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2021-03

Mäkinen , M T , Haavisto , E , Lindström , V , Brolin , K & Castren , M 2021 , ' Finnish and Swedish prehospital emergency care providers' knowledge and attitudes towards pressure ulcer prevention ' , International Emergency Nursing , vol. 55 , 100873 . <https://doi.org/10.1016/j.ienj.2020.100873>

<http://hdl.handle.net/10138/341446>

<https://doi.org/10.1016/j.ienj.2020.100873>

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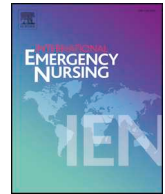
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Finnish and Swedish prehospital emergency care providers' knowledge and attitudes towards pressure ulcer prevention

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ARTICLE INFO

Keywords:

Ambulance
Attitudes
EMS
EMT
Knowledge
Nurse
Pressure ulcer
Prevention

ABSTRACT

Background: Despite the knowledge that transportation by emergency medical services may increase the risk of pressure ulcers (PU), there is still lack of knowledge about the possibility of prehospital emergency care providers to be a part of preventing and reducing the risk of PUs.

Methods: A survey was carried out during 2017 in Finland and Sweden. Validated questionnaires were used.

Results: A total of 179 (72.7%) Finnish and 188 (28.8%) Swedish prehospital emergency care providers participated in the study. The overall rate of correct answers and the mean total knowledge score was 58.8% (SD 21.8), 20/34, in the Finnish group and 70.5% (SD 15.7), 24/34, in the Swedish group ($p < 0.000$). The percent of the total and the mean attitude score was in the Finnish group 71.3% (SD 0.48), 37.1/52, and in the Swedish group 69.4% (SD 0.77), 36.1/52 ($p < 0.813$). Half of the Finnish and most of the Swedish participants felt they needed more education about PUs (Fin 50.2% & Swe: 76.0%).

Conclusions: Prehospital emergency care providers don't see themselves as responsible for PU prevention. Therefore, there is a need for increasing the level of knowledge on PU prevention and classification among prehospital emergency care providers. They could play a key role in developing methods to improve PU prevention and identifying patients in risk of developing PUs.

1. Background

Pressure ulcer (PU) is a localized injury to the skin, often including damage to the underlying tissue, resulting from sustained pressure. Suffering of a PU is known to cause a huge burden for the individual patient, affecting both health and well-being, and health-related quality of life [1–3]. The prevalence of PUs in healthcare setting is described to range from 0% to 72.5%, with large variations between countries and diverse clinical settings [4], while the prevalence rate range in acute care settings is between 6% and 18.5% [5,6]. During the care of the emergency medical services (EMS), the patients are exposed to PUs when they are immobilized for a long time during the ambulance transport [7,8]. Elderly patients received 19% more PUs if they had been transported by an ambulance between healthcare facilities than if they had not been transported [9]. However, there is still a lack of

knowledge whether and to what extent PUs occur during transport between healthcare facilities, or while waiting on a stretcher in the emergency department (ED) [10,11]. It is estimated that up to 60% of all PUs remain undetected by the EMS [9].

In addition to the individual suffering for the patient, the high prevalence of PUs is correlated with the increase of healthcare resource utilization and significant healthcare costs. Every year, 55,000 to 80,000 patients with pressure ulcers are treated in Finland [12]. The cost of pressure ulcers is between EUR 350 and 520 million, or about 2–3% of the whole health expenditure. In various healthcare units, pressure ulcers are detected in 5–25% of patients [13]. Patients with PU are at a greater risk for increased length of hospital stay as compared with patients who do not have PU [14]. For the patient, the treatment of PUs is demanding, the PUs renew easily, and they reduce the patient's quality of life [15]. There is evidence that more than 95% of the

Abbreviations: EMS, Emergency Medical Service; EMT, Emergency medical technician; FIN, Finland; PU, Pressure Ulcer; RN, Registered Nurse; SWE, Sweden

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<https://doi.org/10.1016/j.ienj.2020.100873>

Received 2 January 2020; Received in revised form 1 April 2020; Accepted 16 April 2020

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PUs can be prevented [16]. Despite available evidence-based recommendations for preventing PUs, there is a significant deficiency in compliance with these recommendations [13]. The reasons for healthcare workers not following the guidelines are uncertainty on whether the recommendations have impact on the outcome [17,18]; bad compliance [18,19]; and inadequacy of skills [20–22].

