Consistent pressure injury prevention practices at long-term care facilities

Abstract

Objective: To examine the use of consistent practice in pressure injury prevention based on international guidelines at long-term care facilities in Finland.

Method: A correlational cross-sectional design was used. Data were collected from 84 contact persons from 62 participating units in a certain hospital district in Finland. For collecting data, we used the Pressure Ulcer Prevention Practice (PUPreP) instrument with six sections (51 items). The scale related to frequency of practices was from never to always while a yes/no scale was used for agreement on practices. The data were analyzed statistically.

Results: According to the respondents, skin assessment and skin care was the most often conducted pressure injury prevention practice while nutrition was the least often used. Consistent practices relating to repositioning were most frequently agreed upon whereas those relating to risk assessment practices were most rarely agreed upon. Some respondents' demographic factors were associated with frequency of prevention practices such as reading and knowing.

Conclusions: Pressure injury prevention based on international guidelines was at moderate level but there were often no consistent practices in the units. In conducting pressure injury prevention based on guidelines, further education and knowledge about pressure injury prevention might be more efficient.

Key words

Consistent practices, Guideline, Evidence-based practice, Long-Term Care, Nurses, Pressure Injury

Introduction

Consistent and evidence-based practices are essential[1] because it is not acceptable for patients that the care varies unnecessarily depending on the healthcare environment or who is caring for them. This variation can lead to poor patient outcomes due to harmful or ineffective interventions.[2] Even though it is estimated that more than 95% of pressure injuries (PIs) can be avoided with proper prevention methods,[3] the prevalence of PIs in long-term care facilities or nursing homes is high, ranging from 9.5% to 12.0%.[4-5] However, even though most PIs occur in hospital settings, the overall prevalence of PIs is not much higher in hospitals than in nursing homes.[6] According to a recent study, the overall prevalence of PIs in Swiss nursing homes was only 5.7%. However, it varied between 0% and 19.6% depending on how well the PI prevention strategies were implemented in the units.[7] Research has shown that organizations with the continuous development of prevention protocols have a low PI prevalence.[5] However, the overall prevalence of PIs in the United States, for example, has decreased significantly over ten years related to improved PI prevention practices.[8]

PIs can be prevented with risk assessment, skin assessment, preventive skin care, repositioning, nutrition and use of support surfaces in accordance with the international guidelines.[3] The development of PIs can be predicted through risk assessment at the time of admission, which should be repeated regularly or if the condition changes.[9,3] Skincare, including cleaning, moisturizing and protecting the skin, is essential in PI prevention[9] as well as skin assessment to prevent deeper injuries.[10] The stage 1 and 2 PIs are the most common PIs, and the most commonly reported anatomic location of the PIs is the sacrum, followed by the heel.[11]

According to the previous literature, the most frequently used PI prevention strategies are repositioning regimes and some form of support surface/pressure-relieving devices.[12] The combination of frequent turning and a pressure-redistributing mattress is believed to have the best

effect on PI prevention in older patients.[13] Those hospital patients who are at high risk of developing a PI are more likely to receive pressure-redistributing mattresses and planned repositioning as well as a documented risk assessment than those who are not at high risk.[14] However, in long-term care facilities, a documented repositioning care plan is often lacking in the nursing notes.[15] Early nutrition interventions can help to prevent or delay malnutrition and its impacts on PI risk and the rate of wound healing.[16] For example, in home care settings, malnutrition is the most critical factor associated with the development and severity of PIs.[17]

Nurses play a crucial role in PI prevention,[18] and nurses' high workload can actually be a protective factor associated with PI development in certain situations.[19] Nurses consider multiple patient characteristics for PI risk assessment, such as patients' exposure to pressure, overall care dependency, or self-care abilities.[20] Even though there is evidence of PI prevention, the recommended interventions are not always fully implemented,[21] and PI prevention strategies are not always used consistently.[12]

Previous studies have identified several causes of problems with the implementation of evidence-based practice in PI prevention. According to Lavallée et al.,[22] the following characteristics are associated with PI prevention implementation in nursing homes: knowledge, physical and interpersonal skills, social influences, environmental context and recourses, beliefs about capabilities and consequences, and social or professional role and identity. Even though nurses' competence in preventing PIs is moderate,[23-24] a significant gap has also been observed.[25-26] Nurses' lack of knowledge has been demonstrated in PI development,[27] risk assessment[26] and preventive activities.[28] However, according to a recent Cochrane review, there is no clear evidence as to whether educating healthcare professionals about PI prevention or increasing nurses' knowledge of PI prevention makes any difference to the incidence of PI.[29]

