / 4.0 / 3.39–3.76	88.9	32 / 88.9 / 3.68 / 4.0 / 3.49–3.86	36 / 100 / 3.81 / 4.0 / 3.69–3.93	36 / 100 / 3.81 / 4.0 / 3.69–3.93	96.3
	Learning goal: Can bandage wounds	40 / 78.4 / 3.27 / 3.0 / 3.01–3.51	45 / 88.2 / 3.61 / 4.0 / 3.41–3.78	47 / 92.2 / 3.63 / 4.0 / 3.46–3.76	86.3	31 / 86.1 / 3.52 / 4.0 / 3.27–3.74	35 / 97.2 / 3.78 / 4.0 / 3.65–3.87	35 / 97.2 / 3.78 / 4.0 / 3.65–3.87	93.5
	Learning goal: Knows the principles of negative pressure wound therapy	49 / 96.1 / 3.64 / 4.0 / 3.51–3.75	47 / 92.2 / 3.57 / 4.0 / 3.37–3.72	47 / 92.2 / 3.48 / 4.0 / 3.31–3.62	93.5	35 / 97.2 / 3.84 / 4.0 / 3.72–3.93	35 / 97.2 / 3.78 / 4.0 / 3.65–3.87	35 / 97.2 / 3.72 / 4.0 / 3.59–3.83	97.2
	Wound products ▪ Generic groups: function and use ▪ Bandaging wounds ▪ Negative pressure wound therapy	47 / 92.2 / 3.52 / 4.0 / 3.34–3.68	48 / 94.1 / 3.68 / 4.0 / 3.52–3.79	46 / 90.2 / 3.59 / 4.0 / 3.39–3.76	92.2	32 / 88.9 / 3.59 / 4.0 / 3.34–3.77	35 / 97.2 / 3.81 / 4.0 / 3.68–3.90	34 / 94.4 / 3.80 / 4.0 / 3.65–3.90	93.5
Nutrition	Learning goal: Understands the importance of nutrition in wound prevention and healing and can assess patient's nutrition status	48 / 94.1 / 3.70 / 4.0 / 3.55–3.82	49 / 96.1 / 3.82 / 4.0 / 3.68–3.93	50 / 98.0 / 3.79 / 4.0 / 3.69–3.90	96.1	36 / 100 / 3.81 / 4.0 / 3.69–3.93	36 / 100 / 3.87 / 4.0 / 3.75–3.96	36 / 100 / 3.90 / 4.0 / 3.81–3.99	100
	Content: Nutrition ▪ Importance of nutrition in wound prevention and healing ▪ Assessment	47 / 92.2 / 3.68 / 4.0 / 3.52–3.82	49 / 96.1 / 3.75 / 4.0 / 3.61–3.86	47 / 92.2 / 3.74 / 4.0 / 3.57–3.89	93.5	35 / 97.2 / 3.78 / 4.0 / 3.65–3.90	36 / 100 / 3.81 / 4.0 / 3.69–3.90	36 / 100 / 3.81 / 4.0 / 3.69–3.90	99.1
Wound pain	Learning goal: Is able to assess and manage wound-related pain	48 / 94.1 / 3.72 / 4.0 / 3.56–3.85	49 / 96.1 / 3.75 / 4.0 / 3.61–3.86	49 / 96.1 / 3.82 / 4.0 / 3.69–3.93	95.4	35 / 97.2 / 3.81 / 4.0 / 3.68–3.93	35 / 97.2 / 3.87 / 4.0 / 3.74–3.96	36 / 100 / 3.87 / 4.0 / 3.75–3.96	98.1
	Content: Wound-related pain ▪ Assessment ▪ Management	48 / 94.1 / 3.83 / 4.0 / 3.68–3.95	49 / 96.1 / 3.84 / 4.0 / 3.72–3.94	49 / 96.1 / 3.84 / 4.0 / 3.70–3.95	95.4	36 / 100 / 3.87 / 4.0 / 3.78–3.96	36 / 100 / 3.90 / 4.0 / 3.78–3.99	36 / 100 / 3.87 / 4.0 / 3.75–3.96	100
Documentation	Learning goal: Is able to document the description and management of the wound and to make a care plan	48 / 94.1 / 3.61 / 4.0 / 3.44–3.75	50 / 98.0 / 3.82 / 4.0 / 3.71–3.93	50 / 98.0 / 3.88 / 4.0 / 3.77–3.97	96.7	34 / 94.4 / 3.68 / 4.0 / 3.49–3.81	35 / 97.2 / 3.87 / 4.0 / 3.75–3.96	35 / 97.2 / 3.90 / 4.0 / 3.78–3.99	96.3