The healthcare staff play a key role in the prevention of PUs, and a good level of knowledge is essential in the prevention and management of PUs [20,21]. Several different interventions have therefore been developed, aiming to improve knowledge in the prevention of PUs; risk assessment, position changes, skin care, nutrition and documentation [16,23–26]. Studies have shown that with right interventions it is possible to reduce the prevalence of PUs in different healthcare settings [27,28]. In acute care, PUs can be prevented by supporting nurses in the implementation of evidence-based interventions, which has been shown to be effective and essential in strengthening staff engagement [27,29,30].

The above studies reflect, that despite the knowledge that transportation by EMS may increase the risk of a PU, there is still lack of knowledge about the possibility of prehospital emergency care providers to reduce the prevalence of PU. Research of the integration of PU prevention practices into the EMS context is overall scarce.

2. Aim

The aim of this study was to describe and compare Finnish and Swedish prehospital emergency care providers' present knowledge and attitudes concerning the prevention of PU. The ultimate goal is to promote high-quality care in EMS by adding to the knowledge of effective preventive methods to reduce PUs in EMS facilities, developing the quality of care and patient safety. The information obtained through this study can be utilized in the development of continuing education.

3. Setting and sample

A survey was administered to prehospital emergency care providers in two University Hospital areas, in Finland and in Sweden, during 2017. In the Finnish University Hospital area, with a population of 1.6 million, regional EMS is operating under centralized management and the service is provided by organizations within the county and private companies contracted by the Hospital district. The organization of inter-hospital transfers throughout the University Hospital area also falls under the same administration. Transfers are mainly carried out as a separate activity or, if necessary, as a purchase service. The ambulance staff mainly consists of registered nurses (RN) (210 ECTS) and emergency medical technicians (EMT) (the bachelors degree program in emergency care education lasts four years (240 ECTS) in Finland leading to the degree of paramedic. Education includes also a registered nurse degree). All emergency care students have studies in PU prevention, identification, evaluation, and treatment due to nationally curriculum of nursing education.

In the Swedish University Hospital area, the EMS provides care for approximately 2.4 million inhabitants, regional EMS is operating under centralized management. The County Council is responsible for the EMS, and the service is provided by organizations within the county and private companies contracted by the County Council. During the study period, the inter-hospital transfers were carried out by all ambulances and were not a separate activity as in Finland. The prehospital emergency care team in the ambulance consists of RNs with one-year additional training in emergency care and EMTs (2-year education, at the hospital they are addressed as assistant nurse). Swedish RNs has prevention, identifying, assessing, treating PUs in their curriculum, year 1–3 but nothing during their additional training to become a prehospital emergency care nurse (year 4).

4. Research tools

Data were collected with two instruments, the knowledge test and the attitudes towards PU prevention (Instrument I and Instrument II). The Cronbach alpha for the whole scale was found to be 0.804. Modified knowledge test (Instrument I) based on PU prevention guidelines [13,31] consisted of true and false statements about the prevention and early identification of PUs. Both physicians and an authorized wound care nurse were involved in evaluating the validity of the instrument. The instrument included a total of 34 items about the following seven subscales: PU development and risk factors, (five items); PU classification (five items); risk assessment (five items); repositioning (six items); pressure relief devices (eight items); skin assessment and skin care (three items); nutrition (two items). All items were to be rated as: 1 = True, 2 = False, 3 = I don't know. Each correct answer corresponded to one point. The total score on the knowledge test was the sum of all correct answers. Higher scores indicated better knowledge, total score being 34. Participants were expected to give 90% or more of correct answers to be considered adequate knowledge.