Nurses' attitudes towards PI prevention vary.[30-31] Previous studies have shown a positive attitude[32-33] but also low levels of adherence.[34-35] A negative mindset can result in interventions that are not sufficiently effective.[25] According to a Swedish study, nurses' attitudes about PI prevention were relatively positive, but they did not necessarily adhere to the organization's guidelines despite this.[30] Furthermore, creating effective organization, maintaining persistent awareness and realizing the benefit to patients have been successful factors in PI prevention culture.[36]

Consistent PI prevention practices can be improved by following care guidelines.[37] However, the implementation of care guidelines is always dependent on context and culture[3] meaning that the consistent practices in PI prevention should be studied in different settings and populations. According to the previous literature, PI prevention practices may vary in the organizations.[26] Studies assessing the use of consistent and evidence-based practices in PI prevention in long-term facilities are scarce.

This study is part of the Pressure Ulcer Prevention Study among Elderly Long-Term Care Patients in Finland (PUPEP). Its purpose was to examine PI prevention, patients with PI and their treatment in long-term care facilities (nursing homes, assisted residential homes, healthcare centre wards). The aim of this study was to examine the use of consistent PI prevention practices based on international guidelines in long-term care facilities in Finland. The research questions to be addressed in this study include the following: 1) How frequently are the PI prevention practices based on the international guidelines used in the participating units? 2) Is there common agreement on consistent practices in PI prevention in the participating units? 3) Which demographic or organizational factors are associated with PI prevention practices at the participating units?

Ultimately, this study seeks to improve the quality of care in Finnish long-term care facilities. When assessing the frequency and the consistency or non-consistency in PI prevention practices, potential barriers and educational needs can be identified. The implementation of these evidence-based practices can be promoted.

Methods

Design, sample and data collection

A correlational cross-sectional study design was employed. The study sample comprised the contact persons (n = 84) (nurses) who took part in the more extensive PUPEP study focusing on all volunteer private and public long-term care facilities (healthcare centres, nursing homes and assisted residential homes) (n = 62) in a selected Hospital District (approximate population 230,000) in Finland. Some units wanted to assign more than one contact person, one of whom could be a substitute. Psychiatric clinics, disability units, home healthcare and home hospitals were excluded from the study. In Finland, both registered nurses (bachelor's degree) and practical nurses (vocational qualifications) have an equal role in PI prevention, even though their job descriptions may differ in long-term care facilities.

The data were collected in 2016 using paper and pencil questionnaires. The corresponding author distributed the questionnaires to all contact persons in the Hospital District. Survey participants completed the questionnaires and returned them in sealed envelopes to the corresponding author. The data were collected in a long-term care facility, where the number of patients/clients in the participating units varied between 7 and 120. In the participating units, a total of 158 PIs in 112 patients were identified. The majority of the patients with PI were female (63%), with a mean age of 84.6 years (range 62–105, SD 7.8). The patients had been in the unit for an average of 1.8 years (range 0–13, mean 3.0, SD 3.1). The main reasons for admission to the unit were a decline in mobility (49%)

and memory disorder (31%). PIs among the patients included stage 1 (37%), stage 2 (39%) PIs, stage 3 (13%) and stage 4 (5%). Six per cent of wounds were unstageable. The most common professional group working in these units were practical nurses (mean 14.72; 2.28), followed by registered nurses (mean 2.87; 1.14) and physicians (mean 0.63; 0.2).

Instrument

Data were collected with the Pressure Ulcer Prevention Practice (PUPreP) instrument developed for this study. The instrument measured nurses' perceptions of the PI prevention practices at their unit and was based on international PI prevention guidelines.[38] The PUPreP instrument included 51 questions divided into six sections about the frequency of the facility's PI prevention practices: 1) PI risk assessment (11 items), 2) skin assessment and skincare (8 items), 3) nutrition (7 items), 4) repositioning (13 items), 5) local pressure relief devices (8 items) and 6) documentation (4 items). The questions were Likert-scaled by measuring PI prevention practice frequencies as: 1 = never, 2 = sometimes, 3 = often, 4 = always and 5 = cannot say. These responses meant that the frequency of prevention practices per question and section ranged from 1 to 4; the 'cannot say' responses did not reveal frequency. Prevention practices presented in the items were either recommended or not recommended according to the guidelines. In the Likert-scaled questions, the respondent was also asked to tell whether there was an agreed PI prevention practice in their unit that was based on the international guidelines. The response offered dichotomous options (yes/no, 0 = no agreement and 1 = agreement). The term *pressure ulcer* was used in the instrument's name instead of *pressure injury*, as the term *pressure ulcer* was used when the instrument was developed, and it is still mainly used in Finland.

