Assessing the adequacy of pressure ulcer prevention in hospitals: a nationwide prevalence survey

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Introduction: The development of a pressure ulcer is an adverse event and is often avoidable if adequate preventive measures are applied. No large-scale data, based on direct patient observations, are available regarding the pressure ulcer preventive interventions used in hospitals.

Purpose: The aim of this study was to obtain insight into the adequacy of interventions used to prevent pressure ulcers in Belgian hospitals.

Methods: A cross-sectional, multi-centre pressure ulcer prevalence study was performed in Belgian hospitals. The methodology used to measure pressure ulcer prevalence was developed by the European Pressure Ulcer Advisory Panel. The data collection instrument includes five categories of data: general data, patient data, risk assessment, skin observation and prevention.

Results: The total sample consisted of 19 968 patients. The overall prevalence of pressure ulcers Category I–IV was 12.1%. Only 10.8% of the patients at risk received fully adequate prevention in bed and while sitting. More than 70% of the patients not at risk received some pressure ulcer prevention while lying or sitting.

Conclusion: Generally, there is a limited use of adequate preventive interventions for pressure ulcers in hospitals, which reflects a rather low quality of preventive care. The implementation of pressure ulcer guidelines requires more attention. The pressure ulcer prevention used in practice should be re-evaluated on a regular basis.

INTRODUCTION

Pressure ulcers (PUs) are a serious complication of hospitalisation in terms of increased morbidity, mortality, healthcare expenditure, extended hospital stay and patient suffering.^{1–6} PU prevalence in hospitals has been reported to range from 7% to 26%.^{7–13} PU prevalence data are commonly used as an indicator for the quality of (nursing) care.^{14 15} The development of a PU is an adverse

event and is (often) avoidable with adequate prevention. Adequate PU prevention involves assigning effective preventive measures, consisting of a reduction of the intensity and/or the duration of pressure and shearing forces on the tissue, to patients at risk for PU development.^{16 17}

Since 2001, the Belgian evidence-based PU prevention guideline is available and easily accessible. So far, no large-scale data, based on direct patient observations, are available on PU preventive interventions carried out in Belgian hospitals. Therefore, this study aimed to obtain insight into the adequacy of preventive interventions for PUs in Belgian hospitals and evaluating PU prevalence.

METHODS

Setting and sample

This cross-sectional, multi-centre prevalence study was carried out in Belgian hospitals. All hospitals (n=143), except psychiatric hospitals, were invited to participate. Eighty-four hospitals (68%) agreed to participate. All wards were surveyed, with the exception of day care, psychiatry, paediatric and maternity wards. PUs are seldom observed in patients admitted to these wards.¹⁸

Patients >18 years were included. Each patient or relative was asked to consent to participate in the survey. This study was approved by the ethics review committee of Ghent University Hospital (No B7020072953) and of each participating hospital.

Data collection

The methodology used to measure PU prevalence was developed by the European Pressure Ulcer Advisory Panel (EPUAP).⁹ This

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methodology has been tested in different European countries and is evaluated as sufficiently robust to measure and compare PU prevalence and prevention in different hospitals.⁹ The EPUAP method consists of a minimum dataset and a uniform procedure.

Data collection instrument

The data collection instrument included five categories of data: general data, patient data, risk assessment, skin observation and prevention. General data contained type of hospital and ward. Patient data included age, gender and incontinence. The Braden Scale was used to assess the PU risk of each patient.¹⁹ This scale has been most widely examined for its predictive validity.^{20 21} In Belgium, patients with a Braden score <17 are generally considered as being in need of preventive measures.¹⁶ Skin observation consisted of details on PUs (category and location). PUs were categorised according to the NPUAP-EPUAP classification system¹⁷: Category I is non-blanchable erythema of intact skin, Category II is partial thickness skin loss or blister, Category III is full thickness skin loss and Category IV is full thickness tissue loss. Finally, data on PU preventive measures included prevention in bed and while sitting. Data on materials used and repositioning frequency were recorded. The use of materials was observed by the nurses. They recorded whether the material was present in patient's bed or armchair and whether the patient was in bed or in the armchair at the time of the observation. The repositioning frequency was based on the reported frequency in the patient chart. Both evidence-based effective and non-effective measures were registered. The data collection instrument was developed using the software package SNAP Surveys V.SNAP 9 Professional (Snap Surveys, Inc).

