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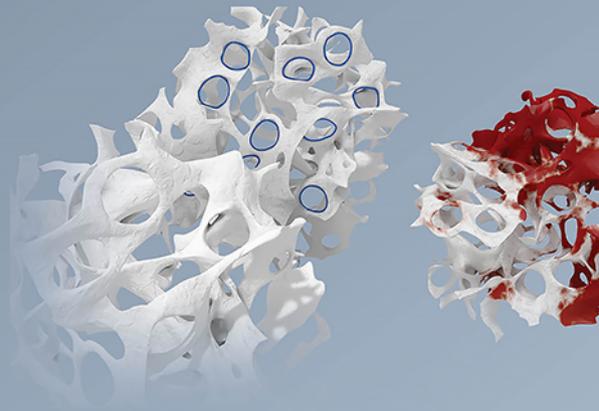
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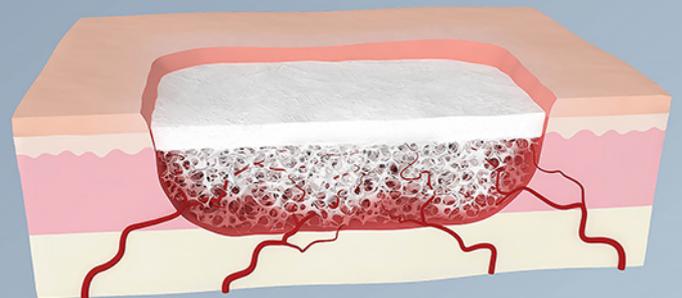
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ORIGINAL ARTICLE

Consistent practices in pressure ulcer prevention based on international care guidelines: A cross-sectional study

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Abstract

The use of consistent and evidence-based practices is essential in terms of patient safety and quality of care. The purpose of this study was to describe the use of consistent practices in PU prevention based on international care guidelines and to assess the validity and reliability of the pressure ulcer prevention practice (PUPreP) instrument. The data (n = 554) were collected between 2018 and 2019 from nursing professionals working at two hospital districts in Finland using the PUPreP instrument. The instrument consisted of 42 items assessing participants' perceptions of the frequencies of pressure ulcer prevention practices with the following scale: never, sometimes, often, always. The data were analysed using statistical analysis. According to the results, the use of pressure ulcer prevention practices was more frequently described as often. The most frequently used prevention practice was repositioning, and the least frequently used practice was nutrition. Factors related to nursing professionals' pressure ulcer prevention practices were the working sector, education and working frequency in pressure ulcer prevention, and early identification of pressure ulcers. The study results suggest that the evidence-based pressure ulcer prevention practices were followed at a moderate level by nurses. The PuPreP instrument demonstrated validity and reliability, but further development is needed.

KEYWORDS

evidence-based practice, nursing, practice guideline, pressure ulcer

Key messages

- pressure ulcers can be prevented by performing a risk assessment, skin and tissue assessment, preventive skin care, repositioning, nutrition, and the use of supporting surfaces. With consistent and evidence-based practices in pressure ulcer prevention, patient safety and quality of care can be improved

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- this study aimed to describe the use of consistent and evidence-based practices in pressure ulcer prevention and to assess the validity and reliability of the pressure ulcer prevention practice (PUPreP) instrument
- in general, pressure ulcer prevention practices were followed quite frequently. The most frequently used prevention practice was repositioning, and the least frequently used practice was nutrition. The agreement levels regarding the prevention practices were mainly found to be at an inadequate level

1 | INTRODUCTION

According to international care guidelines, a pressure ulcer (PU) is defined as a localised injury to the skin and/or underlying tissue, usually over a bony prominence, because of pressure or pressure combined with shear.¹ Most people suffering from PUs have health conditions (mental or physical) that cause immobility, for example, a prolonged period in a bed or chair.² However, PUs can also be caused by medical devices, such as oxygen masks or nasal prongs.³

The prevalence of PUs in Europe in the most recent studies varies between 4.6% and 27.2%,⁴ and the prevalence of hospital-acquired PUs is estimated to be 12.8% from a global perspective.⁵ Most PUs are preventable, and the prevention should be based on evidence-based practice. According to international care guidelines, PUs can be prevented by performing a risk assessment, skin and tissue assessment, preventive skin care, repositioning, nutrition, and the use of supporting surfaces. Despite evidence-based prevention practices, it has been estimated that up to 5% of all PUs are unavoidable,¹ and for example, among the elderly hospital patients, the prevalence of unavoidable PUs is much higher, around 19%.⁶

1.1 | Evidence-based pressure ulcer prevention practices

Evidence-based PU prevention interventions have impacted PU incidence, PU severity, and PU prevalence per patient.⁷ For example, supporting surfaces are considered to reduce the incidence of PUs compared with standard hospital surfaces,⁸ and regular repositioning is suggested to decrease the risk of PU.⁹ However, single interventions, such as risk assessment or repositioning alone, have not been shown to be as effective as multiple intervention programmes.¹⁰ In addition, implementing evidence-based interventions into practice is not always easy,¹¹ and the competence and attitudes of health care professionals towards evidence-based practices and PU prevention vary considerably.¹²⁻¹⁴ Furthermore, nurses'