For purposes of background, 11 questions focused on nurses' demographic and organizational factors, including number of healthcare professionals working in the unit, the number of patients/clients in

the unit, the average length of stay in the unit, length of work experience in healthcare and work experience in this unit (Table 1). In addition, 34 questions related to nurses' PI knowledge were asked as background variables. The knowledge test based on PI prevention guidelines consisted of true/false questions on PI development and risk factors (5), PI classification (5), risk assessment (4), skin assessment and skincare (5), nutrition (5), repositioning (5) and pressure relief devices (5). The content validity, relevance and clarity of knowledge were evaluated by a multidisciplinary panel of experts (physicians and authorized wound care nurses). The purpose of the evaluation was to achieve consensus of the items between the experts.[39]

Ethical considerations

This study was conducted according to procedures for the responsible conduct of research.[40] Permission for the study was obtained from the directors of the organizations. Ethical approval was obtained from the local Human Sciences Ethics Committee (126/2015). Each participant gave their written informed consent to participate in the study. Study participants remained anonymous.

Data analysis

Data were analyzed statistically using the SAS 9.3 software package (SAS Institute Inc., Cary, North Carolina, USA). Frequencies, percentages, means and medians were used as descriptive statistics. Correct answers to the knowledge test received one point while wrong/do not know responses were assigned zero points; the maximum possible score was 34. Two sum variables were formed for each six instrument sections of the facility's PI prevention practices. One sum variable reflected the average frequency of the PI prevention practices consistent with the guidelines. The other gave the rate (percentage) of agreement in the facility based on implementation within each section.

In some items, the scale (never to always) was inverse so that *never* was the desirable answer because some of the practices in the questions were not recommended under the guidelines.[38] This inverse assignment was considered in the analysis by reversing the scale of such items. Internal consistency of the sum variables was examined using Cronbach's alpha coefficient. When there were two categories to be compared, the associations between the sum variables related to "frequency of the practices of PI prevention" and background data (nurses' demographic factors, including knowledge test and organizational factors such as the prevalence of PIs) were studied with t-tests. Analysis of variance (ANOVA) was used to compare means between three or more groups. Relations between numeric variables and sum variables were examined with Pearson's correlation coefficients. A significance level of $< .05$ was used for all tests.

Results

Demographic factors

A total of 84 contact persons, most of whom worked in assisted residential homes, answered the questionnaires. Most of the respondents were head nurses or registered nurses (82%). Less than half of the nurses were their unit's wound care nurse, and only one was an authorized wound care nurse (Table 1). The length of working experience for nurses varied from four months to 40 years, and experience in the participating unit ranged from 2 weeks to 40 years.

Forty per cent of the respondents answered that they cared for patients with PIs less often than monthly. One-third of the respondents answered that they had not participated in any PI education within the past two years. Only 21% said that they had not read scientific articles about PI prevention during the past two years. Similar results (16%) were obtained when asking about reading professional articles. Most of the respondents (70%) had read the guidelines for PI prevention and

early recognition. The nurses mostly needed more education on wound care products (63%) and PI pressure relief devices (61%). Only 16% of the nurses answered that they needed more education on skin assessment and skincare, and patient/next of kin education (Table 1). The average knowledge score was 25.7 (75.6%), with a maximum score of 34 (Std Dev 4.03, range 5.31).

Frequency of PI prevention and agreement on consistent prevention practices

According to the respondents, skin assessment and skincare was the most often conducted PI prevention practice, followed by repositioning. The least used practice was nutrition. The highest agreement on consistent practices was for repositioning; the lowest was risk assessment (Table 2).

PI risk assessment practices

Patients' risk of developing PI was assessed *often* in most of the units (Table 2). For example, most of the respondents answered that patients' factors related to nutrition (69%), skin moisture (68%), friction and shear (65%) sense of touch (70%) and general health status (88%) were assessed either often or always. Still, most participants stated there was no agreement on consistent practice in PI prevention relating to risk assessment practices (53-79%). Exceptions were the patient's health status (62% agreement) and individual prevention plan (65% agreement). Almost half of the nurses stated that risk assessments were never conducted on admission (43%) or repeated regularly (47%) (Table 3).

Skin assessment and skincare practices

Skin assessment and skincare was the most often used prevention practice and was indicated more than *often* in the units (Table 2). Three-quarters of the participants answered that their patients were never turned to the side with skin redness (72%) as recommended. In most units, massage (78%) or rubbing the skin (95%) was never used as recommended for PI prevention. However, there was more

variation in PI-related pain; about one-third (35%) said that patients were often asked about PI-related pain, followed by just *sometimes* (30%). There was agreement on consistent practices in most units regarding skin assessment and skincare. However, for pain assessment, there was no agreement (53%) (Table 3).

