

LOCAL TREATMENT OF PRESSURE ULCERS IN LONG-TERM CARE - CORRELATIONAL CROSS-SECTIONAL STUDY

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Authors:

Minna Stolt, PhD, Docent, University Teacher, Podiatrist, Department of Nursing Science, University of Turku, Finland, and Researcher, Turku University Hospital, Finland minna.stolt@utu.fi

Anna Hjerppe, MD, Chief Physician, Clinical Teacher, Special Competence in Wound Healing, Clinic of Dermatology, Satakunta Hospital District, Department of Medicine, University of Turku, Finnish Medical Association, ahjerppe@kolumbus.fi

Helvi Hietanen, Specialized (Registered Nurse) RN, Wound Care Expert, Finnish Wound Care Association, hetu.hietanen@gmail.com

Pauli Puukka, MSocSci, Senior Research Statistician, National Institute for Health and Welfare, Turku, Finland, pauli.puukka@thl.fi

Elina Haavisto, Professor, PhD, Department of Nursing Science, University of Turku, Finland and Satakunta Hospital District, Finland, elina.haavisto@utu.fi

Corresponding author:

Minna Stolt, PhD, Docent, University teacher, Podiatrist

Address: Department of Nursing Science, 20014 University of Turku, Finland

Phone: +358469237973

Email: minna.stolt@utu.fi

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Abstract

Aims To analyse the treatment of pressure ulcers (PU) in long-term care.

Methods Correlational cross-sectional study. The data was collected between 11/2015–01/2016 from private and public long-term care facilities in Finland. Older people with PUs (n=112) who were being treated in long-term care facilities in a certain Hospital District in Finland. Data collection was conducted by trained nurses using the Pressure ulcer patient instrument (PUP-Ins). The outcomes measured were: prevalence and localization of PU, local PU treatment, frequency (how often/week/day) and duration (minutes/week or day) of PU treatment.

Results In total, 112 patients with 158 PUs were identified, prevalence rate being 5%. PUs were located most often on the heel (38%), hip (13%), buttocks (10%) and lateral malleolus (9.5%). PUs were treated with a variety of methods and products and the number of treatments varied. The most frequently used treatment of PUs were skin protecting agents and local wound care products. The most typical treatment in Stage I, II, and III PUs were foam dressings; in Stage III PUs, ribbon gauze dressings were also used. The most typical products for Stage IV PUs were complex dressings. Stage I PUs received more treatment per day or week than the other types.

Conclusion PU treatment is inconsistent and often conducted with varying treatment methods and products. Holistic patient care must be the focus. Nurses in long-term care settings might benefit from in-depth in-service education focusing on the treatment of PUs. More research is needed about nurses' competence in PU treatment.

Keywords: pressure ulcer, treatment, nursing, long-term care

Keypoints:

- Among 112 older people in private or public long-term care facilities, in total 158 pressure (prevalence 5%) ulcers (PUs) were identified.
- The most common sites of PU were the heel, sacrum, buttocks, lateral malleolus, and hip.
- In general, PUs were treated with a variety of methods and products and often only one local treatment method was used to treat PUs.
- The frequency of PU care ranged from once a week to 21 times in a week and Stage I PUs were treated more frequently than other Stage PUs.

Reflective questions:

- What were the most common locations of the pressure ulcers?
- How the pressure ulcer were treated?
- Was there any difference in treatment according to pressure ulcer stage?

INTRODUCTION

Pressure ulcers (PU) are a common problem in health care and are associated with old age and malnutrition.¹⁻³ However, estimates of PU incidence and prevalence are variable due to differences in the definition and stages of ulcers, the varied patient populations, and diverse care settings.⁴ In the US, the incidence of hospital acquired PUs was 4.5%⁵ and in European hospitals it ranged from 8.3% to 23%.^{6,7} In nursing homes in Europe about 11% of residents have a PU at Stage II or higher on admission, and among ulcer-free residents staying in the nursing home, 14.3% to 33.3% develop a new PU during their stay.⁸

Most PUs are preventable with timely prevention strategies. However, despite the availability of prevention strategies and guidelines,⁹ advanced care equipment, and health care staff education, PUs are prevalent. According to a cross-cultural study of long-term care facilities, 14.4% of patients had PUs occurring predominantly in the sacrum (23%), heel (22.9%), and buttocks (16.2%).¹⁰