Procedure

In each participating hospital a supervisor was appointed who was responsible for the local organisation of the study. Prior to the study, all supervisors attended a training session. This consisted of: (1) a theoretical training (pathophysiology, classification, risk assessment

using the Braden Scale and prevention); (2) an introduction to the study aims and protocol and (3) the use of the data collection instrument. The purpose of this training was to ensure the correctness and uniformity of completing the data collection instrument.

The supervisor composed teams of nurses who collected the data on the wards. Each team consisted of two nurses: a nurse from the staff of the ward being surveyed and a nurse working in another ward. The first nurse could provide relevant background information about individual patients. Accordingly, all patients were observed by two nurses. Both nurses had to agree about the PU classification. If they disagreed, the opinion of the non-ward nurse was decisive.

The supervisors instructed the teams about the study procedure. Therefore, supervisors received a PowerPoint presentation and an information guide on the study procedure to increase the reliability of the data collection.^{22 23}

For practical reasons, participating wards were allowed to choose one day between 15 and 25 April 2008 to perform the study.

Data analysis

The adequacy of PU preventive interventions was assessed for patients at risk (Braden score <17 or having a PU) according to a predefined algorithm (figure 1). This algorithm was constructed based on the Belgian evidence-based PU prevention guideline.¹⁶ The algorithm took into account the prevention while lying in bed, including type of mattress, repositioning scheme and offloading the heels from the mattress, and while sitting in an armchair, including type of cushion and repositioning scheme.¹⁶ An assessment of whether patients not at risk for PU development received no PU prevention was also carried out.

All statistical analyses were performed with the software package SPSS V.15.0 (SPSS, Inc). Descriptive data are presented in frequencies and percentages. The overall prevalence of PUs was based on the number of patients with a PU. If a patient had different PUs, the PU with the severest category was taken into account.

Figure 1 Algorithm of adequate preventive measures for patients at risk.

Table 1 Patient characteristics by ward type

	Surgical – medical wards												Geriatric wards				Intensive care units				Other wards				Total	
	Surgical wards		Medical wards		Surgical – medical wards		Geriatric wards		Intensive care units		Other wards		Total													
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)										
Age*																										
19–39 years	609	(11.5)	346	(5.9)	145	(10.9)	10	(0.3)	58	(7.0)	151	(4.4)	1319	(6.6)												
40–59 years	1366	(15.9)	1222	(20.9)	360	(27.0)	48	(1.5)	165	(20.0)	507	(14.6)	3668	(18.4)												
60–69 years	998	(18.9)	1056	(18.2)	232	(17.4)	105	(3.3)	164	(19.9)	515	(14.9)	3070	(15.4)												
70–79 years	1305	(24.7)	1643	(27.1)	315	(23.6)	748	(24.3)	276	(33.5)	965	(27.8)	5288	(26.5)												
80–89 years	860	(16.3)	1368	(23.4)	246	(18.5)	1854	(57.5)	146	(17.7)	1111	(32.1)	5585	(28.0)												
>89 years	126	(2.4)	210	(3.6)	31	(2.3)	418	(13.0)	14	(1.7)	216	(6.2)	1015	(5.1)												
Gender†																										
Female	2893	(54.9)	2853	(48.8)	709	(53.2)	2170	(67.3)	344	(41.7)	2130	(61.5)	11099	(55.6)												
Male	2381	(45.1)	2995	(51.2)	623	(46.8)	1052	(32.7)	480	(58.3)	1334	(38.5)	8865	(44.4)												
Urinary incontinence	282	(5.3)	649	(11.1)	105	(7.9)	944	(29.3)	44	(5.3)	762	(21.9)	2786	(14.0)												
Faecal incontinence	265	(5.0)	679	(11.6)	119	(8.9)	900	(27.9)	246	(29.9)	684	(19.7)	2893	(14.5)												
Double incontinence‡	348	(6.6)	780	(13.3)	128	(9.6)	1122	(34.8)	51	(6.2)	808	(23.3)	3237	(16.2)												
Braden score <17	934	(17.7)	1200	(20.5)	206	(15.5)	1192	(37.0)	524	(63.6)	999	(29.0)	5055	(25.3)												
Total number	5276	(26.4)	5848	(29.3)	1332	(6.7)	3222	(16.1)	824	(4.1)	3466	(8.6)	19968	(100)												

*22 missing.