Nutrition

Nutrition was the least used prevention practice in the units, used only quite *often* in the units (Table 2). Nutrition status of PI risk patients was assessed either often or always often (62%) in most of the units. However, 91% said that dietary plans conducted by a dietician were never used in most units, and nutrition assessment instruments were never used in only half of the units (49%). There was no agreement on the consistent practice of nutrition assessment instruments (70%) or dietary plans (85%). The optimized diet was used often or always for patients with risk of malnutrition and PI in most of the units (72%; agreement 73%), as was the assessment of nutrition status included in optimized diet (73%, agreement 52%) (Table 3).

Repositioning

Repositioning was the second most used prevention practice and was conducted more than *often* in most of the units (Table 2). PI risk patients were repositioned in all units either often or always (100%). Furthermore, the frequency of repositioning changed based on skin condition either often or always in nearly all of the units (99%). Most of the respondents (83%) reported that positioning the patient directly on tubes and drainages was always avoided. There was also agreement on consistent practices in most units regarding patients' repositioning practices (agreement 68-86%) (Table 3).

Pressure relief devices

Proper pressure relief devices were used *often* in the units (Table 2). Water-filled gloves were never used by 98% of respondents, and synthetic sheepskin was never used by 72% of respondents as recommended to prevent PIs. However, round pillows (58%) and doughnut style pillows (54%) were sometimes used in over half of the units, even though they are not recommended at all. Agreement on these practices varied between 26% and 46%. High-quality foam mattresses were always or often used in 73% of the units (with 68% agreement). However, there was significant variation regarding the use of active high-risk mattresses (low air loss or air fluidized mattresses) if repositioning was not possible. The skin on the patients' heels was observed daily either always (53%) or often (40%). The practices that were most frequently agreed upon were observing the heels daily (79%) and using pillows to prevent PIs in heels (77%) (Table 3).

Documentation

Documentation as a PI prevention practice was realized *often* in the units (Table 2). In documentation practices, the assessment of skin condition (97.6%, agreement 79%) and patients' pain (93.8%, (agreement 64.7%) were documented either always or often in most units. Repositioning and positions (67%, agreement 46.6%) and the effectiveness of repositioning (61% agreement 45.8%) were documented only sometimes or never in most of the units (Table 3).

Association between demographic and organizational factors and PI prevention practices

There were some statistically significant associations between nurses' demographic data and sum variables in the frequencies of PI prevention practices in the participating units. Statistically significant relationships were most commonly related to self-reading about PIs (Table 4). Self-reading was most commonly associated with higher frequencies of risk assessment (P = .001-.004). Reading scientific articles was also associated with documentation (P = .039), and reading professional articles was associated with nutrition (P = .001). In addition, those participants who

answered that they had read PI guidelines reported higher frequencies of PI risk assessment practices (P = .004), nutrition (P = .018) and repositioning (P = .009) than those who had not read the guidelines.

Nurses were asked to choose in which areas of PIs they needed more education. The needed education (PI prevention, nutrition, skin assessment, skincare and documentation) was most commonly associated with lower frequencies of PI prevention practices (Table 4). Some statistically significant associations were found between PI prevention practices and respondents' knowledge. Nurses who were more knowledgeable reported lower frequencies of risk assessment practices (P = .039) and documentation (P = .020). There were no statistically significant associations between PI prevention practices and organizational factors, including the prevalence of PIs.

Discussion

Discussion of the results

This study aimed to examine the use of consistent practices in PI prevention in a selected hospital district area in Finland. Further, the study sought to determine the extent to which the international PI prevention guidelines were followed in these units. Most of the respondents worked in assisted residential homes or nursing homes, caring for older patients.

According to this study's results, skin assessment and skincare was the most commonly used PI prevention strategy. There was agreement on consistent practices related to skin assessment and skincare in most of the units. Skin assessment and skincare practices was also correlated to interest in reading scientific articles associated with PI, which led to a decreased need for further education about skin assessment and skincare. According to the new EPUAP, NPIAP and PPPIA[3] guideline,

skincare and skin assessment are essential in PI prevention. In particular, older people are at higher risk of developing PIs because of the skin's ageing process and possible illnesses, dehydration and incontinence.[10] The importance of basic skincare is typically emphasized in the care of older people. This attention might explain the positive results of skin assessment and skincare practices in the participating units.

The second most used PI prevention practice identified in the study was repositioning, which was also conducted more than often in most units. Previous studies supported the findings about repositioning.[12] In addition, pressure relief devices were used frequently in PI prevention, consistent with an earlier study by Chaboyer et al.[12] However, active high-risk mattresses were not commonly used in most of the units, and there was no agreement on consistent practices related to these high-risk matrasses. This lack of agreement was despite the findings of a previous study, which concluded there is evidence that the combination of frequent turning and high-risk mattresses has the best effect on PI prevention, especially in geriatric patients.[13] A lack of these devices in some units might explain the differences in using pressure relief devices.