Depending on the amount and degree of severity, the costs of PU care and treatment can be high, which causes a substantial financial burden for health care organizations and societies.¹¹ In the US the estimated yearly cost of PUs was approximately 10 billion dollars.¹² In Europe, for example in Finland, estimated costs of PUs are 200 million euros per year.¹³

PU prevalence is universally used as an indicator of quality care.^{14,15} The failure to prevent or heal PUs can lead to future litigation. Previous research in the field is focused primarily on the prevention of PUs,¹⁴ the identification of risk for PU,¹⁶ and the evaluation of particular local wound care products on wound healing.¹⁷ Studies analysing nurse's treatment procedures for PU care is limited. Amir and colleagues (2017)¹⁸ reported that most dressings used for PU care in hospitals

involved saline-impregnated or antimicrobial gauzes. Moreover, in stroke-specializing hospitals, PUs were treated mainly with NaCl 0.9% solution to cleanse the wound without dressings (Stage II) and by using anti-microbial gauze dressing.¹⁹

Treatment of PUs is a prolonged process and should have a goal based on the ulcer's stage of severity.²⁰ Stage I or II PUs have the potential to be healed with conservative care. Stage III and IV PUs require longer times to heal and may need surgical revisions.²¹ Principles of local PU treatment include cleansing, debridement of devitalized tissue, and selection of wound covering material based on ulcer stage and characteristics.²¹

Research on wound cleansing methods is rare. No direct evidence supporting the usage of any specific wound cleansing solution²² has yet been identified. Some data suggests that hydrocolloid dressings can be used for clean Stage II and shallow Stage III PUs.²³ For shallow and minimally exuding PUs, hydrogel dressings can also be used.²⁴ If the PU is moderate or heavily exuding, foam dressings are effective in absorbing extra moisture;²⁵ this treatment is typically used with Stage II and shallow Stage III PUs.⁹ If the PU is clinically infected or heavily colonized, silver impregnated dressings are recommended to improve healing of the ulcer.²⁶ In very severe Stage III and IV PUs, surgical revision, excisions, and constructive surgery might be needed to support the healing process.⁹

In addition to local treatment, healing of PUs always requires holistic patient care.²⁰ Pain management, nutrition and pressure off-loading are key components of any staged PU care.²¹ It has been shown that regular and frequent repositioning reduces PUs.²⁷ Further, support surfaces and medical devices as well as the monitoring of healing are included in the treatment of PU

patients. It is also recommended that health care professionals use clinical PU assessment tools when monitoring PUs and when judging between different clinical treatment modalities.⁹

In summary, prevention and identification of PUs has been under investigation for several decades. Despite several international guidelines for PU prevention, PUs are still a major burden to health care systems. However, little is known about how PUs are treated in long-term care settings. This study was conducted to overcome this gap in knowledge.

AIM

To analyse the treatment of PUs in long-term care facilities in Finland, the following research questions were set:

1. What is the severity and location of PUs?
2. How were PUs treated at different stages?
3. How frequently was PU treatment provided?
4. What was the duration of the PU treatment?

The ultimate goal of this study was to examine the state of existing PU treatment in order to improve ulcer healing outcomes and to improve the quality of care in long-term care facilities.

METHODS

Design, setting and data collection

Research was carried out as a correlated cross-sectional study. Data was collected between November 2015 and January 2016. The sample was formed from senior citizens with a diagnosis of PU who were being treated in one of the private or public long-term care facilities in a certain Hospital District (approximate population of 230 000 people) in Finland. Hospital District consisted of 41 public and 34 private long-term care facilities. All public facilities and 21 private long-term care consented and participated the study.

Long-term care in Finland is a publicly funded, universal system that is open to every citizen (Johansson 2010). It is provided by public health care and private sector. Municipalities are responsible for arranging the social and health services that older people require.²⁷ This consists of institutional care which is provided both in nursing homes and in the inpatient departments of health care centres.²⁸ Living in long-term care facility is covered with monthly fee. The fee includes housing and nutritional services and health care.