Instrument II The Attitude towards Pressure ulcer Prevention instrument is a reliable and valid instrument to assess attitudes towards pressure ulcer prevention [22]. The instrument consists of five factors and a total of 13 items; attitude towards personal competency to prevent pressure ulcers (three items), attitude towards the priority of pressure ulcer prevention (three items), attitude towards the impact of pressure ulcers (three items), attitude towards personal responsibility in pressure ulcer prevention (two items), and attitude towards confidence in the effectiveness of prevention. Items are scored on a four-point Likert scale where 1 indicates "strongly disagree" and 4 indicates "strongly agree". Negatively worded items were reverse-coded. Higher scores indicated more positive attitudes. Attitude score > 75% out of 52 was considered clearly positive.

The questionnaire consisted of five demographic questions (age, gender, education, years in profession and education in PU)

The *t*-test and Mann-Whitney *U* test were used for independent groups according to the number of groups and samples; the ANOVA and Kruskal-Wallis tests were used for independent groups to compare knowledge and attitude scores for preventing PUs according to independent variables. The correlation between the numeric independent variables and knowledge and attitude scores was evaluated using Pearson correlation and Spearman correlation analyses. The significance level was $P < 0.05$. Data was analyzed using the statistical software SPSS 21.0.

5. Data collection

Recruitment of participants was carried out by inviting prehospital emergency care providers working in inter-hospital transfers in the EMS in the University Hospital area in Finland ($n = 246$) and in Sweden ($n = 662$) to participate in the study by e-mail through their supervisors. The research material was collected using a web-based questionnaire (Webropol®). A link to the questionnaire was sent to providers work email address. The survey contained detailed instructions for answering. Answering took about 30–60 min. The invitation consisted of information about the study and that participating was voluntary. Confidentiality was guaranteed, and the participants were informed that they could withdraw their participation at any time. Informed consent was considered achieved when answering the questionnaire. A reminder was sent out to the participants on day 7 and day 14. When answering the e-questionnaire, an answer was mandatory on all questions, meaning that submitting the questionnaire was only possible if all questions were answered.

6. Results

6.1. Participants

Of 246 eligible prehospital emergency care providers, 179 (72.7%) participated in Finland. In Sweden, there were 662 eligible prehospital

Table 1
Demographic data of the participants.

	Finnish group (n = 179)		Swedish group (n = 188)	
	n	%	n	%
Gender				
Male	143	79.8	94	50.0
Female	36	20.2	94	50.0
Profession				
Medical doctor	1	1.1		
RN	35	19.5	135	71.8
EMT	94	52.5		
Rescue service worker	3	1.6	53	28.1
Practical nurse	32	17.8		
Other	14	7.8		
Work experience (mean years)	11.6		12.5	
Workplace				
Private sector	63	35.1	88	46.8
Public sector	116	64.8	100	53.1
Further education about PUs	3	1.6	13	6.9

RN = Registered nurse.

EMT = Emergency medical technician (paramedic and RN).

emergency care providers, and 188 (28.8%) participated in the study. In total, 237 male (Fin: 143, Swe: 94) and 130 female (Fin: 36, Swe: 94). Demographic data of participants are presented in Table 1.

Nearly half of the participants (Fin: 47.4%, Swe: 47.9%) stated that they conducted prevention and early identification of PUs in their work. More than half of them (Fin: 50.2%, Swe: 59.6%) also stated that they cared for patients who had a PU monthly or more often.

6.2. Knowledge of participants

The mean percentage of correct answers and the mean total knowledge score was 58.8% (SD 21.8), 20/34, in the Finnish group and 70.5% (SD 15.7), 24/34, in the Swedish group ($p < 0.000$). The highest percentage of correct answers were found on re-positioning (Fin: 85.2%, Swe: 90.7%) and on PU development and risk factors (Fin: 86.7%, Swe: 85.8%). The lowest percentage of correct answers in the Finnish group were found in the themes of PU classification (34.9%), nutrition (37.2%) and pressure relief devices (54.9%). In the Swedish group, the lowest percentage of correct answers was found in the theme of PU classification (45.6%). (Table 2) In the Finnish group there was no difference between nurses and EMTs knowledge scores. The difference of the overall rate of correct answers and the mean total knowledge score between Finnish and Swedish groups proved to be significant ($p = 0.000$).