Even though documentation practices in PI prevention were realized often in the units, repositioning and the effects of repositioning were documented less frequently than skin assessment and patients' pain. Moore and Cowman[15] found that a documented repositioning care plan was often lacking in senior care facilities. Unit staff should receive training, mentoring, and a program for the use of PI relief devices like high-risk mattresses and various pressure relief devices.

Nutrition as a PI prevention method was not sufficient in most of the units. According to a study by Hommel et al.,[36] adequate nutrition reduces the risk of getting PI, especially older people, who may suffer from poor nutrition.[41] International PI prevention guidelines[3] also emphasize the importance

of nutrition as part of PI prevention. This need means that there should be better planning and more resources when assessing older patients' nutrition status. Nutrition assessment was often conducted by nurses in most of the units, as was offering intensified nutrition. Still, in most units, dietary plans conducted by a dietician for patients at risk of malnutrition and PI were never used. This might explain the lack of resources for nutrition services in the units. Reading articles and guidelines was associated with better nutrition practices. As a particular area of knowledge, nutrition might be a challenge for nurses, demanding independent and guided learning.

Furthermore, PI risk assessments were conducted often at most units, and most of the risk assessment procedures were considered at least often. However, there was no agreement on consistent practices in most risk assessment procedures. Further, there was an absence of standard risk assessments on patient admission and regular risk assessments for all patients. According to the international PI prevention guidelines,[3] several factors other than simple immobility, like body temperature and skin moisture, can affect PI risk. The PI risk assessment should be conducted with validated tools. Still, there is a lack of evidence showing these validated risk assessment tools decrease the incidence of PIs over clinical judgement.[42] Contradictions in respondents' reported frequencies and the agreement level could be explained by lack of unit-specific instructions even though the nurses are competent in those prevention practices. Consistent and evidence-based unit-specific guidelines can help in the implementation of PI practices.

Those respondents who had read scientific or professional articles and PI guidelines reported a higher frequency of several risk assessment practices such as PI risk assessment, nutrition and repositioning. Reading of evidence-based, professional publications increases skills, knowledge and understanding of effective PI prevention practices. It may also improve positive attitudes toward PI prevention, which may, in turn, result in sufficiently effective interventions.[25]

Finally, most respondents said there was no need for further training other than in pressure relief devices and wound care products. This response was surprising because previous studies have demonstrated healthcare professionals' lack of knowledge about PI prevention.[26-28] However, most of the nurses who said they did not need more education reported higher frequencies in most of the PI prevention practices. Still, those participants who said they needed more nutrition education as PI prevention reported higher frequencies of PI prevention practices, except for nutrition itself. That response differs from those related to other education needs. Almost half of the respondents said that they needed further education in nutrition, indicating their lack of knowledge. The uncertainty stemming from a lack of experience could affect how PI prevention practices are conducted. This might explain the difficulty in evaluating one's competence in a specific practice area.

Strengths and limitations

There are some limitations to this study. First, the study was conducted in Finland, meaning that this study's results cannot directly be generalized to other countries as there might be geographical variability regarding the PI prevention guidelines. Also, the data were collected in only one hospital district in Finland. Because the sample size was limited, the results may not apply to the entire country. However, the data were collected systematically from the respondents in all public sector units and almost half of the private sector units. This level of response and participation was representative of the healthcare providers in the area (estimated population of 230,000).

In Finland, hospital districts with a central hospital are similar in terms of providing care and nursing competence, as hospital districts belongs to the public health care, funded by the government, and the qualifications for the nursing professionals are similar in the whole country.[43] Because less than half of the respondents were designated wound care nurses in their units, their competence to evaluate PI

practices might have been better compared to others. Furthermore, PI prevention practices at the unit level were evaluated primarily from individual respondents' points of view, even though the participants represented the practices from the unit's point of view. Some units also had more than one study participant. As practices were self-reported, an actual clinical practice could not be measured. In addition, because study participants were assigned by each participating unit, they were more likely to have a positive attitude about PI prevention. The sample consisted of only nursing professionals. Even though the physicians also have an essential role in PI prevention, all contact persons participating in this study consisted of nursing professionals as physicians are usually not involved in patients' basic care at long-term care facilities in Finland.