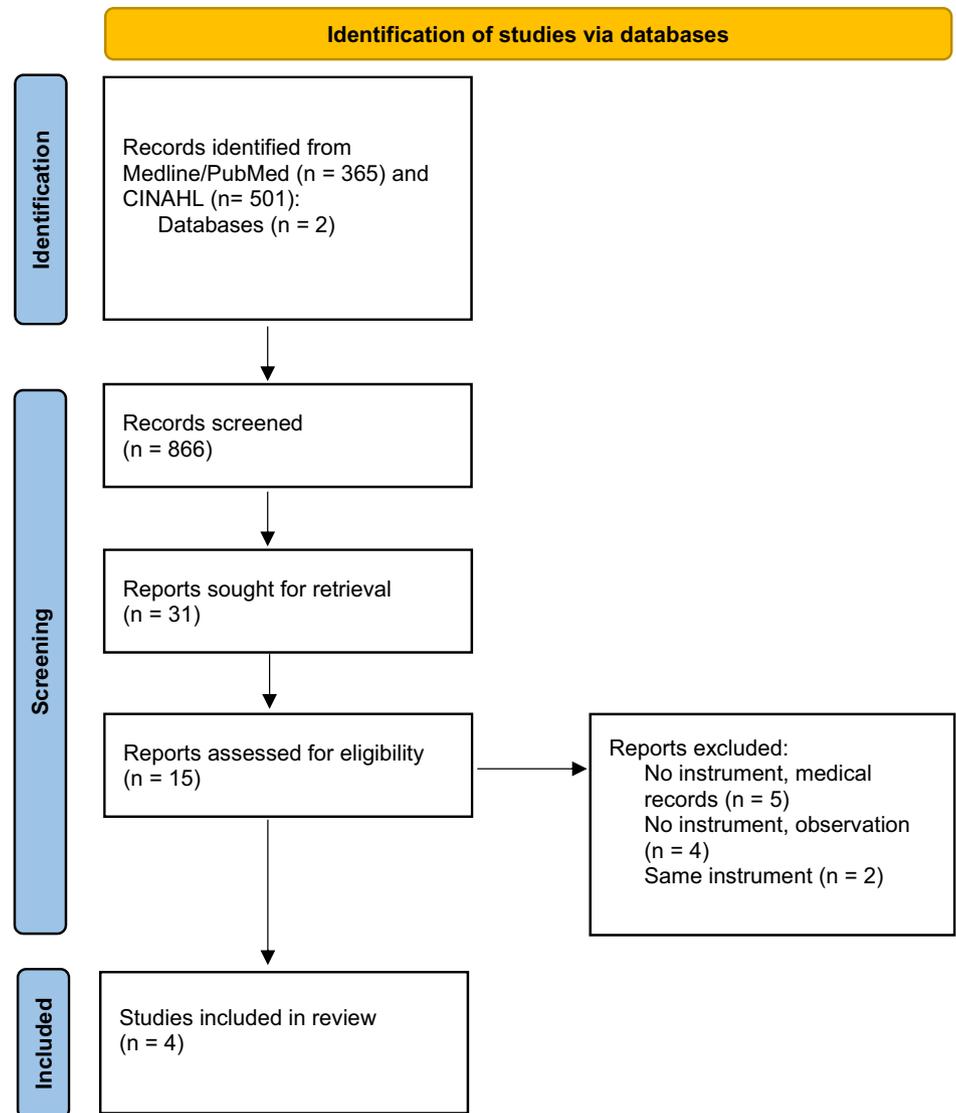
self-efficacy in managing PUs may also play an essential role in PU prevention practices.¹⁵

Despite the evidence supporting the importance of PU prevention practices, previous studies have suggested that PU prevention strategies are not always consistent among health care professionals. According to previous studies, repositioning techniques, for example, might vary between health care professionals,¹⁶ and the documentation of hospital-acquired PUs are not always comprehensive and informative.¹⁷ However, the consistency in the PU prevention practices among nursing staff may be improved with the implementation of evidence-based PU prevention practices.¹⁸

1.2 | Literature review of the instruments

A literature search was made for instruments assessing or measuring the realisation of consistent PU prevention practices among nursing staff. The systematic literature search was conducted using two databases: Medline/PubMed and CINAHL Science in June 2021 with the following search terms: *pressure ulcer, pressure injury, prevention, consistent practices, realisation, implementation, adherence* with their Boolean operators. The time limit was set to 10 years, as the current research based on the most recent guidelines was targeted, and the language was limited to articles written in English. The search gave 866 hits, of which 31 were chosen by the title for further examination. After reading the abstracts of these 31 studies, 15 were chosen for full-text examination. Most (9) of these studies used either observation or medical records for assessing PU prevention practices and were excluded. However, four instruments¹⁸⁻²¹ assessing or measuring nurses' PU prevention practices were identified, of which one¹⁸ was an examination of the same instrument investigated in this study (Figure 1). This same instrument has also been used in another, yet unpublished study.²³ In the remaining two studies, some of the instruments previously mentioned were used. The identified instruments were analysed by their purpose, setting, and scoring.

FIGURE 1 PRISMA flow diagram²² of literature retrieval



In the research conducted by Sutherland-Fraser et al,¹⁹ and for the purpose of their study, an instrument was developed for an intervention study assessing perioperative nurses' knowledge of PUs and PU prevention practices. The instrument assessed PU risk assessment methods, positioning and pressure relief devices, and the use of PU risk assessment scores. The instrument was based on scenarios used in the interventions, meaning that the instrument was not developed or validated for assessing PU prevention practices in general. In the study by Meesterberends et al,²⁰ a pressure ulcer questionnaire (PUQ-2003) was used to assess nursing staffs' knowledge and use of PU preventive measures in nursing homes. The instrument was developed by Hulsenboom et al²⁴ based on an earlier version of the instrument (PUQ-1991). Both versions were based on the care guidelines currently being used at that time. The instrument assesses nurses' knowledge of the usefulness of PU prevention measures and the PU prevention measures

applied in their unit: the instrument uses the scale always, sometimes, never. This instrument, however, is not based on the latest PU prevention guidelines. In the study by Moya-Suárez et al,²¹ an instrument (QARPPU) was developed to evaluate nurses' adherence to the main recommendations for preventing PUs. The instrument consisted of 18 items, which were assessed using the scale: never, rarely, sometimes, often, always. The instrument was based on two vignettes illustrating the situations of typical patients. The instrument was psychometrically tested, and it was developed for hospital care. The literature search discovered no up-to-date instruments assessing nurses' PU prevention practices in either inpatient or outpatient setting. Consequently, this paucity of instruments is an indication that studies assessing nurses' PU prevention practices are scarce despite the various guidelines directing these practices.

The goal of this study was to provide evidence regarding PU prevention practices and their assessment by

identifying possible inconsistencies in PU prevention practices, and suggesting a more efficient focus for PU educational recourses and the implementation strategies in order to ensure equality in care. The purpose of this study was to describe the use of consistent practices in PU prevention based on international care guidelines and to assess the validity and reliability of the pressure ulcer prevention practice (PUPreP) instrument. The research questions were as follows: (a) How frequently are the PU prevention practices based on the international care guidelines used according to the nurses? (b) Which factors are associated with PU prevention practices? (c) How valid and reliable is the PUPreP instrument?

2 | MATERIALS AND METHODS

2.1 | Design, settings, and sample

This cross-sectional study was part of the PU prevention study in two hospital districts in Finland. The setting was in primary ($n = 20$) and specialised health care ($n = 27$) units. The sample represented registered nurses, practical nurses, and nurse managers. In Finland, public health care is divided into primary and specialised care. The primary care is provided by municipalities²⁵ and includes health centres, home care and long-term care facilities, and inpatient care at hospitals for patients who require nursing.²⁶ Specialised care is provided by the hospital districts and includes specialised medical care services provided by medical specialists in hospitals.²⁵ Finland also has two nursing degrees: registered nurse and practical nurse. A registered nurse has a bachelor's degree from a university of applied sciences, and a practical nurse has a vocational degree from a vocational school.