	Content: Documentation ▪ Description of the wound, surrounding skin and factors that affect wound healing ▪ Wound management ▪ Care plan	50 / 98.0 / 3.77 / 4.0 / 3.66–3.88	50 / 98.0 / 3.93 / 4.0 / 3.84–4.00	50 / 98.0 / 3.93 / 4.0 / 3.84–4.00	98.0	34 / 94.4 / 3.74 / 4.0 / 3.56–3.86	35 / 97.2 / 3.84 / 4.0 / 3.71–3.93	35 / 97.2 / 3.90 / 4.0 / 3.78–3.99	96.3
Patient education	Learning goal: Is able to educate and motivate the patient with a wound	47 / 92.2 / 3.65 / 4.0 / 3.48–3.81	50 / 98.0 / 3.84 / 4.0 / 3.73–3.94	51 / 100 / 3.86 / 4.0 / 3.77–3.95	96.7	35 / 97.2 / 3.75 / 4.0 / 3.59–3.87	35 / 97.2 / 3.87 / 4.0 / 3.75–3.99	35 / 97.2 / 3.90 / 4.0 / 3.78–3.99	97.2
	Content: Patient education ▪ Informing the patient (and next of kin) ▪ Motivation and self-care	49 / 96.1 / 3.86 / 4.0 / 3.74–3.95	51 / 100 / 3.86 / 4.0 / 3.77–3.95	51 / 100 / 3.90 / 4.0 / 3.82–3.99	98.7	35 / 97.2 / 3.84 / 4.0 / 3.71–3.93	35 / 97.2 / 3.87 / 4.0 / 3.74–3.99	35 / 97.2 / 3.90 / 4.0 / 3.77–3.99	97.2
Co-operation and multi-professionalism	Learning goal: Understands the importance of multi-professional working and consultations when caring for a patient with a wound	50 / 98.0 / 3.79 / 4.0 / 3.69–3.90	49 / 96.1 / 3.86 / 4.0 / 3.74–3.95	48 / 94.1 / 3.83 / 4.0 / 3.68–3.93	96.1	35 / 97.2 / 3.81 / 4.0 / 3.68–3.93	36 / 100 / 3.93 / 4.0 / 3.84–4.00	36 / 100 / 3.90 / 4.0 / 3.84–4.00	99.1
	Content: Multi-professionalism and co-operation ▪ Multi-professional work ▪ Consultations	49 / 96.1 / 3.82 / 4.0 / 3.70–3.90	50 / 98.0 / 3.84 / 4.0 / 3.73–3.93	49 / 96.1 / 3.79 / 4.0 / 3.68–3.88	96.7	35 / 97.2 / 3.90 / 4.0 / 3.78–3.99	35 / 97.2 / 3.93 / 4.0 / 3.83–4.00	35 / 97.2 / 3.93 / 4.0 / 3.83–4.00	97.2
Overall level of agreement^f					95.8	Overall level of agreement^f			97.8
Values and attitudes									
Wound prevention and care	Learning goal: Understands the importance of wound prevention and care from the perspectives of the patient and healthcare system	48 / 94.1 / 3.81 / 4.0 / 3.65–3.90	51 / 100 / 3.95 / 4.0 / 3.86–4.00	49 / 96.1 / 3.95 / 4.0 / 3.86–4.00	96.7	34 / 94.4 / 3.68 / 4.0 / 3.49–3.84	35 / 97.2 / 3.75 / 4.0 / 3.59–3.87	35 / 97.2 / 3.81 / 4.0 / 3.66–3.93	96.3
	Content: Multi-professionalism and co-operation ▪ The importance of the realisation of prevention and care	46 / 90.2 / 3.76 / 4.0 / 3.59–3.93	51 / 100 / 3.95 / 4.0 / 3.88–4.00	51 / 100 / 3.95 / 4.0 / 3.86–4.00	96.7	34 / 94.4 / 3.70 / 4.0 / 3.53–3.87	34 / 94.4 / 3.83 / 4.0 / 3.67–3.96	35 / 97.2 / 3.87 / 4.0 / 3.75–3.96	95.3
Evidence-based practice	Learning goal: Is able to use evidence-based information in wound care	46 / 90.2 / 3.61 / 4.0 / 3.43–3.78	47 / 92.2 / 3.72 / 4.0 / 3.57–3.86	45 / 88.2 / 3.72 / 4.0 / 3.52–3.89	90.2	34 / 94.4 / 3.83 / 4.0 / 3.65–3.96	34 / 94.4 / 3.83 / 4.0 / 3.65–3.96	35 / 97.2 / 3.87 / 4.0 / 3.75–3.96	96.3