The instrument was developed specifically for this study and the psychometric testing of the instrument was limited. However, the instrument was based on the international PI prevention guidelines, and a multidisciplinary expert panel evaluated its content. Still, the instrument was based on NPUAP/EPUAP/PPPIA guidelines[38] from 2014, as the data were collected in 2016, limiting the generalization of this study for today's practice. Also, the sections of the instrument had an unequal number of items meaning that some sections could had been seen more important than the others among the participants. The Alfa coefficients (Table 2) were mostly moderate for frequency sections and good regarding the agreement sections. The low coefficients relating to pressure relief devices requires further evaluation. In addition, there were some missing data, particularly related to questions on the level of agreement; the number of respondents in the questions about agreement was lower than the questions about frequency. Because a statistician analyzed the data in cooperation with the research team, the validity of the analysis and study results might have been enhanced.

Implications for clinical practice

The findings of this study can be used to improve and to standardize the PI prevention practices in long-term care facilities. Especially, the education and training for nursing professionals could be targeted to those less used prevention practices in order to improve the quality of care and patient safety. The PI prevention training need to be updated based on the current care guidelines to ensure that the latest evidence-based practice is applied. Future studies should focus on PI prevention practices at the national and international level and on educational interventions aimed at improving the implementation of consistent PI prevention practices at long-term care facilities.

Conclusions

PI prevention practices based on international guidelines was suggested to be at moderate level as most of the prevention practices were conducted at least often in most of the units. Skin assessment and skin care followed by the repositioning were the most commonly used PI prevention practice, and there was an agreement on consistent practices relating to skin assessment and care and repositioning in most of the units. Nutrition as a PI prevention method was weakest in the units, and there were not always consistent practices in the units. Reading articles and guidelines as well as knowing PI prevention practices increased the use of consistent practices based on guidelines. Organizational factors including PI prevalence were not associated with PI prevention practices.

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Table 1. Demographic factors of the participants

Variable	%
Workplace (n=84)	
Assisted residential homes	69
Nursing homes	26
Health care centers	2
Elsewhere	2
Respondent's profession (n=84)	
Head nurse / nurse in charge	17
Registered nurse	65
Practical nurse	18
Respondent is unit's wound care nurse (n=79)	
Yes	43
No	57
Respondent is an authorized wound care nurse (n=61)	
Yes	2
No	98
Frequency of working with PI prevention (n=84)	
Daily	87
Weekly	7
Monthly	2
Rarely	4
Frequency of caring for patients with PIs? (n=83)	
Daily	22
Weekly	29
Monthly	9
Rarely	40
Frequency of participating in PI education during the past two years (n=73)	
Never	33
Once	33
More often	34
Frequency of reading scientific articles related to PI prevention during the past two years (n=61)	
Never	21
Once	38
More often	41
Frequency of reading professional articles related to PI prevention during the past two years (n=61)	

Never	16
Once	33
More often	51
Reading guidelines for PI prevention and early recognition of PIs (n=84)	
Yes	70
No	30
Need for more education about following topics (n=84)	
PI development and risk factors	22
PI prevention	35
Nutrition and PI prevention	48
Repositioning	16
Pressure relief devices	61
Mental condition in PI prevention	33
Skin assessment and care	16
Excretion in PI prevention	33
Patient/next of kin education in PI prevention	16
Documentation in PI prevention	33
Wound care products	63

Table 2. Frequency of consistent practices and level of agreement on PI prevention according to the guidelines

	Frequency ¤					Agreement #				
	N	Mean	Median	SD	α	N	Mean	Median	SD	α
Risk assessment	83	2.75	2.73	0.59	0.856	75	0.42	0.40	0.35	0.906
Skin assessment and skin care	83	3.49	3.50	0.34	0.548	77	0.60	0.71	0.37	0.890
Nutrition	81	2.50	2.43	0.56	0.695	75	0.51	0.57	0.36	0.850
Repositioning	80	3.47	3.5	0.30	0.685	76	0.78	1.0	0.35	0.968
Pressure relief devices	83	3.37	3.33	0.33	0.264	70	0.55	0.50	0.35	0.891
Documentation	84	3.02	3.00	0.50	0.559	77	0.61	0.80	0.38	0.791

¤ 1=never, 2=sometimes, 3=often, 4=always

0= no agreement, 1= agreement

α = Cronbach Coefficient Alpha

Table 3: Frequency of consistent practices and level agreement on PI prevention in risk management, skin assessment and skincare, nutrition, repositioning, pressure relief devices and documentation