2.2 | Instruments

Data were collected using a pressure ulcer prevention practice (PUPreP) instrument, the purpose of which is to measure nurses' perceptions of the use of pressure ulcer prevention practices. The previously developed instrument²³ was further developed for this study. It is based on the international PU prevention guidelines by NPUAP, EPUAP, and PPIA.¹ The instrument has six sections: Risk assessment (nine items), skin assessment and skin care (nine items), nutrition (six items), repositioning (nine items), pressure relief devices (four items), and documentation (five items), a total of 42 items. Each item has a scale from 1 to 4: 1 = never; 2 = sometimes; 3 = often; and 4 = always. Each item also includes an option "cannot say." In addition, participants were asked to answer

whether there is agreement in their unit on consistent PU prevention practices by answering either "yes" or "no." The instrument was previously used in two studies^{18,23} and showed mainly moderate to good internal consistency. The instrument was further developed for this study based on the previous research findings. The number of items was reduced from the previous 51 to 42, and some items were modified so as to be based on more strong positive/negative recommendation and strength of evidence.¹

As background information, the characteristics of the participants (12 questions) were collected. In addition, 35 items related to nurses' PU knowledge (pressure ulcer prevention knowledge test, PUPK²⁷) and 13 items related to nurses' attitudes towards PU prevention (attitude towards pressure ulcer prevention, APuP instrument²⁸) were used as background variables. The pressure ulcer prevention knowledge (PUPK) test includes seven different domains (maximum score of 35): (a) PU development and risk factors, (b) PU classification, (c) PU risk assessment, and PU prevention with (d) repositioning, (e) pressure relief devices, (f) skin assessment and skin care, and (g) nutrition. Each domain includes five items with "yes," "no," or "I don't know," answer options.²⁷ The APuP instrument consists of five domains (maximum score of 52; 4 score/item): (a) Personal competency to prevent PUs (three items); (b) priority of PU prevention (three items); (c) impact of PUs (three items), (d) responsibility in PU prevention (two items); and (e) confidence in the effectiveness of prevention (two items). The items are rated on a four-point Likert scale (strongly agree-strongly disagree).²⁸

2.3 | Data collection

The data were collected between May 2018 and January 2019 in Finland, from nursing professionals working at two different hospital districts of approximately 420 000 people. The data were collected using an electronic questionnaire. The first author informed the ward managers about the study and sent a link to the questionnaire and information about the study to the contact person in both hospital districts, who then forwarded the invitation to 1975 nursing professionals. The response rate was 28%. The participants had to be Finnish speaking, they had to work either as a registered nurse, a practical nurse, or a ward manager, and they had to have a permanent or long-term position.

2.4 | Ethical considerations

Participation in this study was voluntary, and the study followed the guidelines for responsible conduct of

research published by the Finnish Advisory on Research Integrity.²⁹ The ethical approval was obtained from the Ethics Committee of Satakunta Higher Education Institution (20 December 2018), and the permission to collect the data was obtained according to the policies of the participating organisations. The study participants received information about the study and could ask questions regarding the study. Participants remained anonymous. Responding to the electronic questionnaire was considered as informed consent.

2.5 | Statistical analysis

Data were analysed using SAS 9.4 statistical software package (SAS Institute Inc., Cary, North Carolina). The variables were described using frequencies, percentages, means, medians, and standard deviations. The associations between self-reported skills of PU prevention and early detection, PU prevention knowledge as well as attitudes towards PU prevention and PU prevention practices were examined using Spearman correlations. To compare the levels of PU prevention practices between the classes of categorical background factors, a Wilcoxon two-sample test was used for two groups and Kruskal-Wallis test for more than two groups. To adjust for multiple comparisons, the Bonferroni method was used to correct the significance levels. The internal consistency of the sum variables was examined using the Cronbach's alpha coefficient. To assess the construct validity of the PUPreP instrument, explorative factor analysis was used. *P* values less than .05 were considered statistically significant.

3 | RESULTS

3.1 | Demographic data

A total of 554 participants answered the questionnaire, of which 329 (61%) worked in primary care and 213 (39%) in specialised care units. Most of the participants worked as registered nurses (*n* = 258, 49%) or as practical nurses (*n* = 244, 46%), with only 5% (*n* = 28) of the participants working as wound care nurses. About half (*n* = 312, 56%) of the participants answered that they worked daily with PU prevention and early detection; however, about a third (*n* = 185, 34%) answered that their need for further education in PU prevention and early detection was quite low or not necessary at all. Participants' knowledge of PU prevention and attitudes towards PU prevention that have been reported in previous studies^{27,30} indicate that nurses' knowledge of PU prevention to be at a moderate

TABLE 1 Demographic factors of the participants

Variable	n/%		
Sector (<i>n</i> = 554)			
Primary care	329/61		
Specialised care	213/39		
Nursing education (<i>n</i> = 550)			
Registered nurse	272/50		
Practical nurse	238/43		
Other	40/7		
Current occupation (<i>n</i> = 526)			
Ward manager	24/5		
Registered nurse	258/49		
Practical nurse	244/46		
Work experience in health care after graduation (<i>n</i> = 546)			
6 years or less	138/25		
6.1 to 14 years	139/26		
14.1 to 25 years	136/25		
25.1 years or more	133/24		
Working as unit's wound care nurse (<i>n</i> = 547)			
Yes	28/5		
No	519/95		
Working in PU prevention and early detection (<i>n</i> = 553)			
Daily	312/56		
Weekly	123/22		
Monthly	71/13		
More rarely	47/9		
Taking care of patients with PUs? (<i>n</i> = 553)			
Daily	90/16		
Weekly	181/33		
Monthly	151/27		
More rarely	131/24		
Participation in PU training in past 2 years within own organisation (<i>n</i> = 540)			
Never	312/58		
Once	160/30		
More often	64/12		
Participation in PU training in past 2 years outside own organisation (<i>n</i> = 539)			
Never	433/80		
Once	72/14		
More often	34/6		
Need for further education in PU prevention and early detection (<i>n</i> = 551)			
Much	63/11		
Moderately	303/55		
A little or not at all	185/34		
	Mean	Median	SD
Self-reported PU prevention and early detection skills (min. 4: weak skills; max. 10: excellent skills) (<i>n</i> = 549)	7.69	8	1.03

(Continues)

TABLE 1 (Continued)

	Mean	Median	SD
PUPK (pressure ulcer prevention knowledge) (min. 0-max. 35) (n = 542)	24.4	25.0	4.09
APuP (attitude towards pressure ulcer prevention (max. 52) (n = 548)	43.02	43.0	3.98
Need for more education about following topics	Yes (%)	No (%)	
Factors affecting PU development	23.0	77.0	
PU stages	44.3	55.7	
PU risk assessment	39.7	60.3	
Repositioning/mobility in PU prevention	21.8	78.2	
Pressure relief devices in PU prevention	47.5	52.5	
Mental condition in PU prevention	33.7	66.3	
Skin assessment and care in PU prevention	42.3	57.7	
Nutrition in PU prevention	46.1	53.9	
Patient/next of kin education in PU prevention	27.9	72.1	
Documentation in PU prevention	27.2	72.8	
Support surfaces and mattresses in PU prevention	31.1	68.9	
Need for any other kind of education in PU prevention	5.0	95.0	

Abbreviation: PU, pressure ulcer.

level, although they also showed positive attitudes towards PU prevention (Table 1).