6.3. Attitudes of participants

The scores emergency care providers received from the Attitude Towards Pressure Ulcer Prevention Instrument varied between 13 and 43 points. When the mean scores were analyzed in percentages, it was seen that the minimum score was 25.0% and the maximum 82.7% of the total score of 52. The mean attitude score in the Finnish group was 71.3% (SD 0.48), 37.1/52, and in the Swedish group the mean score was 69.4% (SD 0.77), 36.1/52 ($p < 0.813$). The highest score was found in the theme of priority of PU prevention (Fin: 77.9% vs. Swe: 75.0%). The lowest scores were found in the themes of confidence in the effectiveness of prevention (Fin: 65.7% vs. Swe: 58.7%) and responsibility in PU prevention (Fin: 70.1% vs. Swe: 64.8%). Of the all participants, 33.4% had an attitude score $> 75\%$ (Table 4). The difference of mean attitudes scores between groups was insignificant with the independent sample t -test: $p = 0.813$, 2-way (Table 3).

6.4. Education needs

The participants felt they needed further education about PUs (Fin: 50.2%, Swe: 76.0%) and they wished for education in prevention methods (Fin: 40.7%, Swe: 60.1%) in addition to other educational requests, as displayed in Table 5. The difference of Finnish and Swedish groups proved to be insignificant ($p = 0.136$).

7. Discussion

The prehospital emergency care providers stated that they conducted both prevention and early identification of PUs in their work. More than half of the participants also stated that they cared for patients who had a PU monthly or more often. This result highlights the possibilities for the prehospital emergency care providers to be more active, and take an active role in preventing and identifying patients with a risk of PUs. However, the results also indicate that prehospital emergency care providers may not (at present) wish to take an active role in preventing and identifying PUs since they don't see themselves as responsible for PU prevention or aren't confident in the effectiveness of PU prevention. As already known, healthcare personnel play a key role in the prevention of PUs, and a good level of knowledge is essential in PUs prevention [20,21,30].

The patients' suffering and the cost of PUs is of great importance in the healthcare service, and hospitals have been working for a long time on preventing PUs. The hospitals have now also started to include the EMS, and the goal is that the prevention of PUs should start already in the ambulance [34]. Therefore, sufficient knowledge among prehospital emergency care providers is necessary for the prevention, classification and management of PUs. The results of this study show that the level of knowledge among both Finnish and Swedish participants could be better. There is a need to develop training programmes to improve insufficient nurses' knowledge and, thus, clinical practices on PU prevention. The overall rate of correct answers among Swedish participants was higher (70.5%) compared to the Finnish participants (58.8%). The Swedish prehospital emergency care providers in this study also had a higher number of correct answers compared to previous studies (64.4–68.0%) [20,21,32,33]. For the purpose of this study, the reason for this and correlations to background variables were not studied more rigorously because the groups looked similar. However, when valuing the overall results of this study, the percentage of correct answers could be considered as relatively low, especially when the mean values were below established cutline, 90%. This result could be problematic considering the prehospital emergency care providers are in charge of the care delivered to patients in the EMS. Further educational interventions and discussions among the prehospital emergency care providers is needed to highlight their role and responsibility in caring for especially the elderly and vulnerable patients with high risk of PUs.