Variables	Frequency %					Agreement %	
Pressure injury risk assessment	Never	Sometimes	Often	Always	Can't say	No	Yes
PI risk factors assessed at your unit							
a. Factors related to nutrition (e.g. anemia, hemoglobin, weight)	2.4	27.4	46.4	22.6	1.2	53.3	46.7
b. Factors related to oxygen supply (e.g. circulation)	3.6	24.1	39.8	31.3	1.2	55.4	44.6
c. Skin moisture (e.g. sweating)	2.4	29.8	38.1	29.8	0	58.1	41.9
Impacts of following factors are assessed in PI risk assessment at our unit							
a. Friction and shear	9.8	25.6	39.0	25.6	0	55.4	44.6
b. Sense of touch	7.3	22.0	47.6	22.0	1.2	60.3	39.7
c. General health status	0	12.1	49.4	38.6	0	37.8	62.2
d. Body temperature	8.5	31.7	43.9	15.9	0	63.5	36.5
PI risk assessment is done on every patient on admission	42.7	32.9	13.4	8.5	2.4	75.3	24.7
PI risk assessment is repeated regularly	47.0	32.5	10.8	7.2	2.4	79.4	20.6
PI risk assessment will be done if the patient's general status changes	18.5	18.5	29.6	30.9	2.5	55.6	44.4
PIs of risk patients are prevented using an individual plan	7.3	8.5	25.6	57.3	1.2	34.7	65.3
Skin assessment and skin care							
Signs of redness in the skin are assessed regularly in patients who are at PI risk	0	3.6	31.3	65.1	0	30.7	69.3
Heat and edema in the skin are assessed especially in patients who have a darker skin tone	4.9	18.3	31.7	40.2	4.9	48.0	52.0
Patients are asked to identify uncomfortable and painful areas in the skin	3.6	30.1	34.9	28.9	2.4	52.6	47.4
PIs caused by medical devices (e.g. urinary catheters) are observed	3.7	14.6	20.7	57.3	3.7	47.4	52.6
Patients are turned to the side that has redness due to pressure*	72.3	25.3	1.2	0	1.2	32.4	67.6

Massage is used for PI prevention*	78.1	12.2	4.9	0	4.9	46.7	53.7
PI risk patients' skin is rubbed*	95.2	4.8	0	0	0	41.9	58.1
Moisturizing lotions and protective products for dry skin are used	2.4	1.2	42.9	53.6	0	18.2	81.8
Nutrition							
Nutrition status of all PI risk patients is assessed	9.8	28.1	41.5	20.7	0	45.3	54.7
Nutrition assessment instruments (e.g. MUST, NRS) are used in nutrition status assessment	49.4	25.3	6.0	12.1	7.2	70.4	29.6
A dietician plans the diet for patients at risk of malnutrition and PI	91.2	7.0	0	0	1.8	84.6	15.4
Optimized diet is used for patients at risk of malnutrition and PI	0	26.5	44.6	27.7	1.2	27.0	73.0
Energy and nutrient intake assessment included in optimized diet	11.0	34.2	30.5	22.0	2.4	50.0	50.0
Nutrition assessment included in optimized diet	3.7	20.0	43.2	29.6	3.7	37.5	52.5
Nutrition supplements are given between meals in optimized diet	2.4	40.2	35.4	19.5	2.4	43.8	56.2
Repositioning							
Repositioning is taken into account in all PI risk patients	0	0	18.3	81.7	0	14.5	85.5
Patient's activity, mobility, skin condition and diseases are in relation to the repositioning schedule	0	4.8	25.0	69.1	1.2	22.7	77.3
Repositioning schedule and methods adjusted based on patient's skin condition	0	1.2	28.6	70.2	0	19.7	80.3
Repositioning schedule depends on the features in the mattress/surface used	11.0	30.5	35.4	22.0	1.2	32.0	68.0
Skin's exposure to pressure and strain is avoided	0	3.7	45.1	51.2	0	14.7	85.3
Aids decreasing friction and strain are used when moving the patient	0	9.9	48.2	42.0	0	20.0	80.0

Positioning the patient directly on tubes and drainages is avoided	1.3	0	9.0	83.3	6.4	27.1	72.9
Positioning the patient on bony prominences is avoided	0	1.2	46.3	52.4	0	18.7	81.3
Pressure increasing positions (e.g. half sitting position) are avoided, unless it is necessary due to patient's status	0	8.6	39.5	50.6	1.2	30.7	69.3
Patient is positioned to a sitting position so that he/she is able to act and function	0	1.2	45.7	51.9	1.2	29.3	70.7
A position that minimizes pressure and strain to the skin is chosen	0	6.3	43.8	48.8	1.2	25.7	74.3
Patient's feet are positioned to a feet holder if patient's feet cannot reach the floor	0	9.8	29.3	61.0	0	32.0	68.0
The time a patient sits in the same chair without relieving the pressure is limited	2.5	7.4	40.7	46.9	2.5	24.0	76.0
Pressure relief devices							
High quality foam mattresses are used for patients at PI risk	6.1	19.5	31.7	41.5	1.2	31.9	68.1
If repositioning is not possible, an active high-risk mattress (low air loss/air fluidized) is used for patients with high PI risk	21.5	19.0	22.8	19.0	17.7	52.4	47.6
Pillows under calves are used to make sure that the heels are not in contact with the mattress	0	13.6	56.8	29.6	0	23.2	76.8
Skin in the heels is observed daily	0	7.2	39.8	53.0	0	21.1	78.9
In PI prevention, the following objects are used:*							
a. Synthetic sheepskin	72.0	25.6	1.2	1.2	0	54.0	46.0
b. Round pillows	58.0	30.9	6.2	1.2	3.7	57.4	42.6
c. Donut style pillows	53.7	36.6	6.1	2.4	1.2	58.1	41.9
d. Gloves filled with water	97.5	1.2	0	0	1.2	73.8	26.2
Documentation							
Assessment of skin condition is documented	0	2.4	26.2	71.4	0	21.3	78.7