3.2 | Frequency of performing consistent practices in pressure ulcer prevention

The total mean value of the frequencies for performing PU prevention practices based on the international guidelines was 3.21/4.0, meaning that these practices were used quite frequently. The most used PU prevention practices were related to repositioning (3.58/4.0), and the

practices least used were related to nutrition (2.68/4.0) (Table 2).

In the risk assessment section, the most used practice was that the units took into account that patients who have a PU are at risk of developing new PUs (3.60/4.0), and the least used practice was that a risk assessment was done on every patient on admission (2.35/4.0). For skin assessment and skin care, the most used practice was to keep patients' skin clean and dry (3.73/4.0), and the least used practice was the assessment of heat and oedema of the skin, especially in patients who have a darker skin tone (3.17/4.0). For nutrition, the most used prevention practice was that the nutrition intake was assessed for every patient (3.08/4.0), and the least used practice was the use of an individualised diet for patients at risk of developing PUs (2.05/4.0). The most frequently used practice in repositioning practices was avoiding positioning the patient directly on tubes and drainages (3.84/4.0), and the least used practice was that the repositioning schedule and methods were adjusted based on the patient's skin condition (3.48/4.0). For pressure relief devices, the use of gloves filled with water had the highest frequency scores (3.86/4.0); however, as an inversed scale was used for practices that were not recommended, the guidance to not use gloves filled with water was followed very well. The least used practice for pressure relief devices was the use of pressure distributing pillows for patients at risk of developing a PU when seated (2.83/4.0). Finally, for documentation, the most regularly used practice was that every comprehensive skin assessment was documented (3.53/4.0), and the least used practice was the documentation of the nutritional status of patients at risk of developing a PU (2.81/4.0) (Table 3).

The highest levels of agreement were in the risk assessment section, in which the majority of the participants answered that there was an agreement in their unit on the practices in six of the nine items. The lowest levels

TABLE 2 PU prevention frequencies in different sections of the instrument and the total PU prevention practices

Section	Mean	Median	SD	Min (1)	Max (4)	α
Risk assessment (nine items)	2.98	3.00	0.64	1.0	4.0	0.896
Skin assessment and skin care (nine items)	3.43	3.56	0.42	1.7	4.0	0.754
Nutrition (six items)	2.68	2.67	0.69	1.0	4.0	0.841
Repositioning (nine items)	3.58	3.67	0.47	1.0	4.0	0.896
Pressure relief devices (four items)	3.28	3.25	0.53	1.7	4.0	0.520
Documentation (five items)	3.09	3.20	0.65	1.0	4.0	0.820
Total PU prevention practices (42 items)	3.21	3.28	0.43	1.3	3.9	0.954

Note: 1 = never, 2 = sometimes, 3 = often, 4 = always. α = Cronbach Coefficient Alpha.

Abbreviation: PU, pressure ulcer.

TABLE 3 Mean frequencies in pressure ulcer practices in different sections based on international guidelines

Item	Frequency					Agreement (%)			
	Mean	SD	Min (1)	Max (4)	Correlation with total	No	Yes		
Risk assessment (n = 353)									
Missing data: n = 204-248									
1) PU risk assessment is done for every patient at admission	2.35	0.97	1.0	4.0	0.620	37.1	62.9		
2) PU risk assessment will be done if the patient's general status changes	2.78	0.94	1.0	4.0	0.703	49.1	50.9		
3) Valid and reliable instruments, as well as clinical assessment, are used for risk assessment	2.45	1.1	1.0	4.0	0.533	41.6	58.4		
4) Impaired mobility is taken into account in the risk assessment	3.46	0.73	1.0	4.0	0.608	68.5	31.5		
5) It is taken into account that patients who have a PU, are at risk of having new PUs	3.60	0.65	1.0	4.0	0.586	67.9	32.1		
6) PUs of risk patients are prevented using an individual plan	2.99	0.95	1.0	4.0	0.679	50.5	49.5		
7) The effects of moist skin are assessed in PU risk assessment	2.91	0.91	1.0	4.0	0.771	43.8	56.2		
8) The effects of sense of touch are assessed in PU risk assessment	2.90	0.95	1.0	4.0	0.749	45.4	54.6		
9) The effects of general status are assessed in PU risk assessment	3.13	0.87	1.0	4.0	0.758	58.1	41.9		
Skin assessment and skin care (n = 364)									
Missing data: n = 243-266									
10) Signs of redness on the skin are assessed regularly in patients who are at risk of developing PUs			3.50	0.73	1.0	4.0	0.665	68.8	31.2
11) Heat and oedema in the skin are assessed, especially in patients who have a darker skin tone			3.17	0.86	1.0	4.0	0.551	51.0	49.0
12) Patients are asked to identify uncomfortable and painful areas in the skin			3.22	0.84	1.0	4.0	0.606	55.3	44.7
13) The skin on patient's heels are observed daily			3.32	0.75	1.0	4.0	0.567	66.9	33.1
14) Pressure injuries caused by medical devices (eg, urinary catheters) are observed			3.37	0.75	1.0	4.0	0.661	61.3	38.7
15) Patients are turned to the side that has redness because of pressure ^a			3.56	0.77	1.0	4.0	0.005	52.0	48.0
16) Massage is used for PU prevention ^a			3.57	0.69	1.0	4.0	-0.121	28.5	71.5
17) Patient's skin is kept clean and dry			3.73	0.55	1.0	4.0	0.542	76.7	23.3
18) Moisturising lotions and protective products for dry skin are used			3.48	0.69	1.0	4.0	0.562	72.9	27.1
Nutrition (n = 319)									
Missing data: n = 255-283									
19) The nutritional status of all patients with a PU risk is assessed		2.68	0.90	1.0	4.0	0.724	53.9	46.1	
20) Valid instruments (eg, NRS) are used in the nutrition status assessment		2.24	1.19	1.0	4.0	0.555	44.2	55.8	
21) An individualised diet is used for patients with a PU risk		2.05	0.94	1.0	4.0	0.718	38.2	61.8	

