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Pressure ulcer prevalence in Europe: a pilot study

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Abstract

Rationale and aims Numerous prevalence studies have been conducted. The problem with these studies is that prevalence proportions cannot be compared with each other, because of differences in performance of each survey. There is no agreed standardized method for determining prevalence proportions. This study aimed to develop and pilot a uniform data collection instrument and methodology to measure the pressure ulcer prevalence and to get some insight into pressure ulcer prevalence across different patient groups in Europe.

Methods Pressure ulcer experts from different European countries developed a data collection instrument, which included five categories of data: general data, patient data, risk assessment, skin observation and prevention. A convenience sample of university and general hospitals of Belgium, Italy, Portugal, UK and Sweden participated in the study. In each participating hospital, teams of two trained nurses who collected the data on the wards were established. All patients admitted before midnight on the day of the survey and older than 18 years were included.

Results The data collection instrument and study procedure of the survey were found to be effective by all participants. 5947 patients were surveyed in 25 hospitals in five European countries. The pressure ulcer prevalence (grade 1–4) was 18.1% and if grade 1 ulcers were excluded, it was 10.5%. The sacrum and heels were the most affected locations. Only 9.7% of the patients in need of prevention received fully adequate preventive care.

Conclusion The methodology is sufficiently robust to measure and compare pressure ulcer prevalence in different countries. The pressure ulcer prevalence was higher than expected and relatively few patients received adequate prevention. This indicates that more attention to prevention is needed in Europe.

Introduction

Pressure ulcers remain a frequently occurring problem in health care. Hospital patients are often particularly vulnerable because of restricted mobility and poor health. Pressure ulcers are caused by pressure and shearing forces [1,2]. They cause pain and discomfort to the affected patients [3,4]. In addition, the treatment of pressure ulcers is associated with considerable costs for society as well as for the patient [5,6]. Therefore, it is important to prevent these ulcers.

To gain insight into the magnitude of the problem, prevalence is one of the most common measures. Prevalence is defined as the number of persons with a pressure ulcer as a proportion of the entire patient population, measured at a specific point in time or over a specific period of time [7]. In several countries, national prevalence studies have been conducted. Previous prevalence surveys in the USA, among patients in acute care hospitals, indicated a pressure ulcer prevalence ranging from 10.1% to 17% [8–11]. In Canada, the overall pressure ulcer prevalence based on existing data from different healthcare settings across the country was estimated at 26% [12]. National pressure ulcers surveys have also been undertaken in different countries in Europe. In Icelandic hospitals, the pressure ulcer prevalence was reported to be 8.9% [13]. In 2001, a pressure ulcer prevalence survey was conducted in acute care hospitals in the Netherlands and found an overall prevalence of 22% [14]. In Germany, the pressure ulcer preva-

lence was found to be 11.1% in hospitals and 11.8% in nursing homes [15].

The difficulty with these studies is that the prevalence rates cannot be compared with each other because of the differences in methodology for each survey. There are various confounding issues:

- Different patient groups included in different surveys.
- Differing pressure ulcer definitions.
- Different methods of data collection.
- No standardized method for determining prevalence rates.

On the one hand, this precludes any comparison between hospitals, regions and countries and on the other hand benchmarking is not possible. Therefore, a more uniform methodology is needed. To fill that gap the European Pressure Ulcer Advisory Panel (EPUAP) instigated a working group to develop and test a robust methodology to determine prevalence proportions. This methodology was intended to allow comparisons between prevalence surveys conducted following the new methods.

Aims of the study

The first aim of this pilot study was to develop a uniform data collection instrument and methodology to measure the prevalence of pressure ulcers. The second aim was to pilot the developed instrument and methodology and to obtain insight into the pressure ulcer prevalence and prevention strategies used for different patient groups in five European countries.

Methods

Data collection instrument

Initially, various experts in the pressure ulcer field were invited to meet to discuss the content of a minimum data set. Eighteen trustees and members of the EPUAP from 10 different European countries outlined the content for a data collection instrument. This instrument was further elaborated in greater detail by a working group which consisted of six pressure ulcer experts from different European countries. The final version of the instrument was approved by all EPUAP trustees. The experts translated the data collection instrument into their native language. The proposed data collection procedure was based on the experience gained in the Netherlands, where eight national measurements of pressure ulcers already had been undertaken [16,17]. The agreed minimum data set included five categories of data: general data, patient data, risk assessment, skin observation and prevention (Fig. 1). Operational definitions were established for each of these categories. The first category, general data, contained the type of hospital, the number of beds of the hospital and the country. The second category, patient data, indicated the patient's gender, the age, the expected length of stay and the care group. In attempt to make the definition consistent across all countries generic care groups covering medical speciality were constructed: neurology or rehabilitation unit, intensive care unit, chronic care unit, acute care or high dependence care unit.

The next category was risk assessment. The vulnerability of each patient to developing pressure ulcers was assessed using the Braden Scale [18]. This risk assessment scale has been most widely tested for its predictive validity [19,20]. The Braden Scale consists of six sub-scales: sensory perception, moisture, activity, mobility, nutrition, and friction and shear. The total score ranges from 6 to 23. In Europe, patients with a Braden score <17 are generally considered being in need of preventive measures [21]. The continence item as defined by the Norton Scale [22] was also registered. This item gave more specific information upon each patient's level of continence. There were four levels ranging from continent to double incontinence.