Pain related to PIs is documented	0	3.7	21.0	72.8	2.5	25.3	64.7
Repositioning and positions are documented	14.6	52.4	25.6	7.3	0	53.4	46.6
The effects of repositioning are assessed and documented	7.2	53.7	25.6	13.4	0	54.2	45.8

*=not a recommended practice

Table 4. Associations of education, self-reading, prevention practices and specific needs for PI education with PI prevention practices

	PI prevention practices																	
Variable	Risk assessment			Skin assessment and care			Nutrition			Repositioning			Pressure relief devices			Documentation		
	Mean	SD	*P*	Mean	SD	*P*	Mean	SD	*P*	Mean	SD	*P*	Mean	SD	*P*	Mean	SD	*P*
Participating in PI education during the past two years																		
None (n=22-24)	2.54	0.70	**.017**	2.51	0.38	.938	2.34	0.63	.058	3.46	0.29	.659	2.22	0.40	.315	3.16	0.52	.234
Once or more (n=47-49)	2.90	0.52		2.54	0.37		2.62	0.52		3.49	0.31		2.23	0.38		3.01	0.48	
Reading scientific articles related to PI prevention during the past two years																		
None (n=13)	2.25	0.66	**.001**	2.82	0.39	.110	2.31	0.63	.068	3.33	0.30	.052	2.12	0.37	.552	2.80	0.34	**.039**
Once or more (n=45-48)	2.87	0.52		2.56	0.37		2.16	0.50		3.51	0.29		2.23	0.40		3.12	0.51	
Reading professional articles related to PI prevention during the past two years																		
None (n=10)	2.16	0.61	**.001**	2.24	0.37	.141	2.04	0.47	**.001**	3.32	0.31	.145	2.10	0.39	.392	2.78	0.38	.064
Once or more (n=47-51)	2.84	0.55		2.56	0.38		2.65	0.50		3.48	0.30		2.22	0.39		3.09	0.50	
Reading guidelines for PI prevention and early recognition of PIs																		
Have read (n=57-59)	2.89	0.50	**.004**	2.55	0.37	.057	2.59	0.53	**.018**	3.53	0.27	**.009**	2.24	0.39	.079	3.08	0.49	.107
Have not read (n=23-25)	2.41	0.69		2.42	0.37		2.27	0.59		3.34	0.31		2.11	0.32		2.89	0.52	
Need more education about PI prevention																		
Yes (n=28)	2.47	0.65	**.002**	2.36	0.36	**.002**	2.28	0.57	**.005**	3.34	0.32	**.003**	2.17	0.39	.199	2.97	0.50	.459
No (n=48-52)	2.89	0.51		2.60	0.35		2.64	0.52		3.54	0.25		2.20	0.33		3.06	0.49	
Need more education about nutrition as PI prevention																		
Yes (n=28-40)	2.94	0.53	**.007**	2.60	0.34	.153	2.40	0.48	.129	3.55	0.27	**.029**	2.25	0.40	.419	3.20	0.50	**.003**
No (n=41-48)	2.59	0.61		2.45	0.39		2.60	0.62		3.40	0.31		2.16	0.35		2.88	0.44	

Need more education about skin care as PI prevention			.529			**.011**			**.001**			.168			.477			.477
Yes (n=12-27)	2.65	0.72		2.25	0.43		2.037	0.466		3.36	0.25		2.11	0.34		3.12	0.49	
No (n=53-67)	2.76	0.58		2.56	0.33		2.649	0.500		3.49	0.30		2.20	0.36		3.01	0.49	
Need more education about documentation in PI prevention			**.017**			**.025**			.627			.229			.988			**.001**
Yes (n=27)	2.52	0.64		2.41	0.42		2.46	0.74		3.42	0.33		2.21	0.29		2.77	0.49	
No (n=53-54)	2.86	0.54		2.57	0.33		2.52	0.47		3.50	0.27		2.18	0.38		3.15	0.44	