(Continues)

TABLE 3 (Continued)

Nutrition (n = 319)						Missing data: n = 255-283			
22) Energy intake is optimised based on variations in weight and possible obesity	2.37	0.90	1.0	4.0	0.618	43.9	56.1		
23) Nutrition supplements are given between meals if the patient's energy intake is not sufficient	3.03	0.86	1.0	4.0	0.587	64.9	35.1		
24) Nutrition intake is assessed for every patient	3.08	0.83	1.0	4.0	0.564	65.3	34.7		
Repositioning (n = 444)						Missing data: n = 252-273			
25) Repositioning is taken into account for all patients with a PU risk			3.71	0.57	1.0	4.0	0.717	83.1	16.9
26) Patient's mobility and general status affects the repositioning schedule			3.62	0.62	1.0	4.0	0.616	78.9	21.1
27) Repositioning schedule and methods are adjusted based on the patient's skin condition			3.48	0.70	1.0	4.0	0.657	75.4	24.6
28) A position that minimises pressure and strain to the skin is chosen			3.63	0.57	1.0	4.0	0.708	76.1	23.9
29) Positioning the patient directly on tubes and drainages is avoided			3.84	0.45	1.0	4.0	0.625	76.1	23.9
30) Positioning the patient on bony prominences with redness is avoided			3.63	0.61	1.0	4.0	0.702	73.3	26.7
31) The patient is positioned in a sitting position so that they are able to act and function			3.60	0.58	1.0	4.0	0.673	71.5	28.5
32) The patient's feet are positioned in a feet holder if the patient's feet cannot reach the floor			3.50	0.77	1.9	4.0	0.604	68.3	31.7
33) The time a patient sits in a chair without relieving the pressure is limited			3.36	0.74	1.0	4.0	0.704	63.7	36.3
Pressure relief devices (n = 392)						Missing data: n = 277-303			
34) High-quality foam mattresses are used for patients with a risk for PUs			3.09	0.95	1.0	4.0	0.420	67.5	32.5
35) Pressure distributing pillows are used for patients with a risk of developing PUs when seated			2.83	0.98	1.0	4.0	0.462	57.6	42.4
36) It is ensured that the heels are not in contact with the mattress			3.36	0.70	1.0	4.0	0.482	72.6	27.4
37) Gloves filled with water are used for PU prevention ^a			3.86	0.44	1.0	1.0	-0.138	17.1	82.9
Documentation (n = 418)						Missing data: n = 271-293			
38) All risk assessments conducted are documented			3.30	0.90	1.0	4.0	0.503	67.1	32.9
39) Every comprehensive skin assessment is documented			3.52	0.69	1.0	4.0	0.557	76.5	23.5
40) Every repositioning of a patient with a PU risk is documented and evaluated			3.04	0.85	1.0	4.0	0.662	60.3	39.7
41) The nutrition status of patients with a PU risk is documented			2.81	0.86	1.0	4.0	0.671	56.2	43.8
42) Pressure relief devices used for patients with a PU risk are documented			2.88	0.91	1.0	4.0	0.660	55.6	44.4

Note: 1 = never, 2 = sometimes, 3 = often, 4 = always.

Abbreviation: PU, pressure ulcer.

^aNot a recommended action.

Source: © Haavisto 2021.

of agreement were in the repositioning and documentation sections, in which the majority answered that there was no agreement in the prevention practices in any of the items (Table 3). The highest levels of agreement in

PU prevention practices were in the two practices that are not recommended: water-filled gloves (82.9%) and massage (71.5%), meaning that there is an agreement that these practices are not used in PU prevention in most of

TABLE 4 Associations between factors and PU prevention practices (only statistically significant variables reported in this table)

PU prevention practices																						
Variable	Risk assessment			Skin assessment and care			Nutrition			Repositioning			Pressure relief devices			Documentation			Total prevention practices			
	Mean	SD	P	Mean	SD	P	Mean	SD	P	Mean	SD	P	Mean	SD	P	Mean	SD	P	Mean	SD	P	
Sector ^a	2.97	0.60	0.299	3.50	0.37	<.0001	2.65	0.65	0.065	3.65	0.39	0.0003	3.40	0.47	<.0001	3.07	0.65	0.247	3.25	0.38	0.118	
Primary care (n = 290-308)																						
Specialised care (n = 184-194)	3.00	0.69		3.34	0.46		2.73	0.73		3.47	0.55		3.08	0.56		3.13	0.64		3.16	0.48		
Nursing education ^b	3.00	0.62	0.790	3.42	0.41	0.051	2.68	0.67	0.564	3.57	0.43	0.035	3.27	0.51	0.194	3.04	0.65	0.012	3.20	0.40	0.038	
Registered nurse (n = 242-254)																						
Practical nurse (n = 205-218)	2.99	0.64		3.49	0.38		2.73	0.67		3.64	0.42		3.33	0.51		3.20	0.62		3.27	0.41		
Working in PU prevention and early detection ^b	3.04	0.61	0.0006	3.49	0.38		2.68	0.66	0.126	3.17	0.82	0.009	3.36	0.47	0.004	3.06	0.63		3.25	0.38	0.092	
Daily (n = 285-294)																						
Weekly (n = 112-116)	3.00	0.57		3.43	0.37		2.80	0.59		3.57	0.46		3.24	0.52		3.15	0.62		3.23	0.39		
Monthly (n = 57-65)	2.92	0.67		3.37	0.40		2.53	0.76		3.51	0.55		3.10	0.61		3.16	0.69		3.17	0.50		
More rarely (n = 29-35)	2.39	0.88		3.07	0.68		2.52	1.01		3.17	0.82		3.04	0.76		3.08	0.84		2.89	0.73		
Work experience in healthcare after graduation ^b	2.87	0.72	0.255	3.37	0.48	0.500	2.63	0.77	0.728	3.49	0.57	0.109	3.10	0.59	0.002	3.04	0.71	0.155	3.13	0.52	0.263	
6 years or less (n = 116-125)																						
6.1-14 years (n = 118-128)	2.95	0.64		3.42	0.45		2.72	0.65		3.53	0.50		3.31	0.52		3.08	0.61		3.21	0.42		
14.1-25 years (n = 121-127)	3.00	0.61		3.49	0.34		2.66	0.68		3.64	0.36		3.34	0.49		3.02	0.64		3.24	0.37		
25.1 years or more (n = 123-127)	3.06	0.60		3.45	0.39		2.71	0.64		3.63	0.41		3.35	0.49		3.20	0.62		3.27	0.40		
Current occupation ^b	2.92	0.55	0.660	3.49	0.27	0.162	2.67	0.47	0.721	3.59	0.43	0.098	3.47	0.39	0.048	3.17	0.62	0.029	3.24	0.31	0.114	
Ward manager (n = 23-24)																						
Registered nurse (n = 220-239)	3.00	0.63		3.41	0.41		2.67	0.69		3.55	0.46		3.24	0.54		3.02	0.66		3.19	0.43		