	Content: Evidence-based practice ▪ Care guidelines	45 / 88.2 / 3.59 / 4.0 / 3.39–3.79	49 / 96.1 / 3.75 / 4.0 / 3.63–3.86	49 / 96.1 / 3.79 / 4.0 / 3.69–3.90	93.5	35 / 97.2 / 3.87 / 4.0 / 3.75–3.96	35 / 97.2 / 3.87 / 4.0 / 3.75–3.96	35 / 97.2 / 3.90 / 4.0 / 3.78–3.99	97.2
Holistic care	Learning goal: Understands the meaning of holistic and patient-centred care when caring for a patient with a wound	49 / 96.1 / 3.75 / 4.0 / 3.62–3.86	50 / 98.0 / 3.75 / 4.0 / 3.64–3.86	50 / 98.0 / 3.82 / 4.0 / 3.71–3.93	97.4	32 / 88.9 / 3.59 / 4.0 / 3.31–3.81	36 / 100 / 3.81 / 4.0 / 3.69–3.93	35 / 97.2 / 3.84 / 4.0 / 3.71–3.96	95.4
	Content: Holistic and patient-centred care ▪ Patient's physical, psychological and social health ▪ Patient's needs and expectations	45 / 88.2 / 3.46 / 4.0 / 3.25–3.64	51 / 100 / 3.77 / 4.0 / 3.66–3.88	50 / 98.0 / 3.82 / 4.0 / 3.71–3.93	95.4	33 / 91.7 / 3.68 / 4.0 / 3.46–3.86	35 / 97.2 / 3.81 / 4.0 / 3.68–3.89	36 / 100 / 3.81 / 4.0 / 3.69–3.93	96.3
Respect	Learning goal: Is able to respect patient's privacy and autonomy in wound care	45 / 88.2 / 3.59 / 4.0 / 3.38–3.79	45 / 88.2 / 3.57 / 4.0 / 3.35–3.74	47 / 92.2 / 3.61 / 4.0 / 3.44–3.77	89.5	35 / 97.2 / 3.75 / 4.0 / 3.59–3.87	35 / 97.2 / 3.72 / 4.0 / 3.56–3.84	35 / 97.2 / 3.72 / 4.0 / 3.53–3.87	97.2
	Content: Respect of privacy and autonomy ▪ Characteristics related to wound care	43 / 84.3 / 3.57 / 4.0 / 3.35–3.78	45 / 88.2 / 3.61 / 4.0 / 3.41–3.79	47 / 92.2 / 3.65 / 4.0 / 3.48–3.82	88.2	32 / 88.9 / 3.53 / 4.0 / 3.29–3.72	34 / 94.4 / 3.65 / 4.0 / 3.46–3.81	40 / 3.46–3.78	93.5
Professionalism	Learning goal: Is able to act professionally when caring for wounds	45 / 88.2 / 3.57 / 4.0 / 3.35–3.76	50 / 98.0 / 3.71 / 4.0 / 3.58–3.84	50 / 98.0 / 3.71 / 4.0 / 3.57–3.84	94.7	30 / 83.3 / 3.58 / 4.0 / 3.27–3.83	32 / 88.9 / 3.71 / 4.0 / 3.46–3.91	33 / 91.7 / 3.71 / 4.0 / 3.49–3.87	88.0
	Content: Professionalism ▪ Professional attitude in wound care ▪ Courage and open-mindedness in wound care	40 / 78.4 / 3.41 / 4.0 / 3.16–3.65	48 / 94.1 / 3.68 / 4.0 / 3.50–3.82	47 / 92.2 / 3.65 / 4.0 / 3.46–3.82	88.2	29 / 80.6 / 3.49 / 4.0 / 3.18–3.74	32 / 88.9 / 3.65 / 4.0 / 3.40–3.87	32 / 88.9 / 3.61 / 4.0 / 3.30–3.83	86.1
Economics	Learning goal: Understands the economic perspectives of care from the patient's and society's point of view	47 / 92.2 / 3.57 / 4.0 / 3.39–3.71	49 / 96.1 / 3.66 / 4.0 / 3.53–3.78	48 / 94.1 / 3.70 / 4.0 / 3.55–3.82	94.1	33 / 91.7 / 3.68 / 4.0 / 3.46–3.86	34 / 94.4 / 3.74 / 4.0 / 3.56–3.87	35 / 97.2 / 3.74 / 4.0 / 3.59–3.90	94.4
	Content: Economics ▪ Wound care costs	47 / 92.2 / 3.50 / 4.0 / 3.33–3.68	49 / 96.1 / 3.66 / 4.0 / 3.53–3.79	48 / 94.1 / 3.65 / 4.0 / 3.50–3.79	94.1	35 / 97.2 / 3.78 / 4.0 / 3.62–3.90	35 / 97.2 / 3.75 / 4.0 / 3.59–3.90	35 / 97.2 / 3.78 / 4.0 / 3.62–3.90	97.2
Overall level of agreement^f					93.2	Overall level of agreement^f			94.4