Of the all participants, 33.4% had an attitude score $> 75\%$ which was considered to satisfactory. The results of this study show that the willingness of taking responsibility for PU prevention could be considered as relatively low among prehospital emergency care providers (max score 8 mean FIN: 5.61; SWE: 4.95). The reasons for this attitude were not investigated in this study, but it may be caused by the prehospital emergency care providers' own inner conflict between identifying themselves as a rescuer more than a caregiver, as discussed by Lazarsfeld-Jensen [34,35]. Nevertheless, taking responsibility for PU prevention in the EMS gives the possibility to reduce the patients' suffering. After handover of patients from the ambulance service to the ED, the patients have a high risk of PUs since the development of PUs may already have started at the scene of illness/injury and during the ambulance transport. The patients' immobility during ambulance transport and their sometimes-long stay in the ED, on a stretcher, is a major risk factor for a PU since these can occur in a few hours. It is known that if elderly patients had been transported by ambulance

Table 2
Knowledge of the participants – total rates of correct answers and themes.

	Finnish group total score mean % (n =)	Swedish group total score mean % (n =)	Difference
PU development and risk factors			0.786
PU is an impaired area of the skin or of the underlying tissue. (T)	100 (179)	98.9 (186)	
The most important contributing factor in the development of PU is a prolonged, direct external pressure. (T)	97.2 (174)	85.6 (161)	
PU is usually located over a bone prominence. (T)	86.0 (154)	76.6 (144)	
Impaired skin integrity caused by direct / orthogonal, continuous pressure is aggravated by friction. (T)	73.7 (132)	92.0 (173)	
Prolonged exposure to moisture predisposes to PU. (T)	76.5 (137)	76.1 (143)	
PU Classification			0.808
The redness of a stage I PU will vanish in 30 min after repositioning. (F)	6.88 (11)	18.6 (35)	
A stage II PU manifests itself as a blister or as a wound. (T)	49.1 (88)	71.8 (135)	
A stage III PU penetrates fascia. (F)	4.35 (7)	12.2 (23)	
A blueish, reddish colour on an intact skin suggests tissue damage, which may reach deep tissues. (T)	70.9 (127)	80.8 (152)	
In a stage IV PU, a bone or a tendon is always exposed. (T)	43.5 (78)	44.7 (84)	
Risk assessment			0.307
Clinical assessment of the patient and of the skin is necessary, regardless of which tool is used for risk assessment. (T)	82.6 (148)	85.6 (161)	
By using a risk assessment tool, all risk factors will be assessed consistently by different persons. (T)	59.2 (106)	64.9 (122)	
By using a risk assessment tool, all risk factors will be assessed consistently by EMS. (T)	65.9 (118)	89.3 (168)	
A sense of numbness is irrelevant in PU assessment. (T)	77.6 (139)	74.5 (140)	
Pain and warmth on a pressure site may be an initial sign for a PU. (T)	91.0 (163)	88.8 (167)	
Re-positioning			0.115
A patient is to be encouraged to spontaneous mobility and to change of position. (T)	96.6 (173)	97.3 (183)	
An immobile patient can sit for a maximum of 6 h without being repositioned. (F)	66.4 (119)	77.1 (145)	
An immobile patient should change body position every 2–4 h despite high or medium risk for PU. (T)	83.7 (150)	97.2 (149)	
A high risk patient is to be repositioned during transportation, should the status of the patient allow for it. (T)	83.7 (150)	91.5 (172)	
When repositioned, the pressure on the tissues should decrease and be redistributed. (T)	99.4 (178)	100 (188)	
The patient should be seated in a well-balanced position, and without causing friction. (T)	81.5 (146)	81.4 (153)	
Pressure relief devices			0.190
A seated patient ought to be repositioned by using tools such as a slide, a pull sheet or a manual lifting aid (belt). (T)	79.8 (143)	90.9 (171)	
Artificial sheepskin prevents pressure on skin and on subcutaneous tissues. (F)	7.4 (12)	13.8 (26)	
A foam gel pad completely relieves the pressure on the heel. (F)	62.5 (112)	43.1 (81)	
Alternating air mattresses are to be equipped with an alarm. (T)	82.1 (147)	78.7 (148)	
High risk patients should have dynamic special mattresses. (T)	73.1 (131)	6.8 (182)	
Donut-shaped aids are used to elevate heels. (F)	5.0 (8)	8.5 (16)	
Patients need a dynamic special mattress. (T)	77.6 (139)	88.8 (167)	
Pressure ulcers can occur as a complication caused by a platform (such as a bed or a stretcher). (T)	88.2 (158)	97.9 (184)	
Skin assessment and skin care			1.000
The skin of a patient with impaired mobility is checked while the patient is transferred on a stretcher. (T)	79.3 (142)	80.3 (151)	
If a medical device is in contact with the skin, the skin is to be checked every few hours. (T)	77.0 (138)	76.1 (148)	
Skin humidity and temperature is considered in selecting mattresses and cushions. (T)	77.6 (139)	74.5 (140)	
Nutrition			0.557
All patients with a risk for pressure ulcers are to be assessed for dietary intake. (T)	7.2 (13)	58.5 (110)	
Malnutrition should be assessed by using reliable measuring scales. (T)	67.5 (121)	64.4 (121)	