(Continues)

TABLE 4 (Continued)

PU prevention practices																						
Variable	Risk assessment			Skin assessment and care			Nutrition			Repositioning			Pressure relief devices			Documentation			Total prevention practices			
	Mean	SD	P	Mean	SD	P	Mean	SD	P	Mean	SD	P	Mean	SD	P	Mean	SD	P	Mean	SD	P	
Practical nurse (n = 211-224)	2.99	0.64		3.48	0.39		2.73	0.67		3.64	0.42		3.33	0.51		3.19	0.63		3.27	0.41		
Taking care of patients with PUs ^{a,b}			0.182			0.160			0.149			0.621			0.015			0.482				0.338
Daily (n = 85-88)	2.98	0.61		3.48	0.39		2.77	0.58		3.61	0.38		3.41	0.47		3.11	0.59		3.24	0.38		
Weekly (n = 160-170)	3.08	0.59		3.48	0.39		2.76	0.67		3.62	0.43		3.32	0.51		3.07	0.67		3.26	0.41		
Monthly (n = 136-142)	2.95	0.60		3.45	0.35		2.59	0.68		3.59	0.41		3.29	0.44		3.07	0.63		3.20	0.37		
More rarely (n = 99-113)	2.86	0.79		3.32	0.53		2.62	0.78		3.47	0.63		3.11	0.67		3.15	0.70		3.14	0.56		
Need for further education in PU prevention and early detection ^b			0.144			0.157			0.045			0.038			0.772			0.500				0.098
Much (n = 45-53)	2.99	0.71		3.41	0.46		2.71	0.88		3.56	0.60		3.31	0.59		3.09	0.77		3.24	0.53		
Moderately (n = 273-285)	2.94	0.60		3.42	0.38		2.62	0.66		3.55	0.43		3.28	0.50		3.06	0.65		3.19	0.40		
A little or not at all (n = 164-172)	3.03	0.69		3.03	0.46		2.77	0.67		3.62	0.49		3.27	0.56		3.14	0.61		3.25	0.45		

^aBetween-group comparisons with Wilcoxon test.^bBetween-group comparisons with Kruskal-Wallis test.

Abbreviation: PU, pressure ulcer.

TABLE 5 Associations between participants' educational needs and PU prevention practices (only statistically significant variables are reported in this table)

PU prevention practices																					
Variable	Risk assessment			Skin assessment and care			Nutrition			Repositioning			Pressure relief devices			Documentation			Total prevention practices		
	Mean	SD	P	Mean	SD	P	Mean	SD	P	Mean	SD	P	Mean	SD	P	Mean	SD	P	Mean	SD	P
Need more education PU risk assessment ^a			.177			.186			.007			.604			.097			.297			.096
Yes (n = 172-188)	2.91	0.67		3.40	0.41		2.55	0.73		3.55	0.50		3.23	0.53		3.02	0.68		3.16	0.45	
No (n = 263-275)	3.00	0.61		3.46	0.39		2.74	0.63		3.59	0.42		3.31	0.53		3.11	0.63		3.24	0.40	
Need more education about skin assessment and care in PU prevention ^a			.201			.023			.035			.001			.0002			.111			.003
Yes (n = 178-194)	2.92	0.65		3.39	0.39		2.57	0.69		3.49	0.50		3.17	0.54		3.01	0.65		3.15	0.43	
No (n = 257-268)	3.00	0.62		3.46	0.40		2.72	0.67		3.63	0.41		3.36	0.51		3.12	0.65		3.25	0.41	
Need more education about documentation in PU prevention ^a			.119			.983			.330			.071			.167			.003			.121
Yes (n = 117-126)	2.89	0.65		3.44	0.37		2.60	0.70		3.50	0.50		3.23	0.51		2.92	0.69		3.16	0.43	
No (n = 318-335)	2.99	0.63		3.43	0.41		2.68	0.67		3.60	0.43		3.30	0.54		3.14	0.63		3.23	0.42	
Need more education about support surfaces and mattresses in PU prevention ^a			.016			.200			.152			.161			.017			.586			.071
Yes (n = 136-143)	2.86	0.67		3.39	0.43		2.59	0.74		3.53	0.48		3.19	0.53		3.05	0.66		3.15	0.46	
No (n = 306-318)	3.01	0.62		3.45	0.38		2.70	0.65		3.59	0.44		3.32	0.52		3.09	0.66		3.23	0.41	
Need for any other kind of education in PU prevention ^a			.955			.459			.244			.304			.040			.581			.929
Yes (n = 22-23)	2.98	0.60		3.49	0.41		2.49	0.66		3.66	0.43		3.50	0.38		3.04	0.59		3.23	0.41	
No (n = 413-438)	2.96	0.64		3.43	0.40		2.67	0.68		3.57	0.46		3.27	0.53		3.08	0.66		3.21	0.43	

Note: The bold values indicate that $p < .05$.
 Abbreviation: PU, pressure ulcer.
^aBetween-group comparisons with Wilcoxon test.