^a Number of panellists rating a score of ≥ 3 .

^b Level of agreement: percentage of panellists rating a score of ≥ 3 .

^c 5% trimmed mean.

^d Bias Controlled and Accelerated (BCa) 95% Confidence Interval.

^e Average of the levels of agreement (b) for clarity, relevance and importance.

^f Average of the average levels of agreement (e) in a given competence area.

varied between 94.4% and 98.1%, meaning that the overall levels of agreement were higher than in the first round. The overall levels of agreement were highest in the Care of chronic and acute wounds competence area and lowest in the Values and attitudes competence area. (Table 2.)

In general, the number of comments in the second round was much lower than in the first round (Table 3). Most of the comments were related to the Anatomy and physiology competence area and, again, Care of chronic and acute wounds, especially chronic wounds. The feedback on the atypical wounds learning goal and content that had been added to the Care of chronic and acute wounds competence area after the first round was slightly controversial, as three of the 36 panellists commented that they were an important addition but one found them irrelevant. Still, the researchers decided to keep them, as the level of agreement between the panellists on the importance of this competence area was high. After the second round, only minor revisions were made to two learning goals. The panellists suggested swapping the order of the words *care* and *prevention*. Accordingly, this was changed in the learning goals related to care of chronic and acute wounds and nutrition. A third round was not considered necessary, as the overall levels of agreement in the second round had been high and the revisions made after that were minor. The final learning goals and content are presented in Table 2.

5. Discussion

5.1. Discussion of the results

The objectives of this study were to create learning goals and content for wound care education in Bachelor's level nursing education in Finland and to assess the consensus relating to these learning goals and content among wound care experts. The learning goals and content were based on previous focus-group interviews (Kielo et al., 2019a; Kielo-Viljamaa et al., 2022) and were divided into four competence areas adapted from these studies: 1) Anatomy and physiology, 2) Care of chronic and acute wounds, 3) Wound management and care of a patient with a wound, and 4) Values and attitudes. These competence areas came to comprise 26 learning goals and 29 pieces of content after two Delphi rounds with wound care experts. The consensus between the panellists was already high in the first round and improved to almost 100% in the second round. The competence areas that formed the basis for the learning goals and content in this study had been identified in previous focus-group interviews, which might explain the high consensus.

The first competence area, Anatomy and physiology, was devised as a distinct competence area even though human anatomy and physiology usually has its own course(s) in nursing education. The reasoning behind this was that clinically oriented anatomy and physiology that is related specifically to wound care and taught as its own competence area in wound care education will probably benefit student nurses to better understand for example the aetiologies of wounds. According to a previous study (Kielo et al., 2019a), understanding of the circulation is particularly essential when caring for chronic wounds. Understanding of the cardiovascular system, including venous disease and peripheral arterial disease, has also been identified as a learning outcome in undergraduate nursing education by the Anatomical Society in the UK (Connolly et al., 2018). The consensus between the panellists in the Anatomy and physiology competence area was highest in the first round and second-highest in the second round, which indicates that the

panellists also regarded anatomy and physiology as an important constituent of wound care competence.

The second competence area comprised care of chronic and acute wounds based on their aetiology. The chronic wounds section included prevention and care of the most common chronic wounds, and the acute wounds section included first aid and care of the most common acute wounds. Based on comments from the panellists, atypical wounds were added to chronic wounds after the first Delphi round. Even though the aim of wound care education in nursing education is to teach the basics of wound care, atypical wounds make up approximately 20% of all chronic wounds (Isoherranen et al., 2019). This implies that a significant number of chronic wounds can have an atypical aetiology, and graduating nurses should be aware of this possibility. The learning goal and content related to atypical wounds included the *most common* atypical wounds. On the face of it, this might appear contradictory, but it denotes the fact that covering all potential wound aetiologies during nursing studies is not a realistic goal. Likewise, care of atypical wounds was not included in the learning goals, as it was regarded as adequate if graduating nurses know the aetiologies and characteristics of the most common atypical wounds. The consensus between the panellists in the Care of chronic and acute wounds competence area was the second-highest in the first round and the highest in the second round. Acute wounds attracted slightly higher consensus than chronic wounds, which might be explained by the complexity of chronic wounds and their care, which can be challenging even to experts (Frykberg and Banks, 2015).