(True = T, False = F) Copyright@Haavisto, Hietanen.

Table 3
Attitudes of the participants – total scores and themes.

	Finnish group Mean	Swedish group Mean	Difference
Personal competency to prevent PUs	8.67/12	8.42/12	0.904
I feel confident in my ability to prevent PU.	2.50	3.61	
I am well trained to prevent PU.	3.16	2.71	
PU prevention is too difficult. Others are better in it than I.	3.01	2.10	
Priority of PU prevention	9.35/12	9.01/12	0.805
Too much attention is given to the prevention of PUs.	3.24	3.50	
PU prevention is not that important.	3.40	3.72	
PU prevention should be a priority.	2.71	1.79	
Impact of PUs	8.16/12	9.0/12	0.380
A PU almost never causes discomfort for a patient.	3.76	3.75	
The financial impact of PU on a patient should not be exaggerated.	2.61	3.39	
The financial impact of PUs on society is high.	1.79	1.86	
Responsibility in PU prevention	5.61/8	4.95/8	0.704
I am not responsible if a PU develops on my patients.	3.23	3.56	
I have an important task in PU prevention.	2.38	1.39	
Confidence in the effectiveness of prevention	5.26/8	4.70/8	0.632
PU are preventable in high-risk patients.	2.03	1.32	
Pressure ulcers are almost never preventable.	3.23	3.38	
Total score max 52	37.15 (71.3%)	36.08 (69.4%)	0.813

Likert rating scale (1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree).

PU = Pressure ulcer.

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Table 4
Knowledge and attitudes of the participants – total rates of correct answers and scores.

	Finnish group n = 188 mean % of correct answers (n =) (mean score/total)	Swedish group n = 179 mean % of correct answers (n =)(mean score/total)	Difference
*Knowledge			
PU development and risk factors	86.7 (153) (4.3/5)	85.8 (161) (4.3/5)	
PU Classification	34.9 (61) (2.1/5)	45.6 (89) (2.3/5)	
Risk assessment	75.3 (135) (3.7/5)	80.6 (151) (4.0/5)	
Re-positioning	85.2 (152) (5.1/6)	90.7 (170) (5.4/6)	
Pressure relief devices	59.4 (106) (4.7/8)	64.8 (123) (5.9/8)	
Skin assessment and skin care	77.9 (138) (2.3/3)	76.9 (144) (2.3/3)	
Nutrition	37.2 (66) (0.8/2)	61.5 (116) (1.3/2)	
Total	58.8 (105) (20/34)	70.5 (132) (24/34)	0.000
	mean % of total score (mean score/total)	mean % of total score (mean score/total)	
**Attitudes			
Personal competency to prevent Pus	72.2 (8.7/12)	70.1 (8.4/12)	
Priority of PU prevention	77.9 (9.4/12)	75.0 (9.0/12)	
Impact of Pus	68.0 (8.2/12)	75.0 (9.0/12)	
Responsibility in PU prevention	70.1 (5.6/8)	61.8 (5.0/8)	
Confidence in the effectiveness of prevention	65.7 (5.3/8)	58.7 (4.7/8)	
Total	71.2 (37.1/52)	69.3 (36.1/52)	0.813

PU = pressure ulcer.