The exclusion criteria were: psychiatric units, rehabilitation centres and disability units, home health care, and home hospitals (hospital-level care provided by health care personnel at patients' own home). In total, 62 long-term care facilities (2,475 beds) participated in the study. Data was collected by using a part of an instrument (PU patient instrument, PUP-Ins) which was developed and tested in previous studies.^{20,29,30} This study reports the answers to questions on background (6 questions), characteristics of PU (12 questions) and three questions on the local treatment of PU: one open-ended question to describe local treatment (what kind of local care), one question on frequency (how often/week or day) and one question on time spent (minutes/week or day).

In the private sector, authorized ulcer nurses and in the public sector, appointed contact persons (nurses named by each participating unit) collected the data. If the patients had given an informed written consent to this study, then the authorized ulcer nurses and contact persons checked the skin condition of the patients (n=2248). Questionnaires were filled out for every PU patient. Background data was also collected from the records of the PU patients. Before data collection, all contact persons were trained by the authorized ulcer nurse who collected the data from the private sector. Training included central information about PU development, stages of PU, characteristics of PU, PU prevention, and treatment of PU. During the training sessions, the purpose of the study, the method of data collection, and the questionnaire were also discussed. After training, the contact persons received the estimated number of questionnaires and the completed questionnaires were sent to the researchers.

The study was conducted in line with good scientific practice. The study was reviewed and approved by an institutional review board (Ethics committee of Satakunta Hospital District, statement code: ETMK 126/2015). Permission to collect the data was obtained according to organizations' policies.

Data analysis

The data was analysed statistically and by using content analysis. At first, data was analysed deductively and inductively by qualitative content analysis. The structure of analysis was based on the previous literature of PUs' local treatment: cleansing, debridement and wound dressings for treatment.⁹ Following this each of the three categories were analysed inductively (Table 2).

Analysis was derived directly from the descriptions.³¹ Firstly, the descriptions of the treatment of 158 PUs were read several times to become familiarized with the content. Secondly, the meaning units were identified, which included words, parts of a sentence, or sentences relevant to a research question.³² The meaning units were condensed into a description close to the written answers. Condensed meaning units of the same type relating to local treatment were first classified into three categories: cleansing, debridement, and wound dressings for treatment based on the literature.⁹ Next, in each of the categories the condensed meaning units were compared based on similarities and differences, and then grouped into sub-categories.³³ At this stage, the category “wound dressings for treatment” was divided into four categories: skin protecting agents, local wound care products, protective dressings, and fixative products. The analysis resulted in 18 subcategories that formed six categories. Two researchers undertook the grouping process. Finally, categories were discussed and revised within the research group.

The quantitative analyses of the data were made using SAS 9.3 software (SAS Institute Inc., Cary, NC, USA). Frequencies and percentages were presented as descriptive statistics. The association between stage and location of PUs was analysed by chi-squared test. Only the most common locations were tested, and Stages III and IV were combined because of small frequencies. Unstageable PUs were excluded from the analysis. Treatments between the stages were compared by chi-squared test, or in the case of small expected frequencies, by Fisher’s exact test. Frequency and duration of PU treatment were presented as median, minimum and maximum because of very skewed distribution. For this reason, the comparisons of frequency and duration between the grades were made first by the Kruskal-Wallis test and then pairwise

using the Wilcoxon two-sample test. P-values less than 0.05 were regarded as statistically significant.

RESULTS

Participants

In total, 112 consenting PU patients participated the study. The mean age of the participants was 84.6 years (range 62–105, SD 7.8) and the majority were female (n=71, 63.4%). Their median care period in the current unit was 1.8 years (range 0–13, mean 3.0, SD 3.1). The main reasons for admission to the unit were mobility decline (n=55, 49.1%), memory disorder (n=35, 31.3%) and being immobile and bedridden (n=16, 14.3%). The majority of the participants had previously diagnosed memory disorders (n=69, 61.6%), cardiovascular diseases (n=60, 53.5%) or stroke (n=30, 26.8%). Most of the patients had one PU (n=77, 68.8%) and every fourth (n=25, 22.3%) had two PUs.

Locations and stages of PUs

In total, 158 PUs were identified (Table 1) prevalence rate being 5%. The most common sites of PU were the heel (37%), sacrum (26%), buttocks (10%), lateral malleolus (10%), and hip (8%). In addition, other locations such as medial malleolus or upper parts of the body made up 9% of the total PUs. Based on PU staging, Stages II and I were most prevalent (39% and 37%, respectively). Unstageable PUs made up a minor part (6%) of the study. There were no statistically significant differences in the distribution of stages between the location of PUs ($p=0.60$, unstageable PUs

excluded, only five most common locations). The most common locations for Stage I PUs were: hip, lateral malleolus and buttocks. Stage II PUs were predominantly in the buttocks and the sacrum, and Stage III PUs were predominantly in the hip and the heel. Stage IV PUs were usually located in the lateral malleolus and the heel.