The third competence area, Wound management and care of a patient with a wound, was the largest competence area, comprising ten separate sub-competence areas. This was a broad competence area not related to any specific type of wound, as it covered topical wound

Table 3
Examples of panellists' comments.

Profession	Comment
Round 1	
Registered nurse	"I find it's important to be aware of the possibility of atypical wounds."
Authorised wound care nurse	"All topics below [chronic wounds][are] very important. [However,] it needs to be considered how deep one drills into each of these topics in education. If the content [of education] [is] limited to these that have been mentioned, it's OK. A scratch on the surface will put the idea in students' heads, and they can [then] deepen their knowledge in practice and in further studies."
Registered nurse	"To [be able to] differentiate [a] truly infected [wound] from [a wound in] the normal healing process."
Registered nurse	"[This is] certainly important, but there are lots of different kinds of [wound] care products available. [One] should perhaps focus on the basic products only."
Registered nurse	"This [is] especially important, evidence-based practice! For example, clinical practice guidelines, finding studies and [their] critical appraisal."
Registered nurse	"What does [holistic care] include? Physical, psychological, social? In my opinion, [this] requires further description with, for example, the afore-mentioned words."
Round 2	
Authorised wound care nurse	"Learning goals related to circulation are very fundamental and important."
Registered nurse	"[It was] great that the atypical wounds were brought in."
Authorised wound care nurse	"I was thinking about that wording: the most common atypical [wounds]... I do understand what is meant [with that], but [those words] somehow feel like [they're] cancelling each other out."

management of all types of wounds as well as different areas of care of a patient with a wound, e.g., nutrition, pain management and documentation. All sub-competence areas except one in this competence area had only one learning goal and one piece of content; the wound care products were divided into three separate learning goals because all three goals could not be fitted into one goal. According to previous studies, the variety and abundance of wound care products cause lack of confidence even to tissue viability nurses (Blackburn et al., 2019), let alone student nurses (Stephen-Haynes, 2013). In keeping with this point, the panellists stressed the importance of being familiar with the most common products and the generic groups of the products rather than memorising dozens of different products. The consensus between the panellists increased the most between the rounds in this competence area, indicating that the revisions made after the first round had been necessary.

The fourth competence area, Values and attitudes, displayed the lowest consensus in both rounds. Nevertheless, the consensus between the panellists was over 90% in both rounds and increased after the revisions of the first round. The lower consensus might be explained by issues related to the clarity of this competence area, because the levels of agreement between the panellists on the relevance and importance of most learning goals and content in this competence area were high. This indicates that the panellists found this competence area relevant and important, but its learning goals and content could have been more clearly expressed. The lower consensus on clarity might be explained by the ambiguousness of the learning goals and content in this competence area and by the difference in perspective between nursing science and medicine. In addition, values in particular are difficult to operationalise and measure reliably (Van de Mortel, 2008), resulting in the outcome of education also being more difficult to assess in this competence area than with other competences.

As stated in the background, general learning goals and content for wound care for undergraduate nursing education are missing. Nevertheless, previous studies have identified learning goals and competence requirements for registered nurses' wound care education at the post-graduate level. The results of this study are in line with those studies which also identified the competence areas of wound management, for example, *nutrition and healing*, care of different types of chronic wounds, for example, *lower leg ulcers* (Pokorná et al., 2017; Probst et al., 2019), and values and attitudes, for example, *holistic approach to the patient* (Eskes et al., 2014).

In this study, the learning goals and content followed the definition of competence by Cowan et al. (2005) as a complex combination of knowledge, skills, performance, values and attitudes. Competence can also be classified to different levels, as in Bloom's Taxonomy, i.e., to remembering, understanding, applying, analysing, evaluating and creating (Adams, 2015). The learning goals and content in this study mainly cover the remembering and understanding levels of Bloom's Taxonomy, and the applying level, especially in the Wound management and care of a patient with a wound and in the Values and attitudes competence areas. The more advanced levels of Bloom's Taxonomy can be achieved with learning methods that force the students to analyse and evaluate the evidence and use it to create new material, for example guidelines.