Table 1 European Pressure Ulcer Advisory Panel classification system [23]

Grade	Definition
Grade 1	Non-blanchable erythema of intact skin. Discolouration of the skin, warmth, oedema, induration or hardness may also be used as indicators, particularly on individuals with darker skin.
Grade 2	Partial thickness skin loss involving epidermis, dermis, or both. The ulcer is superficial and presents clinically as an abrasion or blister.
Grade 3	Full thickness skin loss involving damage to or necrosis of subcutaneous tissue that may extend down, but not through the underlying fascia.
Grade 4	Extensive destruction, tissue necrosis, or damage to muscle, bone, or supporting structures with or without full thickness skin loss.

The category skin observation provided details about the skin observations. First, the most severe pressure ulcer and its location were recorded, using the EPUAP classification system [23]. A grade 1 pressure ulcer is non-blanchable erythema, a grade 2 is an abrasion or blister, a grade 3 is a superficial ulcer and a grade 4 is a deep ulcer (Table 1). It was agreed that necrotic ulcers were to be recorded as deep ulcers (grade 4). Where multiple ulcers of the same grade were present, the pressure ulcer to be recorded was the one which, in the judgement of the nurse, had the greatest impact on the patient and their quality of life. Finally, the anatomical location of all existing pressure ulcers were recorded.

The last category, prevention, involved the equipment used in bed and in the chair. This equipment was defined as being non-specialist (e.g. standard hospital mattress), as non-powered (e.g. pressure reducing foam mattress) or powered (any device with an electrical supply). Given the wide range of specialist mattresses and cushions in use across Europe, no attempt has been made to identify individual products. Furthermore, it was also recorded whether the patient received manual repositioning in bed or in the chair. Regular repositioning was recorded as either not planned/or delivered irregularly or at frequencies of every 2, 3 or 4 hours.

Procedure

Hospitals from Belgium, Italy, Portugal, UK and Sweden participated in the survey, using a convenience sample of hospitals. In each country a National Coordinator (NC) was appointed from among the ranks of the EPUAP trustees and their work colleagues. The primary roles of the NC were to identify potential hospitals in which data on the prevalence of pressure ulcers would be collected and to facilitate staff within these hospitals to undertake the survey. Each NC was committed to ensure a minimum recruitment of

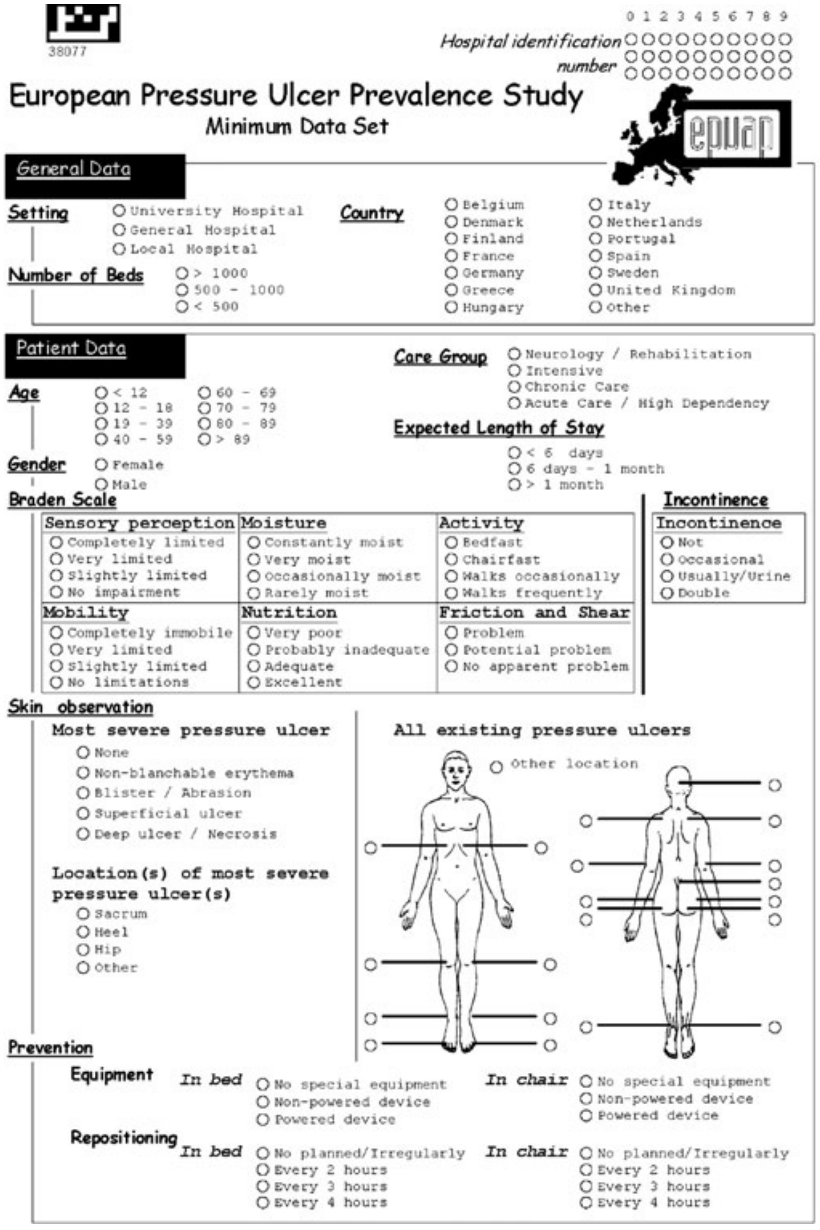

Figure 1 Data collection instrument.

750 patients in total from at least one university and at least one general hospital. Having identified potential hospitals within each country, research ethics applications for the survey were submitted and approval for data collection obtained.