Insert Table 1 about here.

Local treatment of differently staged PUs

In general PUs were treated with a variety of methods and products, and the number of treatments for single PUs varied from zero to nine (see Table 2). Most often (38%), only one local treatment method was used to treat PUs. With Stage I PUs, one treatment (23%) and with Stage II PUs two (14%) local treatment methods were used. The number of treatments of Stage III PUs varied the most. The Stage IV PUs were treated with one or two local treatments.

Insert Table 2 about here.

Treatment of PUs was defined using six categories: cleansing, debridement, skin protecting agents, local wound care products, e.g. hydrocolloid dressings, protective dressings, and fixative products (Table 3). According to the nurses' descriptions, skin protecting agents and local wound care products (56%) were most frequently used in the treatment of PUs. Usually, some kind of foam dressings (37%) or primary wound dressings (26%) were applied. In over 58% of cases, skin protecting agents were used—most frequently an unspecified cream (34%). Only a quarter of the

PU were cleansed, and the cleansing was most often done by using wound swab towels.

Protective dressings and fixative products were rarely used.

Insert Table 3 about here.

The treatment of Stage I PUs differs most from the treatment of other PUs (Table 4). With the exception of complex dressings, hydrocolloid dressings, and transparent wound contact layer dressings, differences between various treatments were statistically significant (Table 4). The majority of Stage I wounds as well as half of other PU wounds were treated with skin protecting agents. In all PU stages, local wound care products were used, but were used most often in Stage II and III PUs. The most typical treatment Stage I, II and III wounds was foam dressings; in Stage III wounds ribbon gauze dressings were also used. The most typical product for Stage IV wounds were complex dressings. The PUs were rarely cleaned except for Stage III wounds, of which 80% were cleaned. Stage IV wounds were not cleaned at all. Most often, protective dressings were used in Stage IV wounds.

Insert Table 4 about here.

Frequency and duration of PU local treatment

The frequency of PU care ranged from once a week to 21 times in a week. Stage I PUs were treated more frequently (md 11.03) than Stage II or III and IV PUs (Table 5). The Stage I PUs were treated more often compared with Stage II ($p < 0.001$) and Stage III and IV PUs ($p = 0.002$). The duration of differently-staged PU care ranged from 0.10 hours to 15.00 hours in a week. The

higher the PU stage, the longer the care duration. The treatment of Stage III and IV PUs was statistically longer compared with Stage I ($p=0.007$) and II ($p=0.02$) PUs. PUs located on the sacrum and the heels were treated more frequently than PUs on buttocks. However, the difference was not statistically significant. Care duration ranged from 0.10 hours to 15.00 hours in a week. Care duration was the highest on heels (md 1.25) and was statistically significant ($p=0.01$).

Insert Table 5 about here.

DISCUSSION

This study provided new knowledge about PU treatment in long-term care facilities in Finland. PU care was inconsistent and often conducted with varying treatment methods and products.

The study findings confirm the moderate prevalence of PU in older people. However, the prevalence of PUs in different locations was contradictory to previous studies. The prevalence rates of PUs in heels and sacrum areas were much higher in our study compared to previous studies. One-third of our participants (37%) had PUs on their heel in contrast to 22.9% in a previous study by Van Gilder et al.¹⁰ Moreover, one-quarter (26%) had PUs on their sacral regions which conflicts with previous studies^{19,34} where only every tenth patient had a PU in the sacral area. Prevalence of PUs in buttocks (10%) was lower than previously reported (16.2%).¹⁰ The prevalence of PUs in malleolar areas (10%) was distinctly lower compared to previous studies where almost one-third (27%) had PUs in malleolar areas.³⁵

The stages of PUs found were in line with previous studies.³⁵⁻³⁷ In our study, the majority of the PUs were Stage I (37%) and Stage II (39%) ulcers. However, the percentage of PUs in these two lower stages were notably lower than detected previously.^{36,37}

In our study PUs were treated locally with a variety of methods and products, and the number of treatments varied greatly. It has been found that methods of treatment and local products used vary considerably in other countries as well.^{18,25,26} In the worst scenarios, uneducated nurses often independently assess wound characteristics and make decisions about a suitable product³⁸ in the absence of proper medical support.