TABLE 6 Explorative factor analysis (highest factor loadings in grey)

Rotated factor pattern						
Item	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
Risk assessment						
1	0.106	0.198	0.703	0.085	0.039	-0.068
2	0.134	0.400	0.543	0.079	0.186	-0.077
3	0.073	-0.014	0.761	0.096	0.119	0.004
4	0.312	0.495	0.343	-0.037	0.149	0.011
5	0.354	0.592	0.266	0.030	0.114	0.141
6	0.202	0.379	0.445	0.234	0.254	-0.068
7	0.138	0.486	0.544	0.174	0.205	-0.099
8	0.135	0.456	0.568	0.124	0.145	-0.153
9	0.137	0.513	0.505	0.206	0.169	-0.117
Skin assessment and skin care						
10	0.291	0.662	0.176	0.093	0.087	-0.002
11	0.156	0.620	0.167	0.084	0.098	-0.140
12	0.181	0.653	0.158	0.115	0.227	-0.100
13	0.253	0.616	0.038	0.116	0.027	-0.030
14	0.312	0.637	0.014	0.205	0.164	0.018
15 ^a	0.063	-0.003	-0.163	0.042	0.035	0.621
16 ^a	-0.034	-0.155	0.057	-0.070	-0.052	0.669
17	0.484	0.373	-0.002	0.236	0.101	0.097
18	0.464	0.468	-0.050	0.292	-0.043	-0.034
Nutrition						
19	0.239	0.171	0.426	0.575	0.177	-0.032
20	0.086	-0.235	0.491	0.535	0.044	0.028
21	-0.020	0.080	0.537	0.567	0.161	-0.047
22	0.111	0.173	0.197	0.627	0.213	-0.111
23	0.211	0.214	0.025	0.671	0.129	-0.049
24	0.246	0.320	0.065	0.566	0.246	0.041
Repositioning						
25	0.678	0.309	0.115	0.093	0.175	0.006
26	0.654	0.140	0.164	-0.112	0.169	-0.092
27	0.626	0.256	0.079	0.138	0.200	-0.092
28	0.696	0.247	0.129	0.033	0.159	0.001
29	0.659	0.129	0.044	0.036	0.092	0.074
30	0.727	0.163	0.038	0.098	0.182	0.028
31	0.711	0.069	0.096	0.095	0.217	0.060
32	0.664	0.123	0.106	0.178	-0.059	-0.068
33	0.672	0.135	0.133	0.191	0.156	-0.124
Pressure relief devices						
34	0.314	0.229	0.066	0.249	-0.195	-0.256
35	0.471	0.258	0.065	0.244	-0.052	-0.250
36	0.508	0.374	0.019	0.299	-0.015	-0.065
37 ^a	-0.084	0.059	-0.051	-0.072	-0.099	0.668

TABLE 6 (Continued)

Rotated factor pattern						
Item	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
Documentation						
38	0.145	0.066	0.226	0.094	0.629	0.123
39	0.347	0.296	0.004	0.065	0.597	0.079
40	0.200	0.190	0.185	0.165	0.660	-0.185
41	0.214	0.168	0.185	0.470	0.563	-0.111
42	0.156	0.130	0.176	0.260	0.680	-0.161
Variance explained by each factor (%)	14.9	12.1	9.0	7.6	6.6	4.0

^aInverted scale.

the units. The lowest levels of agreement in the recommended practices were in the repositioning of patients at risk (16.9%) and the patient's mobility, general status, and repositioning schedule (21.1%).

3.3 | Association between factors and PU prevention practices

The factors that explained most of the PU prevention practices were the sector, the nurses' education and their frequency of working in PU prevention, and early identification of PUs. Statistically, participants working in the primary care sector showed significantly higher practices in skin assessment and skin care ($P < .0001$), repositioning ($P = .0003$), and pressure relief devices ($P < .0001$). The practical nurses (vocational degree) showed statistically a significantly higher total of PU prevention practices than registered nurses (bachelor's degree) ($P = .038$) including repositioning ($P = .035$) and documentation ($P = .012$). In addition, those participants who worked more often with PU prevention and early identification of PUs performed, statistically, significantly higher prevention practices in each of the four sections: risk assessment ($P = .0006$), skin assessment and skin care ($P = .0004$), repositioning ($P = .009$), and pressure relief devices ($P = .004$) (Table 4).

The factors that explained the least used PU prevention practices were working experience and how frequently the participant took care of patients with PUs. Those participants who had more experience in the health care field only showed statistically significant higher prevention practices as regards pressure relief devices ($P = .002$). In addition, those participants who cared more frequently for patients with PUs only showed statistically significant higher prevention practices as regards pressure relief devices ($P = .015$) (Table 4).

The section that was statistically significant for the highest number of factors was pressure relief devices, as a total of seven factors explained these practices: the sector ($P < .0001$), the frequency of how often the participant was working with PU prevention and early detection ($P = .004$), working experience ($P = .002$), current occupation ($P = .048$), the frequency of how often the participant was taking care of patients with PU ($P = .015$), the need for more education about support surfaces and mattresses in PU prevention ($P = .017$), and the need for any other kind of education in PU prevention ($P = .040$) (Tables 4 and 5).

The section that was least statistically significant as regards the factors was risk assessment. Only two factors were statistically significant related to the participants' risk assessment practices: working in PU prevention and early detection ($P = .0006$) and the need for more education about support surfaces and mattresses in PU prevention ($P = .016$) (Tables 4 and 5).

Finally, the attitudes towards PU prevention among the study participants had a statistically significant correlation with the total PU prevention practices ($P < .0001$, $r_s = 0.258$) and with all the sections (risk assessment: $P < .0001$, $r_s = 0.243$, skin assessment and skin care: $P < .0001$, $r_s = 0.284$, repositioning: $P < .0001$, $r_s = 0.253$, pressure relief devices: $P < .0001$, $r_s = 0.194$, documentation: $P = .0006$, $r_s = 0.154$) except in nutrition. However, knowledge about PUs only had a statistically significant correlation with the skin assessment and skin care practices ($P = .0086$, $r_s = 0.116$).

3.4 | Validity and reliability of the PUPreP instrument

The psychometric properties of the PUPreP instrument were assessed using internal consistency: (Cronbach alpha), item to total correlation, inter-item correlation,

and explorative factor analysis. The internal consistency in the sum variables of the instrument was at a desirable level (>0.7)³¹ except in pressure relief devices (0.52) (Table 2). In addition, the item to total correlations was at an acceptable level (>0.2)³¹ except for the inverted items (Table 3). The inter-item correlations varied in the different sections as follows: risk assessment: 0.25 to 0.79; skin assessment and skin care: -0.21 to 0.60; nutrition: 0.28 to 0.61; repositioning: 0.37 to 0.62; pressure relief devices: -0.14 to 0.47; documentation: 0.39 to 0.63. The negative correlations came from the inverted items. In the explorative factor analysis, six factors were identified (Table 6). The items in the nutrition, repositioning, and documentation sections completely corresponded to the same factors. Additionally, the risk assessment, skin assessment and skin care, and pressure relief devices corresponded well. However, the inverted items could not be placed into the factors with other items in the same section.