In each participating hospital, a Local Coordinator (LC) was assigned. This LC was responsible for the internal coordination during the registration period and functioned as the contact person for the NC. The NC trained the LCs on the execution of the survey protocol. The LC identified teams of nurses who collected the data on the wards. Each team consisted of a nurse drawn from staff of the ward being surveyed and a nurse working on another ward. The first knew the ward well and could provide relevant background information about the individual patients. The second was a nurse considered to be an expert in the field of pressure ulcers. All the team nurses were trained by the LC to complete the data collection instrument, to undertake the risk assessment and to identify any pressure ulcers according to the EPUAP grading system.

Each patient was examined for the presence or absence of pressure ulcers by a designated staff nurse from his or her own ward together with a non-ward nurse. Both nurses had to agree on the pressure ulcer grade which would be recorded. If they did not agree, the non-ward nurse decided about the grade of the pressure ulcer. Furthermore, the LC visited all the involved wards and observed whether they followed the procedure for the data collection correctly.

Inter-rater reliability

The LC randomly selected two wards from each participating hospital to perform independently a second set of data collection. The LC filled out the data collection instrument separately to the team of nurses.

Data collection

The data collection instrument developed by the working group was designed using the software package Teleform Standard 6.1 (Cardiff Software, Inc.). In this way all the forms could be scanned and automatically converted into a SPSS databank. An instruction manual for the data collection form was made up to reduce any ambiguity.

Setting and sample

The pilot survey was carried out in a convenience sample of university and general hospitals in Belgium, Italy, Portugal, UK and Sweden. All wards of these hospitals were surveyed with the exception of psychiatry, day care and maternity wards. Pressure ulcers are seldom observed in patients admitted to these wards [16]. All patients admitted before midnight on the day of the survey and older than 18 years were included.

Each patient or relative was asked to consent to participation in the survey. Patients who refused to do so were asked to indicate this on a consent form. This procedure was approved by the Medical Ethical Approving committee of the University Hospital Maastricht and of each participating hospital.

Statistics

All analyses were done with the software package SPSS 10.0 (SPSS, Inc.). The data were described on national level. Depending on the measurement scale of the variables, either mean values, median values or frequencies were established. The inter-rater reliability was calculated using a two-tailed Spearman's rho correlation test.

Results

Data collection instrument

No systematic assessment to identify any difficulties with the completion of the data collection instrument was performed. In each country there were informal meetings between the participants. From these meetings it became clear that the Braden Scale appeared to be difficult to complete in some countries. Especially, the nurses who participated in the UK, Sweden and Belgium were less familiar with the Braden Scale and this made the data collection more time consuming.

Procedure

The problems that had occurred were mainly linked to preparation and the practical organization of the survey. Two hospitals experienced difficulties related to sickness on the day of data collection of identified team nurses. All coordinators reported that the process had actually been considerably more time consuming than they had anticipated. The coordinators agreed unanimously about the valuable experience of the survey. They highlighted the level of thoroughness that is required to undertake an accurate survey.

Some observers found the physical examination of the patient's skin by two nurses to be intrusive on the patient's privacy.

The final collection of all the data collection forms of all the participating countries and the actual scanning of the data was found to be very straightforward.

Table 2 Inter-rater reliability (Spearman's rho) of the Braden Scale, the most severe pressure ulcer and location of the most severe pressure ulcer ($P < 0.01$)

	n	Braden Scale	Most severe PU	Location most severe PU
Belgium	25	0.95	0.92	0.92
Italy	35	0.83	1.00	1.00
Portugal	36	0.97	1.00	1.00
Sweden	16	0.98	0.75	1.00
UK	113	0.99	0.97	0.95
Total	225	0.98	0.96	0.97

PU, pressure ulcer.

Inter-rater reliability

Data were collected of 225 patients, ranging from 16 patients in Sweden to 113 patients in the UK (Table 2). Across all participating countries the level of agreement between observers was very high as well for the scores on the Braden Scale (Spearman's rho = 0.98, $P < 0.01$), for the most severe pressure ulcer (Spearman's rho = 0.96, $P < 0.01$) as for the location with the most severe grade (Spearman's rho = 0.97, $P < 0.01$). Generally, the inter-rater reliability did not deviate in each country. Only in Sweden was the level of agreement on the most severe pressure ulcer somewhat lower (Spearman's rho = 0.75, $P < 0.01$) than in the other countries, however, there were limited data.

General data and patient data

A total of 5947 patients were surveyed in 25 hospital sites across the five participating countries. Fifty-two per cent ($n = 3079$) of all patients were nursed within general hospitals, the remainder within teaching hospitals (Table 3). Of all patients in the sample, 51.9% ($n = 3088$) were female with the gender of 109 (1.8%) unreported. As the age of the patients was collected as a series of age ranges, it is not possible to calculate the mean age of the surveyed population. Approximately half of the patients ($n = 2921$, 49.1%) were aged over 70. The majority of the patients ($n = 3703$, 62.3%) were admitted to an acute care/high-dependency care unit (Table 3).