*Rating scale (1 = True, 2 = False, 3 = I don't know). Each correct answer corresponded to one point.

**Likert scale (1 = strongly disagree and 4 = strongly agree). Negatively worded items were reverse-coded. Higher scores indicated more positive attitudes.

Table 5
Topics for needed education of the participants.

	Finnish group mean % (n =)	Swedish group mean % (n =)	Difference
Mechanisms causing PUs*	27.9 (50)	35.1 (66)	
Prevention methods	40.7 (73)	60.1 (113)	
Risk assessment	54.7 (98)	37.2 (70)	
Prevention by repositioning and mobilization	21.7 (39)	44.1 (83)	
Tools for prevention	16.7 (30)	42.0 (79)	
Mental status in prevention of PUs	14.5 (26)	25.0 (47)	
Assessment and care of skin	12.8 (23)	39. (75)	
Nutrition	42.4 (76)	22.3 (42)	
Patient education	18.9 (34)	17.0 (32)	
Documentation	24.0 (43)	23.9 (45)	
Products used in PU care	33.0 (45)	36.7 (69)	
Other	6.0 (8)	1.6 (3)	
			0.136

PU = Pressure ulcers.

between healthcare facilities, they received 19% more PUs than if they had not been transported [9]. However, PUs can sometimes be prevented by small and rapid actions, and skin assessment seems to be appropriate for identifying and preventing PUs in both ambulance service and in ED [36].

The results in this study show that prehospital emergency care providers want further education especially concerning risk assessment (Fin: 54.7) and prevention of PUs (Swe: 60.1%). However, it may not only be a question about wanting more education: the prehospital emergency care providers also need to take responsibility for PU prevention in the patients' chain of care, especially when transporting vulnerable patients.

Some limitations have to be considered in this study. One is the low response rate in Sweden (28.8%) that may have caused a selection bias. Whether and how the selection bias affected the results is not known. However, it is possible that the participants answering the questionnaires were more interested in care interventions such as preventing PUs in the EMS. Another limitation is the differences between Finnish and Swedish participants. There may have been differences in the content of

basic education between countries and there were more females in the Swedish group. This may have affected the results and needs to be considered when interpreting the results. Overall, the differences between Finland and Sweden concerning the organization and cultural matters in the EMS may also have affected the results, but it is reasonable to think that the EMS and the patients cared for in the ambulance service in these two countries are relatively similar. Despite these limitations, our assessment is that the results give a picture of the knowledge and attitudes of preventing PUs in the EMS. In addition, the reliability of the study is increased by a systematic sampling and the previously developed and tested instruments used in previous studies.

8. Conclusion

Prehospital emergency care providers conducted both prevention and early identification of PUs in their work. However, prehospital emergency care providers may not wish to take an active role in preventing and identifying PUs in a higher extent since they don't see themselves as responsible for PU prevention. Therefore, there is a need for an increase in the level of knowledge on PU prevention and classification of PUs among prehospital emergency care providers, as the lack of knowledge may cause difficulties in using and following clinical guidelines. Suffering of a PU is known to cause a huge burden for the individual patient and to increase healthcare costs. The prehospital emergency care providers could play a key role in developing methods to improve PU prevention and identifying patients with a risk of developing PU.

9. Ethics approval and consent to participate

Ethical approval for the study was obtained from ethical committees in Finland (HUS/1504/2016) and in Sweden (2016/727-31/5) University Hospital area.

10. Consent for publication

Not applicable.

11. Availability of data and material

The data collected and analyzed in this study are not publicly available, but may be requested from the corresponding author on reasonable request

Funding

No funding was received.

Author contributions

MM, EH & MC planned the study design. Data collection were conducted by MM, VL and KB. Analyses were made by MM, VL, KB and MC. The manuscript was drafted by MM, EH and VL. All authors read and approved the final manuscript.

Declaration of Competing Interest

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

Acknowledgements

Not applicable.

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