†4 missing.

‡both urinary and faecal incontinence.

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Table 2 Prevalence of pressure ulcers Category I–IV and Category II–IV by ward type (N=19968)

	Pressure ulcers Category I–IV		Pressure ulcers Category II–IV	
	n	(%)	n	(%)
Surgical wards	426	(8.1)	226	(4.3)
Medical wards	648	(11.1)	361	(6.2)
Surgical–medical wards	85	(6.4)	42	(3.2)
Geriatric wards	609	(18.9)	395	(12.3)
Intensive care units	164	(19.9)	107	(13.0)
Other wards	487	(14.1)	265	(7.8)
Total	2419	(12.1)	1396	(7.0)

RESULTS

In total, 1005 out of 2043 potential hospital wards participated. The total sample consisted of 19968 patients. The majority of the patients (62.4%) were admitted to surgical and medical wards (table 1). Almost 60% of the patients were aged ≥ 70 years and about 25% were at risk for PUs according to the Braden Scale.

The overall prevalence of PUs Category I–IV was 12.1% and Category II–IV was 7%. Intensive care units and geriatric wards had the highest prevalence figures (table 2). Table 3 provides details on the location and categories of PUs. Sacrum and heels were most frequently affected locations. This analysis was based on the total number of PUs observed.

Findings on the adequacy of the applied prevention by ward type are provided in table 4. In intensive care units,

the highest percentage of patients at risk (30.4%) received adequate preventive measures in bed and while sitting in an armchair, whereas on wards with surgical patients the lowest figures (6.2%, 6.6%) were reported. Overall, only 10.8% of the patients at risk received fully adequate prevention. The majority of patients at risk (73.5%) received partly adequate prevention, which was defined as not all required preventive measures were applied in bed and/or armchair. Generally, a higher percentage of patients at risk received adequate prevention in an armchair (34%) than in bed (25.5%). More than 70% of the patients not at risk received (some) prevention while lying or sitting (table 4).

Details on inadequate preventive measures in at risk patients are presented in table 5. Heels were not offloaded in 60.8% of the patients at risk. While sitting, the most occurring failure was patients having a standard

Table 3 Location and categories of the pressure ulcers* by ward type (N=19968)