Pressure ulcer prevalence

Among the 5947 patients examined in this study, 1078 patients (18.1%) had one or more pressure ulcers. Belgium, Sweden and the UK had similar prevalence figures ranging form 21.1% to

Table 3 General data and data of all surveyed patients ($n = 5947$) by country

	Belgium ($n = 871$) *n* (%)	Italy ($n = 1097$) *n* (%)	Portugal ($n = 786$) *n* (%)	Sweden ($n = 649$) *n* (%)	UK ($n = 2544$) *n* (%)	Total ($n = 5947$) *n* (%)
Hospital						
Teaching hospital	1	2	–	1	4	8
Patients	665 (76.3)	770 (70.2)	–	613 (94.5)	820 (32.2)	2865 (48.2)
General hospital	1	1	3	1	11	17
Patients	206 (23.7)	327 (29.8)	786 (100)	36 (5.5)	1724 (67.8)	3079 (51.8)
Gender						
Male	406 (46.6)	556 (50.7)	417 (53.1)	312 (48.1)	1059 (41.6)	2750 (46.2)
Female	445 (51.1)	502 (45.8)	362 (46.1)	321 (49.5)	1458 (57.3)	3088 (51.9)
Missing	20 (2.3)	39 (3.6)	7 (0.9)	16 (2.5)	27 (1.1)	109 (1.8)
Age (years)						
≤39	205 (23.5)	146 (13.3)	120 (15.3)	53 (8.2)	288 (11.4)	812 (13.6)
40–59	201 (23.1)	187 (17.1)	175 (22.3)	152 (23.4)	400 (15.7)	1115 (18.8)
60–69	155 (17.8)	231 (21.1)	165 (21.0)	104 (16.0)	402 (15.8)	1057 (17.8)
70–79	160 (18.4)	295 (26.9)	217 (27.6)	129 (19.9)	618 (24.3)	1419 (23.9)
80–89	112 (12.9)	176 (16.0)	89 (11.3)	167 (25.7)	628 (24.7)	1172 (19.7)
>89	35 (4.0)	41 (3.7)	18 (2.3)	39 (6.0)	197 (7.7)	330 (5.5)
Missing	3 (0.3)	21 (1.9)	2 (0.2)	5 (0.8)	11 (0.4)	42 (0.7)
Care group						
Neurology	149 (17.1)	125 (11.4)	145 (18.4)	35 (5.4)	375 (14.7)	829 (14.0)
Intensive	74 (8.5)	55 (5.0)	65 (8.3)	32 (4.9)	43 (1.7)	269 (4.5)
Chronic care	209 (24.0)	25 (2.3)	304 (38.7)	84 (12.9)	456 (17.9)	1078 (18.1)
Acute care/high dependency	427 (49.0)	866 (78.9)	270 (34.4)	487 (75.1)	1653 (65.0)	3703 (62.3)
Missing	12 (1.4)	26 (2.4)	2 (0.2)	11 (1.7)	17 (0.7)	68 (1.1)
Braden score						
At risk (<17)	367 (42.1)	247 (22.5)	242 (30.8)	227 (35)	1031 (41.2)	2114 (35.5)
Not at risk (≥17)	499 (57.3)	766 (69.8)	540 (68.7)	399 (61.5)	1474 (58.8)	3678 (61.8)
Missing	5 (0.6)	84 (7.7)	4 (0.5)	23 (3.5)	39 (1.5)	155 (2.6)
	Median (IQR)	Median (IQR)	Median (IQR)	Median (IQR)	Median (IQR)	Median (IQR)
Braden score	19 (15–22)	21 (17–22)	19 (15–22)	19 (17–22)	19 (15–22)	19 (16–22)

23%. The pressure ulcer prevalence was lower in both Italy (8.3%) and Portugal (12.5%) (Table 4). Excluding grade 1 pressure ulcers the prevalence was 10.5% ($n = 624$), in Italy ($n = 56$, 5.1%), this percentage was remarkably lower than in the other countries (Table 4). The 1078 patients with pressure ulcers experienced a total of 1860 pressure ulcers. The sacrum ($n = 532$, 28.6%) and the heels ($n = 484$, 26%) were the most frequently affected pressure ulcer sites. In Italy (34.8%) and the UK (34.1%), the percentage of sacral pressure ulcers was remarkably higher than in the three other countries (21.9%). There were high percentages of ankle and hip pressure ulcers in Sweden and Portugal respectively (Table 4).

The majority (42.1%) of all patients with pressure ulcers experienced non-blanchable erythema (grade 1) as their most severe pressure ulcer. Only in Portugal was the most common ulcer (30.6%) more severe (grade 3) (Table 4). One hundred and forty-three patients (13.3% of all patients with pressure ulcers) had a deep ulcer (Grade 4). By country, 37% to 53% of the most severe ulcers were located at the sacrum. Deep pressure ulcers (Grade 4) occurred also most over the sacrum (39.9%), except for Sweden (50%) and the UK (52.1%) where most Grade 4 ulcers were located at the heels.

Risk assessment

The median Braden score for the patients surveyed across the participating European countries was 19 (IQR = 16–22) (Table 3). The median Braden score was higher in Italy (median score 21, IQR = 17–22). Based on their Braden scores, 2114 (35.5%) patients were considered at risk of developing pressure ulcers. The Braden scores of 155 patients were not reported during the surveys. When considering the continence level of the assessed patients, 75.2% ($n = 4$, 417) of the patients were found to be continent, 11.8% ($n = 694$) occasionally incontinent, 3.8% ($n = 225$) usually urinary incontinent and 9.2% ($n = 542$) were doubly incontinent.