In our study, only one method was most often mentioned with Stage I PU treatment. They were most often treated with skin protecting agents, e.g., emollient creams. The local treatment of Stage I PUs differs most from the treatment of other PUs. Foam dressings were used for Stage I PUs, probably as a preventive treatment because the skin of first stage PUs is not broken but needs protection and pressure relief. Foam dressing treatment has been proven effective and cost-beneficial for high risk PU prevention in acute care facilities, and these preventive methods of treatment may also benefit long-term patients.^{39,40}

Local wound care products were most often mentioned as a treatment in this study. This may be due to the fact that they are considered to be important in wound healing. These products were used most often in Stage II and III PUs. In half of the wounds of Stages I and II foam dressings were used, which has also been found to be effective.^{9,25} Hydrocolloid dressings were mentioned very rarely as local wound care. This finding is not parallel to Heyneman et al.,²³ which may be due to the open-ended nature of the question. The reason may also be that hydrocolloid dressings are an

old product. Half of the Stage III PUs also used primary wound dressings. Most of these wounds were cleaned, compared with Stage IV wounds that were not cleaned at all. In our study different products were used to clean the wounds. According to a previous study, no specific wound cleansing solutions have been identified.⁴¹ A quarter of the Stage IV wounds were treated with complex dressings. Protective dressings were most often used in Stage IV wounds. Surgical revision was not mentioned as treatment. It may be that this data did not include any very severe Stage III and IV PUs.⁹ In our study there are no statistical differences in the use of local wound care products between Stage II, III and IV PUs. It is worth of noticing that incontinence and wound infection may influence the selection of local treatments for PUs in sacrum or coccyx.

The frequency and duration of PU care was versatile. In general, Stage I PUs were treated most often. The treatment purpose for the stage I PUs is to prevent skin breaks^{9,21} and therefore use of skin protecting agents is recommended. High frequency in the care of stage I PUs seems to be in line with the international guideline.⁴² The duration of the PU care was associated with a higher stage of the PU; the higher the stage, the longer the individual nursing time. Previous studies analysing the level of frequency and the duration of PU treatment are seldom examined. Therefore, comparative discussion about the results with previous studies is difficult to make. However, the frequency and duration of PU care seems to be in line with international guidelines related to PU.⁴²

A long-term PU is painful for patients and presents a risk of secondary infection, not to mention an enormous cost for society. More effort must be focused on timely and cost-saving PU diagnosis and treatment. Clinical judgment on wound diagnosis and staging can be difficult and may lead to

trying out various products for short periods of time because product availability is extensive in Finland.

Treatment of PUs requires in-depth knowledge and collaboration between health professionals. In worst scenario, if the treatment is left undone, it has detrimental effects on patients' health and can cause life threatening situations. Therefore, treatment of PU is considered as significant part of high quality care.

In the future, health care professionals in long-term care settings might benefit from in-depth in-service education focusing on treatment of PU. Education should result in unifying the treatment process and increasing the healing rate of PUs. More research is needed about health care professionals' competence in PU treatment. The units which are responsible for taking care of patients with PUs could have one or two nurses who are particularly appointed and educated as PU care nurses. They could share their expertise in PU care and prevention and serve as coordinators of evidence-based PU care.

Strengths and limitations

This study includes unique data systematically assessing the skin of 112 PU patients and documenting the treatment of the PUs. The limitations of this study are related to sampling, instrumentation and data collection. The participants were recruited and chosen by convenience sampling from one hospital district in Finland (approximate population of 230 000 people). The participants represent average long-term care patients of their age.⁴³ Previously used and validated instruments were used in data collection. The frequency of missing values was minimal,

indicating that instruments were easy to administer. In the private sector, data collection was conducted by an authorized ulcer nurse. The data collectors in the public sector were educated in the use of the instrument, which may have increased the unanimous use of the instrument. However, nurses' wound care competence may vary significantly even if nurses with experience in wound care were asked to assist with data collection. The data were collected by authorized ulcer nurses (private sector) and appointed contact persons (public sector). This approach has both advantages and limitations. The advantage is that these nurses/persons had competence to evaluate the stage and local treatment for PUs. Potential limitation is that at least part of these PUs identified in this study are treated by these same nurses/persons. It may be difficult for nurses to describe wound care by answering the open-ended questions. However, open-ended questions were used and considered to provide exact and in-depth information about local PU treatment. As there is a great variety of local treatment products, a structural questionnaire containing all products was considered demanding to develop. In future, the data collected in this study could serve as a starting point to develop a structural instrument to measure the details of local treatment and its frequency.