Location	Surgical wards n (%)	Medical wards n (%)	Surgical–medical wards n (%)	Geriatric wards n (%)	Intensive care units n (%)	Other wards n (%)	Total n (%)
Sacrum	285 (52.2)	435 (51.6)	61 (55.5)	359 (45.4)	93 (40.2)	256 (44.5)	1489 (48.1)
Category I	149 (27.3)	227 (27.1)	31 (28.2)	144 (18.2)	37 (16.0)	147 (25.5)	735 (23.8)
Category II	66 (12.1)	115 (13.7)	16 (14.5)	91 (11.5)	36 (15.6)	66 (11.5)	390 (12.6)
Category III	41 (7.5)	63 (7.5)	7 (6.4)	76 (9.6)	16 (6.9)	39 (6.8)	242 (7.8)
Category IV	29 (5.3)	30 (3.6)	7 (6.4)	48 (6.1)	4 (1.7)	4 (0.7)	122 (3.9)
Heels	199 (36.5)	277 (33.1)	38 (34.6)	341 (43.2)	80 (34.7)	249 (43.2)	1184 (38.4)
Category I	96 (17.6)	114 (13.6)	23 (20.9)	125 (15.8)	31 (13.4)	113 (19.6)	502 (16.2)
Category II	33 (6.1)	61 (7.3)	8 (7.3)	70 (8.9)	22 (9.6)	40 (6.9)	234 (7.6)
Category III	35 (6.4)	47 (5.6)	6 (5.5)	73 (9.2)	16 (6.9)	47 (8.2)	224 (7.3)
Category IV	35 (6.4)	55 (6.6)	1 (0.9)	73 (9.3)	11 (4.8)	49 (8.5)	224 (7.3)
Hips	8 (1.6)	23 (2.8)	3 (2.7)	25 (3.2)	10 (4.3)	13 (2.2)	82 (2.6)
Category I	1 (0.2)	14 (1.7)	2 (1.8)	10 (1.3)	4 (1.7)	7 (1.2)	38 (1.2)
Category II	1 (0.2)	2 (0.3)	0 (0.0)	6 (0.8)	3 (1.3)	3 (0.5)	15 (0.5)
Category III	3 (0.6)	6 (0.7)	1 (0.9)	4 (0.5)	1 (0.4)	0 (0.0)	15 (0.5)
Category IV	3 (0.6)	1 (0.1)	0 (0.0)	5 (0.6)	2 (0.9)	3 (0.5)	14 (0.4)
Other	53 (9.7)	103 (12.2)	8 (7.2)	66 (8.2)	48 (20.8)	58 (10.1)	336 (10.9)
Category I	27 (4.9)	47 (5.6)	5 (4.5)	27 (3.4)	14 (6.1)	20 (3.5)	140 (4.5)
Category II	10 (1.8)	27 (3.2)	1 (0.9)	17 (2.1)	19 (8.2)	16 (2.8)	90 (2.9)
Category III	13 (2.4)	17 (2.0)	2 (1.8)	13 (1.6)	7 (3.0)	15 (2.6)	67 (2.2)
Category IV	3 (0.6)	12 (1.4)	0 (0.0)	9 (1.1)	8 (3.5)	7 (1.2)	39 (1.3)
Total	545	383	110	791	231	576	3091

*Based on the total number of pressure ulcers observed.

Table 4 Adequate pressure ulcer (PU) prevention in patients at risk (Braden score <17 or PU) and not at risk by ward type

	Surgical wards n (%)	Medical wards n (%)	Surgical— medical wards n (%)	Geriatric wards n (%)	Intensive care units n (%)	Other wards n (%)	Total n (%)
Patients at risk	1123	1429	241	1372	543	1205	5913
In bed and armchair							
Fully adequate prevention*	74 (6.6)	121 (8.5)	15 (6.2)	165 (12.0)	165 (30.4)	96 (8.0)	636 (10.8)
Partly adequate prevention†	852 (75.9)	1034 (75.9)	178 (73.9)	1001 (73.0)	323 (59.5)	960 (79.7)	4348 (73.5)
No adequate prevention‡	197 (17.5)	274 (19.2)	48 (19.9)	206 (15.0)	55 (10.1)	149 (12.4)	929 (15.7)
In bed							
Fully adequate prevention	196 (17.5)	298 (20.9)	33 (13.7)	501 (36.5)	196 (36.1)	283 (23.5)	1507 (25.5)
Partly adequate prevention	789 (70.3)	974 (68.2)	169 (70.1)	811 (59.1)	312 (57.5)	832 (69.0)	3887 (65.7)
No adequate prevention	138 (12.3)	157 (11.0)	39 (16.2)	60 (4.4)	35 (6.4)	90 (7.5)	519 (8.8)
In armchair							
Fully adequate prevention	426 (37.9)	442 (30.9)	86 (35.7)	327 (28.3)	440 (81.0)	290 (24.1)	2011 (34.0)
Partly adequate prevention	171 (15.2)	214 (15.0)	27 (11.2)	430 (31.3)	23 (4.2)	385 (32.0)	1250 (21.1)
No adequate prevention	526 (46.8)	773 (54.1)	128 (53.1)	615 (44.8)	80 (14.7)	530 (44.0)	2652 (44.9)
Patients not at risk	4153	4419	1091	1850	281	2261	14055
In bed and armchair							
Correct: no prevention	1269 (30.6)	1391 (31.5)	370 (33.9)	427 (23.1)	47 (16.7)	580 (25.7)	4084 (29.1)
Incorrect: prevention	2884 (69.4)	3028 (68.5)	721 (66.1)	1423 (76.9)	234 (83.3)	1681 (74.3)	9971 (70.9)
In bed							
Correct: no prevention	1333 (32.1)	1441 (32.6)	377 (34.6)	501 (27.1)	56 (19.9)	641 (28.4)	4349 (30.9)
Incorrect: prevention	2820 (67.9)	2978 (67.4)	714 (65.4)	1349 (72.9)	225 (80.1)	1620 (71.6)	9709 (69.1)
In armchair							
Correct: no prevention	3908 (94.1)	4221 (95.5)	1072 (98.3)	1461 (79.0)	238 (84.7)	1913 (84.6)	12813 (91.2)
Incorrect: prevention	245 (5.9)	198 (4.5)	19 (1.7)	389 (21.0)	43 (15.3)	348 (15.4)	1242 (8.8)