Prevention

To evaluate the allocation of preventive care, the surveyed patients were divided into two groups: those considered vulnerable to pressure ulcer development (Braden score <17 or with a pressure ulcer) and those patients considered to be at minimal or no risk of pressure damage (Braden score 17. Based upon this definition, 2114 (35.5%) patients were considered in need of preventive

Table 4 Pressure ulcer prevalence of the surveyed patients ($n = 5947$) by country

	Belgium ($n = 871$) *n* (%)	Italy ($n = 1097$) *n* (%)	Portugal ($n = 786$) *n* (%)	Sweden ($n = 649$) *n* (%)	UK ($n = 2544$) *n* (%)	Total ($n = 5947$) *n* (%)
Most severe PU	**184 (21.1)**	**91 (8.3)**	**98 (12.5)**	**149 (23)**	**556 (21.9)**	**1078 (18.1)**
Grade of most severe PU						
Grade 1	91 (49.5)	35 (38.5)	23 (23.5)	98 (65.8)	207 (37.2)	454 (42.1)
Grade 2	50 (27.2)	27 (29.7)	21 (21.4)	22 (14.8)	162 (29.1)	282 (26.1)
Grade 3	22 (11.9)	14 (15.4)	30 (30.6)	17 (11.4)	116 (20.9)	199 (18.5)
Grade 4	21 (11.4)	15 (16.4)	24 (24.5)	12 (8.0)	71 (12.8)	143 (13.3)
Location of most severe PU						
Sacrum	68 (36.9)	48 (52.7)	39 (39.8)	66 (44.3)	262 (47.1)	483 (44.8)
Heels	39 (21.2)	16 (17.6)	24 (24.5)	56 (37.6)	126 (22.7)	261 (24.2)
Hips	21 (1.1)	– (–)	10 (10.2)	4 (2.7)	13 (2.3)	29 (2.7)
Others	55 (29.9)	13 (14.3)	23 (23.5)	16 (10.7)	129 (23.2)	236 (21.9)
Missing	20 (10.9)	14 (15.4)	2 (2.0)	7 (4.7)	26 (4.7)	69 (6.4)
Location grade 4 PU						
Sacrum	7 (33.3)	12 (80.0)	12 (50.0)	4 (33.3)	22 (31)	57 (39.9)
Heels	5 (23.8)	2 (13.3)	5 (20.8)	6 (50.0)	37 (52.1)	55 (38.5)
Hips	– (–)	– (–)	2 (8.3)	2 (16.7)	2 (2.8)	6 (4.2)
Others	7 (33.3)	1 (6.7)	5 (20.8)	– (–)	9 (12.7)	22 (15.3)
Missing	2 (9.5)	– (–)	– (–)	– (–)	1 (1.4)	3 (2.1)
All encountered PU	**351**	**155**	**228**	**269**	**857**	**1860**
Location of all encountered PU						
Sacrum	77 (21.9)	54 (34.8)	59 (21.9)	59 (21.9)	292 (34.1)	532 (28.6)
Heels	105 (29.9)	42 (27.1)	70 (27.7)	70 (26)	204 (23.8)	484 (26)
Ischium	37 (10.5)	10 (6.5)	27 (2.2)	27 (10.1)	107 (12.5)	186 (10.0)
Ankle	11 (3.1)	12 (7.7)	57 (8.3)	57 (21.2)	50 (5.8)	149 (8.0)
Elbow	43 (12.3)	– (–)	7 (5.7)	7 (2.6)	80 (9.3)	143 (7.7)
Hip	28 (8.0)	14 (9.1)	13 (15.8)	13 (4.8)	45 (5.3)	136 (7.3)
Others	50 (14.3)	23 (14.8)	36 (18.4)	36 (13.4)	79 (9.2)	230 (12.4)

PU, pressure ulcer.

measures. Non-powered devices in bed were provided to 41.2% of these patients and powered devices to 30.4% (Table 5). The remaining 28.4% of the patients at risk received no special equipment in bed. This percentage ranged from 4.9% in the UK to 74.9% in Italy. On the contrary, a total of 42.1% patients who were not considered at risk received powered (39.5%) or non-powered (2.6%) devices. Almost 71% at risk patients were not provided with a special cushion while seated. This percentage was high in each participating country (Table 5).

A high percentage of patients in need of prevention were not regularly repositioned while in bed (61.8%) and more than 80% of these patients were not repositioned when seated. Conversely, 265 (7.2%) patients were reported to be repositioned in bed, but not assessed to be vulnerable to pressure ulcer development.

A final indicator was developed from the data collected during the survey to mark the allocation of 'adequate' preventive care. In Table 5 the algorithm used to identify whether the recorded preventive care was likely to be adequate or inadequate is set out. Only 9.7% of the patients in need of prevention received fully adequate preventive care. This percentage varied from 0% in Italy to 17% in the UK. Most of the patients (63.4%) received some preventive measures, while a remarkable part (26.9%) of those patients received no prevention at all. On the contrary, a total of 43.2% patients not in need of prevention received some preventive measures (41.5%) or even adequate prevention (1.6%).

Discussion

A uniform methodology was developed to collect pressure ulcer prevalence data from different European countries. Face and content validity of the data collection instrument were not only assured by the involvement of various pressure ulcer experts in the development of the instrument, but also by the approval of the instrument by all EPUAP trustees [24]. The high inter-rater reliability suggests that the instrument is reliable, however, only limited data were collected [24]. The experts, who translated the instrument in their own native language spoke English fluently and guaranteed that the translation and meaning of the wording was correct. This ensured the comprehensibility of the instrument.

As a minimum level of commitment to this pilot study each country had to recruit a total of 750 patients. In the UK, Wales, Northern Ireland, and England participated with at least 750 patients. Only Sweden did not reach this goal for the survey participants.