Further, with information about individual nurse-related background factors, it would have been possible to conduct more in-depth analysis about care-related factors. Therefore, future research is needed to overcome this shortcoming.

Comparison with previous studies is challenging because types of institutions, selected districts or countries, health insurance systems, and survey years totally may have influenced the results.

CONCLUSION

The prevalence of PUs in older people was moderate, with Stage II and Stage I PUs as the most common. Local PU treatment was irregular and conducted with varying care methods and ulcer care products. The Stage I PUs were treated most often which is in line with international guideline.⁹ A longer duration of PU care was associated with a higher stage of PU. In the future, more research is needed to follow up this study of the methods and products of different stages of PU treatment. Holistic patient care must also be focused on more. In PU management, it is crucial to identify the most relevant and individualized treatment for patients. Research focused on nurses' competence in PU treatment is essential. As the development of new ulcer care products is rapid, it is essential to identify best possible care products for different staged PUs.

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Table 1. Locations and stages of PUs (n=158)

Location	Stage					In total
	I	II	III	IV	Unstageable	
	f (%)	f (%)	f (%)	f (%)	f (%)	f (%)
Sacrum	15 (37)	20 (49)	5 (12)	1 (2)	0 (0)	41 (26)
Hip	6 (46)	3 (23)	4 (31)	0 (0)	0 (0)	13 (8)
Buttocks	6 (38)	8 (50)	1 (6)	0 (0)	1 (6)	16 (10)
Lateral malleolus	6 (40)	4 (27)	2 (13)	2 (13)	1 (7)	15 (10)
Heel	20 (34)	21 (36)	8 (14)	4 (7)	6 (10)	59 (37)
Other location	5 (36)	6 (43)	0 (0)	1 (7)	2 (14)	14 (9)
In total	58 (37)	62 (39)	20 (13)	8 (5)	10 (6)	158 (100)

Table 2. The number of local treatments in Stage I to IV PUs (n=148)

The number of treatments used	Stage I f (%)	Stage II f (%)	Stage III f (%)	Stage IV f (%)	Total f (%)
0	3 (2)	1 (1)	3 (2)	0 (0)	7 (5)
1	36 (23)	17 (11)	0 (0)	4 (3)	57 (38)
2	13 (8)	22 (14)	2 (1)	3 (2)	40 (27)
3	6 (4)	9 (6)	3 (2)	1 (1)	19 (13)
4	0 (0)	8 (5)	4 (3)	0 (0)	12 (8)
5	0 (0)	3 (2)	5 (3)	0 (0)	8 (5)
6	0 (0)	2 (1)	1 (1)	0 (0)	3 (2)
7	0 (0)	0 (0)	1 (1)	0 (0)	1 (1)
9	0 (0)	0 (0)	1 (1)	0 (0)	1 (1)
Total	58 (39)	62 (42)	20 (14)	8 (5)	148 (100)

Table 3. Local treatments of PUs (n=158)

Categories	Subcategories	f (%)	
Cleansing	Saline	10 (6)	
	Wound irrigation solution/cleansing solutions	24 (15)	
	Wound swab towels	5 (3)	
	Unspecified cleansing methods	4 (3)	
Debridement	At least one cleansing care in use ³	38 (24)	
	Curettage	8 (5)	
	Iodine cotton swab	1 (1)	
Skin protecting agents	At least one debridement care in use ³	9 (6)	
	Talc	1 (1)	
	Sprays	16 (10)	
	Basic cream	32 (20)	
	Unspecified cream	54 (34)	
Local wound care products	At least one skin protecting agent in use ³	92 (58)	
	Primary wound dressings (at least one)	41 (26)	
	○ moist saline compression with gauze	1 (1)	
	○ gauze	4 (3)	
	○ transparent wound contact layer dressing	9 (6)	
	○ hydrofiber dressings	12 (8)	
	○ ribbon gauze dressings	15 (9)	
	○ gels or gel dressings	21 (13)	
	Hydrocolloid dressings	6 (4)	
	Complex dressings	7 (4)	
Foam dressings	59 (37)		
Protective dressings	At least one local wound care product in use ³	88 (56)	
	Sterile/dry gauzes	19 (12)	
	Fixative Products	Fixative bandage	8 (5)
		Tubular bandage	11 (7)
		Dressing fixation	6 (4)
		Unspecified fixative products	1 (1)
	At least one fixative product in use ³	20 (13)	