4 | DISCUSSION

4.1 | Discussion of the results

This study aimed to describe the use of consistent practices in PU prevention based on international care guidelines and to assess the validity and reliability of the PUPreP instrument. The study results suggest that, in general, the prevention practices according to the international guidelines were conducted quite frequently, indicating that the study participants followed the guidelines at a moderate level. Of these prevention practices, repositioning was the most frequently used practice. Similar findings were indicated in a previous study conducted in China,³² where more than 70% of the patients were repositioned every 2 hours. The higher frequencies in repositioning practices could be explained through its effectiveness in PU prevention even though the knowledge of repositioning as a PU prevention intervention among nursing staff has not been at a sufficient level in some of the recent studies assessing nurses' knowledge of PU prevention.^{27,33} The levels of agreement in the units regarding repositioning as a PU prevention practice were the lowest, indicating that there was no agreement on these practices in most units despite the realised practices.

Skin assessment and skin care was the second most frequently used PU prevention practice among the study participants, suggesting that skin assessment and skin care practices were also primarily sufficient. This result is in line with two previous studies in which skin assessment and skin care as a PU prevention practice in long-

term care facilities were also found to be mainly sufficient.^{18,23} The other PU prevention methods described as being used frequently by the participating nurses were pressure relief devices and documentation. The use of pressure relief devices, such as specialist mattresses, is one of the key PU prevention practices in PU prevention guidelines³ even though the evidence is somewhat uncertain about the differences in the effects of these devices.³⁴ In addition, not all the devices, such as water-filled gloves or sheepskins, are recommended as they might cause more harm than good.¹ Documentation as a PU prevention practice was used quite regularly among the participating nurses. However, a previous study has showed a lack of quality and comprehensiveness in the nursing documentation of PUs, especially in PU appearance, staging, and treatment.¹⁷ Nevertheless, another study demonstrated that documentation practices in PU prevention were improved by implementing evidence-based PU prevention practices.¹⁸

In this study, the two PU prevention practices least often used were risk assessment and nutrition. Risk assessment is the first step in PU prevention, and it should be conducted with structured and validated risk assessment tools, of which the most frequently used tool, according to previous studies, is the Braden scale.^{35,36} In keeping with international guidelines, a risk assessment should be conducted as soon as possible after admission and repeated regularly or after any change in a patients' status.³ In this study, however, the risk assessment was only conducted sometimes on admission. Despite the inconsistencies in risk assessment practices, the agreement levels were highest in risk assessment, and knowledge regarding risk assessment among the nursing staff was found to be sufficient.²⁷ Finally, nutrition as a PU prevention practice was used less frequently than the other methods, meaning that nutrition as a prevention method was not at a sufficient level. According to previous studies, nutrition plays a vital role in PU prevention, especially among older patients.³⁷ In addition to the prevention of PUs, nutrition also has an important role in wound healing.³⁸ The results of this study are in line with a previous study, in which nutrition was also the least used PU prevention practice in long-term care facilities.²³ However, according to a previous study, nutritional practices in PU prevention could be improved with the implementation of consistent practices.¹⁸

The factors that were most related to the participants' PU prevention practices were the sector, the education level and the frequency of working in PU prevention, and early identification of PUs. Participants working in the primary sector showed higher practices in three sections, which might be explained by their better attitudes towards PU prevention.³⁰ Of the participating nurses, the

practical nurses with vocational degrees showed a higher number of total prevention practices even though their knowledge of PU prevention was lower than the registered nurses.²⁷ This might be explained by the fact that in certain units, especially in specialised care, practical nurses in Finland perform more basic care, including repositioning, compared with registered nurses. Furthermore, the more frequent PU prevention practices and the higher working frequency in PU prevention and early identification of PUs could be simply explained because those nurses who work more frequently in PU prevention consequently perform more PU prevention practices and are also more aware of these actions. Finally, the participants' attitudes towards PU prevention correlated strongly with the prevention practices; this indicates that with better attitudes towards PU prevention, the more frequently the PU prevention practices are performed.

The validity and reliability of the PUPreP instrument were mainly at a sufficient level. The overall internal consistency of the instrument was high, and all except one of the sections were at a desirable level. The item to total and inter-item correlations were also mostly acceptable except for those items that were inverted. This indicates that the inverted items did not function well in this instrument and should either be removed or edited for future use of the instrument. The explorative factor analysis showed that three of the six sections were attained entirely by the same factor, and the remaining three were also achieved well, except for the inverted items. This also strengthens the challenges with the inverted items. The literature review found that three previously developed instruments assessing nurses' PU prevention practices were available; however, none were developed with similar purposes or settings as the PUPreP. According to the WHO,³⁹ consistent and evidence-based practices should be developed as they can lead to a higher quality of care and better equality in care. This highlights the need for this instrument because by studying the performance of consistent and evidence-based PU prevention practices, the differences in everyday practices can be better identified, and the practices improved.

4.2 | Strengths and limitations

This study has some limitations. The data were collected in Finland, meaning that the results of this study cannot be generalised internationally. However, the study results could be generalised nationally at least at some levels, as the data were collected from two hospital districts, and the hospital districts in Finland are considered to be similar in terms of nursing care. In addition, the participants represented both the primary and specialised care sector,

and both registered and practical nurses giving a more heterogeneous perspective of PU prevention practices in these two hospital districts. The study sample was representative, and the number of respondents was high, even though the response rate remained low and there were some missing data, especially related to questions on the level of agreement. The low response rate is comparable to other electronic surveys in contrast to paper surveys.⁴⁰ The literature review was updated for this study. However, only three previously developed instruments assessing PU prevention practices were identified. The small number of databases might decrease the validity of the literature retrieval even though Medline and CINAHL are found to be the most essential databases in nursing topics.⁴¹

The data were collected with the PuPreP instrument, which showed appropriate internal consistency and validity. However, the instrument should be developed for future use to meet the standards of the current guidelines³ on PU prevention. Moreover, the inverted items should be either removed or edited for future use. However, further validation is needed if the instrument is to be used in other countries. It is also worth noting that the PU prevention practices were assessed from the individual participants' point of view, meaning that the study results were based on self-assessment, not on an objective assessment. The data were analysed by a statistician, which increased the validity of the data analysis.

5 | CONCLUSIONS

This study suggests that the evidence-based PU prevention practices were followed to a moderate degree among the participating nursing staff. Repositioning was the most frequently used PU prevention practice, and nutrition was the least used. The agreement levels regarding the prevention practices were mainly found to be at an inadequate level. The working sector, education and working frequency in PU prevention, and early identification of PUs were all related to higher frequencies in PU prevention practices; additionally, attitudes towards PU prevention correlated with the prevention practices. The PuPreP instrument demonstrated validity and reliability, but further development and testing are warranted. Future studies could focus on implementing evidence-based PU prevention practices and validation of the PuPreP instrument in other cultures and languages.

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CONFLICT OF INTERESTS

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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