In this pilot survey the overall prevalence of pressure ulcers was 18.1%. The prevalence proportions ranged from 8.3% to 23% across the five participating countries. Almost 50% of the pressure ulcers were grade 1 pressure ulcers, which is consistent with the findings of other studies [8–11,13,16]. In the present study the sacrum was the most common site for pressure ulcers. This finding is also in line with the results of other studies reporting anatomical

Table 5 Reported preventive measures ($n = 5792$) by country

	Belgium ($n = 866$)		Italy ($n = 1013$)		Portugal ($n = 782$)		Sweden ($n = 626$)		UK ($n = 2505$)		Total ($n = 5792$)	
	At risk ($n = 367$) *n* (%)	No risk ($n = 499$) *n* (%)	At risk ($n = 247$) *n* (%)	No risk ($n = 766$) *n* (%)	At risk ($n = 242$) *n* (%)	No risk ($n = 540$) *n* (%)	At risk ($n = 227$) *n* (%)	No risk ($n = 399$) *n* (%)	At risk ($n = 1031$) *n* (%)	No risk ($n = 1474$) *n* (%)	At risk ($n = 2114$) *n* (%)	No risk ($n = 3678$) *n* (%)
Equipment in bed												
No special equipment	98 (26.7)	272 (54.5)	185 (74.9)	754 (98.4)	152 (62.8)	528 (97.8)	115 (50.7)	344 (86.2)	51 (4.9)	232 (15.7)	601 (28.4)	2130 (57.9)
Non-powered device	147 (40.1)	211 (42.3)	24 (9.7)	9 (1.2)	84 (34.7)	12 (2.2)	107 (47.1)	54 (13.5)	508 (49.3)	1168 (79.2)	870 (41.2)	1454 (39.5)
Powered device	122 (33.2)	16 (3.2)	38 (15.4)	3 (0.4)	6 (2.5)	– (–)	5 (2.2)	1 (0.3)	472 (45.8)	74 (5.0)	643 (30.4)	94 (2.6)
Equipment in chair												
No special equipment	284 (77.4)	453 (90.8)	241 (97.6)	761 (99.4)	207 (85.5)	533 (98.7)	177 (78.0)	382 (95.7)	587 (56.9)	1192 (80.9)	1496 (70.8)	3321 (90.3)
Non-powered device	78 (21.3)	45 (9.0)	6 (2.4)	5 (0.6)	35 (14.5)	7 (1.3)	50 (22.0)	17 (4.3)	410 (39.8)	266 (18.0)	579 (27.4)	340 (9.2)
Powered device	5 (1.4)	1 (0.2)	– (–)	– (–)	– (–)	– (–)	– (–)	– (–)	34 (3.3)	16 (1.1)	39 (1.8)	17 (0.5)
Repositioning in bed												
No planned/irregularly	256 (69.8)	463 (92.8)	120 (48.6)	720 (94.0)	203 (83.9)	531 (98.3)	151 (66.5)	388 (97.2)	577 (56.0)	1311 (88.9)	1307 (61.8)	3413 (92.8)
Every 2 hours	7 (1.9)	– (–)	31 (12.6)	12 (1.6)	22 (9.1)	1 (0.2)	23 (10.1)	2 (0.5)	252 (24.4)	191 (6.2)	335 (15.8)	106 (2.9)
Every 3 hours	34 (9.3)	10 (2.0)	66 (26.7)	20 (2.6)	15 (6.2)	7 (1.3)	43 (18.9)	6 (1.5)	95 (9.2)	32 (2.2)	253 (12.0)	75 (2.0)
Every 4 hours	70 (19.1)	26 (5.2)	30 (12.1)	14 (1.8)	2 (0.8)	1 (0.2)	10 (4.4)	3 (0.8)	107 (10.4)	40 (2.7)	219 (10.4)	84 (2.3)
Repositioning in chair												
No planned/irregularly	324 (88.3)	488 (97.8)	203 (82.2)	723 (94.4)	237 (97.9)	536 (99.3)	201 (88.6)	387 (97.0)	760 (73.7)	1326 (90.0)	1725 (81.6)	3460 (94.1)
Every 2 hours	10 (2.7)	2 (0.4)	1 (0.4)	2 (0.3)	4 (1.7)	3 (0.5)	12 (5.3)	4 (1)	19 (18.5)	102 (6.9)	218 (10.3)	113 (3.1)
Every 3 hours	9 (2.5)	– (–)	10 (4.0)	6 (0.8)	1 (0.4)	– (–)	8 (3.5)	2 (0.5)	37 (3.6)	21 (1.4)	65 (3.1)	29 (0.8)
Every 4 hours	24 (6.5)	9 (1.8)	33 (23.4)	35 (4.6)	– (–)	1 (0.2)	6 (2.6)	6 (1.5)	43 (4.2)	25 (1.7)	106 (5.0)	76 (2.1)
Preventive care												
No preventive measures	93 (25.3)	264 (52.9)	183 (74.1)	750 (97.9)	149 (61.6)	525 (97.2)	100 (44.1)	334 (83.7)	43 (4.2)	217 (14.7)	568 (26.9)	2090 (56.8)
Some preventive measures	258 (70.3)	234 (46.9)	64 (25.9)	16 (2.1)	89 (36.8)	15 (2.8)	117 (51.5)	64 (16.0)	813 (78.9)	1199 (81.3)	1341 (63.4)	1528 (41.5)
Adequate prevention*	16 (4.4)	1 (0.2)	– (–)	– (–)	4 (1.6)	– (–)	10 (4.4)	1 (0.3)	175 (17.0)	58 (3.9)	205 (9.7)	60 (1.6)