³ Frequency of PUs (and %) that have been treated with one or more treatments

Table 4. Local treatment of Stage I to IV PUs (n=148)

Categories	Subcategories	Stage I n= 58 f (%)	Stage II n= 62 f (%)	Stage III n= 20 f (%)	Stage IV n= 8 f (%)	Total n=148 f (%)	p ^{1,2}
Cleansing		3 (5)	16 (26)	16 (80)	0 (0)	35 (24)	0.002 ⁴ <.0001 ⁵ 0.004 ⁶
Skin protecting agents		48 (83)	30 (48)	8 (40)	4 (50)	90 (61)	< 0.0001 ⁴ 0.0002 ⁵
Local wound care products	Primary wound dressings	3 (5)	22 (35)	10 (50)	2 (25)	37 (25)	<.0001 ⁴ <.0001 ⁵
	○ gels or gel dressings	2 (3)	12 (19)	5 (25)	1 (13)	20 (14)	0.007 ⁴ 0.01 ⁵
	○ ribbon gauze dressings	0 (0)	7 (11)	7 (35)	1 (13)	15 (10)	0.01 ⁴ <.0001 ⁵
	○ transparent wound contact layer dressing	0 (0)	3 (5)	2 (10)	1 (13)	6 (4)	0.03 ⁵
	Foam dressing	16 (28)	31 (50)	8 (40)	1 (13)	56 (38)	0.01 ⁴
	Complex dressings	0 (0)	3 (5)	2 (10)	2 (25)	7 (5)	0.01 ⁵
	Hydrocolloid dressings	4 (7)	2 (3)	0 (0)	0 (0)	6 (4)	ns
	At least one local wound care product in use ³	22 (38)	43 (69)	14 (70)	4 (50)	83 (56)	0.0006 ⁴ 0.02 ⁵
Protective dressings		1 (2)	8 (13)	6 (30)	3 (38)	18 (12)	0.03 ⁴ 0.0001 ⁵ 0.03 ⁶
Fixative Products		1 (2)	10 (16)	6 (21)	0 (0)	17 (11)	0.006 ⁴ 0.004 ⁵

¹ Stage III and IV together because of low frequency

² Fisher's Exact Test used if at least 25% of the cells have been expected, count less than 5, otherwise Chi-squared test

³ Frequency of PUs (and %) that have been treated with one or more treatments

⁴ Statistical significance between Stage I and II

⁵ Statistical significance between Stage I and III/IV

⁶ Statistical significance between Stage II and III/IV

Table 5. Frequency and duration of local PU treatment based on ulcer staging and location

	<u>Frequency, times / week</u>				<u>Duration, h / week</u>				
	n	median	min	max	p-value*	median	min	max	p-value*
Stage									
I	47	14.00	1.00	21.00	I vs. II: p<0.001	0.50	0.10	7.00	I vs. II: p=0.43
II	58	3.25	1.00	14.00	II vs. III+IV: p=0.64	1.00	0.10	15.00	II vs. III+IV: p=0.02
III + IV	25	3.00	2.00	21.00	I vs. III+IV: p=0.002	1.75	0.50	4.00	I vs. III+IV: p=0.007
Location									
Sacrum	33	7.00	1.50	21.00	Sacrum vs. Buttocks: p=0.05	1.00	0.10	7.00	Sacrum vs. Buttocks: p=0.12
Buttocks	15	3.00	2.00	14.00	Buttocks vs. Heels: p=0.10	0.50	0.20	3.50	Buttocks vs. Heels: p=0.01
Heels	49	7.00	1.50	21.00	Sacrum vs. Heels: p=0.47	1.25	0.15	15.00	Sacrum vs. Heels: p=0.19

obs. (n) = number of observations

* Wilcoxon two-sample test