5.2. Strengths and limitations

The panellists were recruited using purposeful and snowball sampling, which means it is possible that not all potential experts in this field were reached. Nonetheless, with snowball sampling, the panellists could recruit more experts by using their own networks, which, on the other hand, increased the validity of the study (Shorten and Moorley, 2014). In order to ensure a broad angle on the subject, encompassing both the clinical and educational aspects, the recruitment was targeted to include registered nurses and physicians as well as nurse educators. Moreover, the registered nurses and physicians came from various healthcare units, both organisationally and geographically, which decreased the impact

of possible local institutional policies on the final learning goals and content.

Owing to difficulties in recruitment, only 10% of the panellists in the first Delphi round and 5% in the second round were nurse educators. It is apparent that this led to the views of the clinical experts being given more weight in the final learning goals and content, but this should probably be regarded as more of a strength than a limitation of this study, as these competences are ultimately defined by knowledge and skills that can be transferred to clinical practice. In this regard, it is worth noting that almost all of the registered nurses who participated in the panel had further education in wound care, and more than half of the total registered nurses were authorised wound care nurses. In 2021, there were 57 authorised wound care nurses in Finland (Finnish Wound Care Society, 2021), meaning that 30% of them participated in the first Delphi round of this study. Likewise, the physicians in the panel represented several different specialities that care for patients with wounds, both conservative and operative, and most of them had a special competence in wound care.

The Delphi panel was conducted in an online setting, and the panellists participated in it separately. This might have decreased the validity of the study, as there was no discussion or interaction between the panellists. However, online Delphi panels enable larger samples as well as anonymity for participants, which promotes honesty and reduces the risk of dominant or high-profile participants controlling the discussion (Barrett and Heale, 2020). In addition, nearly three-fourths of the panellists in the first round also participated in the second round, increasing the validity of the study.

The data were analysed using both statistical and qualitative analysis. The comments from the panellists were assessed by two researchers, which increased the validity of the study. The panellists were also informed about the revisions that had been made after the first round, so that it was easier for them to assess the revised learning goals and content. Still, the consensus between the panellists on some individual learning goals and content decreased after the revisions, which might have decreased the validity and stability of the study. This decrease was, however, minor and did not impact the overall consensus.

Positive coefficients or response rates could not be calculated as invitations to participate in the panel were distributed to an unknown number of potential participants. The authority coefficient was not calculated as the specific criteria or level for the familiarity with the field would have been difficult to set due to the participants' different professional backgrounds and competence areas. We did not expressly inquire of the participants' familiarity with the field because the starting point of the study was to recruit only experts in wound care. Nevertheless, the majority of the nurses and physicians who participated in the study were specialised in wound care which increased the reliability of their comments. We did not calculate the stability between the two rounds because the consensus between the experts was already high in the first round and it improved in the second round.

This study was conducted in Finland, which means the results cannot be generalised directly to other countries, as the education of registered nurses varies between different countries. In addition, nurses' roles and responsibilities in wound care may vary. However, and as stated in the Background section, nursing education in Finland is regulated by the European Union Directives (2005/36/EC; 2013/55/EC) on the recognition of professional qualifications. Therefore, the results of this study should also apply to other European countries, at least on some level.

6. Conclusions

Four competence areas with 26 learning goals and 29 pieces of content were created for wound care education in Bachelor's level nursing education. The learning goals and content were assessed by a Delphi panel of wound care experts, and the consensus between the experts was high, which suggests that the learning goals and content were clinically valid. The results of this study can be used as a

framework for both planning wound care education and assessing the outcomes of such education and competence. Future studies should focus on the implementation of these learning goals and content in nursing curricula as well as on the assessment of the effectiveness of this education.

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CRedit authorship contribution statement

Emilia Kielo-Viljamaa: Conceptualization, Methodology, Validation, Formal analysis, Investigation, Resources, Writing - Original Draft, Writing - Review & Editing, Visualization, Project administration, Funding acquisition.

Jaakko Viljamaa: Methodology, Investigation, Resources, Writing - Original Draft, Writing - Review & Editing.

Riitta Suhonen: Conceptualization, Methodology, Writing - Review & Editing, Supervision, Funding acquisition.

Leena Salminen: Writing - Review & Editing.

Minna Stolt: Conceptualization, Methodology, Writing - Review & Editing, Supervision, Funding acquisition.

Declaration of competing interest

None.

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