*Adequate prevention: powered device in bed an powered device in chair; powered device in bed and non-powered device in chair and repositioning in chair every 2 or 3 hours; powered device in bed and bedfast (activity Braden Scale); non-powered device in bed an repositioning in bed every 2, 3 or 4 hours and powered device in chair; non-powered device in bed and repositioning in bed every 2, 3 or 4 hours and non-powered device in chair; non-powered device in bed and repositioning in bed every 2, 3 or 4 hours and non-powered device in chair and repositioning in chair every 2 or 3 hours; non-powered device in bed and bedfast (activity Braden Scale); no device in bed and repositioning in bed every 2 hours and powered device in chair; no device in bed and repositioning in bed every 2 hours and non-powered device in chair and repositioning in chair every 2 or 3 hours; no device in bed an repositioning in bed every 2 hours and bedfast.

locations [8,9,11,16]. Prevalence figures provide a hospital or government with insight into the magnitude of the problem. The results of this pilot study revealed that in Europe a substantial percentage of patients still experience pressure ulcers. Prior research shows that effective preventive measures can reduce the pressure ulcer percentage [25–27]. This indicates that attention to pressure ulcer prevention continues to be needed. Based on the results of prevalence studies policy makers and institutions are able to plan their resources and facilities. Even so, 2.5% ($n = 143/5947$) of the surveyed patients had a grade 4 pressure ulcer highlighting that effective prevention and treatment of pressure ulcers should remain a high priority in acute care across Europe.

This survey attempted to identify the appropriateness of the preventive care. Therefore, the patients at risk were determined using the Braden Scale (score < 17) [21,28]. Almost 30% at risk patients received no special mattress in bed and approximately 70% of the at risk patients were not allocated a pressure-redistributing seat cushion. More than 60% of the patients at risk were also not regularly repositioned by the nursing staff (Table 5). It was a disappointing observation that prevention strategies were scarcely used in patients at risk for pressure ulcers. Possible reasons for this might be a lack of preventive equipment or a lack of knowledge about effective prevention. The latter could be an explanation of why so few patients received prevention while seated. It is possible that nurses are not aware that the interface pressure is much higher when seated compared with lying in bed [29,30] and thus that prevention certainly is required. Nurses have possibly also little knowledge about the frequency of repositioning. However, it must be noted that very little research has been done on the necessary repositioning frequency [26,27].

On the contrary, many patients that were considered to be not vulnerable to pressure ulcer development were allocated a pressure-redistributing mattress (42.1%) or cushion (9.7%) and were regularly repositioned in bed (7.2%) or while seated (6%) (Table 5). These preventive strategies were unnecessarily applied and are very expensive [5,31]. They would have been more useful in patients who really needed it.

The most important finding was that preventive measures were generally not allocated in an appropriate manner. It would be worthwhile to perform a large prevalence study across all care settings in all European countries on the basis of which healthcare organizations and policy makers could enhance their allocation of preventive measures. There appears to be much scope for improvement of pressure ulcer prevention across Europe.

The execution of this pilot survey provided valuable insights for future studies [32]. Generally, the form was well completed by participants. Only a few minor difficulties were discovered. In some countries, the use of the Braden Scale will need more attention during the training sessions. The procedure of the survey was clear and well accomplished by the coordinators and nurses. This was made possible by the thoroughly training on the execution of the survey protocol. Although some felt that the inspection of the patient's skin by two nurses was intrusive, it is, however, essential to observe each patient by two nurses to ensure reliability of the data. Further, a few logistical problems were identified, including the time required for data collection. The preparation and the practical organization of the survey would need to be done even more thoroughly in order to eliminate this in future surveys. Taking into account the above mentioned points, the methodology used in this pilot study appears sufficiently robust for the EPUAP to recommend its adoption in future prevalence studies.

Limitations

It should be noted that the pilot study did not recruit a representative sample of European hospital sites because the participation was voluntary and did not happen at random. This may have influenced the findings. Consequently, we must be careful in generalizing the results.

It was not possible to identify individual preventive products as the data collection instrument needed to be valid across Europe, where a wide range of specialist mattresses and cushions are used. In the future, it would be interesting to inventory the preventive products used in each participating country and to group them into different categories based on their working principle. This would allow evaluating the preventive measures in more detail.

The data about the repositioning provide only an impression on its reporting. It was not verified whether reported repositioning was, in fact, performed. It is possible that these data are overestimations of the actually executed repositioning and that the real figures are somewhat lower.

Conclusion

This pilot survey showed that the methodology developed by the EPUAP is sufficiently robust to measure and compare the pressure ulcer prevalence in different countries. This methodology can certainly be applied in the future to obtain reliable and comparable data. The pressure ulcer prevalence across 25 general and university hospitals in the five participating European countries was 18.1%. This considerable percentage and the relatively few patients who received adequate prevention indicate that more attention to pressure ulcer prevention is needed in Europe.

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References

1. Panel for the Prediction and Prevention of Pressure Ulcers in Adults (1992) Pressure Ulcers in Adults: Prediction and Prevention. Clinical Practice Guideline Number 3. Publication No. 92-0047. Rockville, MD: AHCPR, United States Department of Health and Human Services, Public Health Service.
2. Defloor, T. (1999) The risk of pressure sores: a conceptual scheme. *Journal of Clinical Nursing*, 8, 206–216.
3. Edwards, M. (1994) The rationale for the use of risk calculators in pressure sore prevention, and the evidence of the reliability and validity of published scales. *Journal of Advanced Nursing*, 20, 288–296.
4. Maklebust, J. (1997) Pressure ulcer assessment. *Clinics in Geriatric Medicine*, 13, 455–481.
5. Health Council of the Netherlands (1999) Pressure Ulcers (publication No. 1999/23). The Hague: Health Council of the Netherlands.

6. Bennett, G., Dealey, C. & Posnett, J. (2004) The cost of pressure ulcers in the UK. *Age and Ageing*, 33, 230–235.
7. National Pressure Ulcer Advisory Panel. Cuddigan, J., Ayello, E. & Sussman, C. (2001) Pressure Ulcers in America: Prevalence, Incidence, and Implications for the Future. Reston, VA: NPUAP.
8. Meehan, M. (1994) National pressure ulcer prevalence survey. *Advances in Wound Care*, 7, 27–36.
9. Barczak, C. A., Barnett, R. I., Childs, E. J. & Bosley, L. M. (1997) Fourth national pressure ulcer prevalence survey. *Advances in Wound Care*, 10, 18–26.
10. Whittington, K., Patrick, M. & Roberts, J. L. (2000) A national study of pressure ulcer prevalence and incidence in acute care hospitals. *Journal of Wound, Ostomy and Continence Nursing*, 27, 209–215.
11. Whittington, K. T. & Briones, R. (2004) National prevalence and incidence study: 6-year sequential acute care data. *Advances in Skin Wound Care*, 17, 490–494.
12. Woodbury, M. G. & Houghton, P. E. (2004) Prevalence of pressure ulcers in Canadian healthcare settings. *Ostomy/Wound Management*, 50, 22–38.
13. Thoroddsen, A. (1999) Pressure sore prevalence: a national survey. *Journal of Clinical Nursing*, 8, 170–179.
14. Tannen, A., Dassen, T., Bours, G. & Halfens, R. (2004) A comparison of pressure ulcer prevalence: concerted data collection in the Netherlands and Germany. *International Journal of Nursing Studies*, 41, 607–612.
15. Lahman, N. A., Halfens, R. J. G. & Dassen, T. (2005) Prevalence of pressure ulcers in Germany. *Journal of Clinical Nursing*, 14, 165–172.
16. Bours, G., Halfens, R., Abu-Saad, H. & Grol, R. (2002) Prevalence, prevention and treatment of pressure ulcers: descriptive study in 89 institutions in the Netherlands. *Research in Nursing and Health*, 25, 99–110.
17. Halfens, R. J. G., Janssen, M., Meijers, J. & Mistiaen, P. (2005) Landelijke Prevalentiemeting Zorgproblemen 2005, overzicht van de belangrijkste resultaten [National Pressure Ulcer Prevalence Survey Health Care Problems 2005, Overview of the Most Important Results]. Maastricht: Universiteit Maastricht.
18. Braden, B. J. & Bergstrom, N. (1994) Predictive validity of the Braden Scale for pressure sore risk in a nursing home population. *Research in Nursing and Health*, 17, 459–470.
19. Nixon, J. & McGough, A. (2001) Principles of patient assessment: screening for pressure ulcers potential risk. In The Prevention and Treatment of Pressure Ulcers, 1st Edn (ed. Morison, M.), pp. 55–74. Edinburgh: Mosby.
20. Schoonhoven, L., Haalboom, J. R. E., Bousema, M. T., Algra, A., Grobbee, D. E., Grypdonck, M. H. & Buskens, E. (2002) Prospective cohort study of routine use of risk assessment scales for prediction of pressure ulcers. *British Medical Journal*, 325, 797–800.
21. Defloor, T., Van den Bossche, K., Derre, B., Feyaerts, S. & Grypdonck, M. (2001) Belgische richtlijnen voor decubituspreventie [Belgian Guidelines for Pressure Ulcer Prevention]. Gent: Academia Press.
22. Norton, D., McLaren, R. & Exton-Smith, A. N. (1975) An Investigation of Geriatric Nursing Problems in Hospital. New York: Churchill Livingstone.
23. European Pressure Ulcer Advisory Panel (1999) Guidelines on treatment of pressure ulcers. *EPUAP Review*, 1 (2), 31–33.
24. Polit, D. F., Beck, C. T. & Hungler, B. P. (2001) Essentials of Nursing Research. Methods, Appraisal, and Utilization, 5th Edn. Philadelphia, PA: Lippincott Williams & Wilkins.
25. Gunningberg, L., Lindholm, C., Carlsson, M. & Sjödén, P.-O. (2001) Reduced incidence of pressure ulcers in patients with hip fractures: a 2 year follow-up of quality indicators. *International Journal for Quality in Health Care*, 13 (5), 399–407.
26. Defloor, T., Grypdonck, M. & De Bacquer, D. (2005) The effect of various combinations of turning and pressure reducing devices on the incidence of pressure ulcers. *International Journal of Nursing Studies*, 42, 37–46.
27. Vanderwee, K., Grypdonck, M. & Defloor, T. (2005) The effectiveness of alternating pressure air mattresses for the prevention of pressure ulcers. *Age and Ageing*, 34, 261–267.
28. CBO [Dutch Institute for Health Care Improvement] (2002) Decubitus. Tweede Herziening [Second revision pressure ulcers]. Utrecht: CBO.
29. Defloor, T. & Grypdonck, M. H. F. (1999) Sitting posture and prevention of pressure ulcers. *Applied Nursing Research*, 12, 136–142.
30. Rosenthal, M. J., Felton, R. M., Hileman, D. L., Lee, M., Friedman, M. & Navach, J. H. (1996) A wheelchair cushion designed to redistribute sites of sitting pressure. *Archives of Physical Medicine and Rehabilitation*, 77, 278–282.
31. Xakellis, G. C., Frantz, R. & Lewis, A. (1995) Cost of pressure ulcer prevention in long-term care. *Journal of the American Geriatrics Society*, 43, 496–501.
32. van Teijlingen, E., Rennie, A. M., Hundley, V. & Graham, W. (2001) The importance of conducting and reporting pilot studies: the example of the Scottish Births Survey. *Journal of Advanced Nursing*, 34, 289–295.