*Effective preventive measures.

†some preventive measures.

‡no preventive measures.

cushion or no cushion in combination with an inadequate repositioning frequency (72.3%).

DISCUSSION

This study revealed a PU prevalence of 12.1% in Belgian hospitals, which is in line with other international studies.^{7–13} The PU prevalence was the highest on geriatric and intensive care wards and the heels and sacrum were the most affected sites. Both these findings are also consistent with other international studies.^{7–13} Geriatric and intensive care patients are high risk patients to develop PUs. They have multiple risk factors, such as limited mobility and activity, higher age, perfusion and oxygenation problems, and a reduced general health status, which explains their high level of risk.^{24–30} The proportion of sacral and heel PUs was rather high.

Specifically, heel PUs are often viewed as a (outcome) quality indicator, as most heel ulcers can easily be prevented.¹⁶

The main purpose of this study was to gain insight into the adequacy of preventive interventions for PUs in Belgian hospitals. This gives us more information about the process of nursing care and can be used as a quality indicator. The results of this study indicate that the adequacy of PU prevention in Belgian hospitals was suboptimal. Only 1 out of 10 patients at risk for PUs received fully adequate prevention. A significant number of patients not at risk received some kind of preventive measure which is, in fact, unnecessary and inefficient.^{2–31}

Prevention while sitting and heel prevention can be described as problematic. Prevention while sitting is of utmost importance as the pressure on the sacrum is higher in the sitting position compared to the lying

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Table 5 Inadequate pressure ulcer (PU) preventive measures in at risk patients (Braden score <17 or PU) by ward type (N=5913)

	Surgical wards n (%)	Medical wards n (%)	Surgical– medical wards n (%)	Geriatric wards n (%)	Intensive care units n (%)	Other wards n (%)	Total n (%)
Patients at risk	1123	1429	241	1372	543	1205	5913
<i>In bed</i>							
Mattress							
Standard mattress with no adequate repositioning frequency	202 (18.0)	237 (16.6)	58 (24.1)	131 (9.5)	16 (0.3)	136 (11.3)	780 (13.2)
Pressure-redistributing mattress with no adequate repositioning frequency	533 (47.5)	497 (34.8)	91 (37.7)	310 (22.6)	77 (1.4)	389 (32.3)	1897 (32.1)
Total	735 (65.5)	734 (27.5)	149 (61.8)	441 (32.1)	93 (1.7)	525 (43.6)	2677 (45.3)
Heel prevention							
Heels not elevated from the mattress	674 (18.7)	967 (26.9)	168 (4.7)	716 (19.9)	323 (9.0)	748 (20.8)	3596 (60.7)
Mattress ⁽¹⁾ + heel prevention							
Inadequate prevention on mattress and heels not elevated from mattress	927 (21.0)	1131 (25.7)	208 (4.7)	871 (19.8)	347 (7.9)	922 (20.9)	4406 (74.5)
<i>In armchair</i>							
Cushion							
Standard cushion or no cushion with no adequate repositioning frequency	532 (47.4)	800 (56.0)	131 (5.4)	700 (51.0)	81 (1.5)	577 (47.9)	2821 (47.7)
Pressure-redistributing cushion with no correct repositioning frequency	165 (14.7)	187 (13.1)	24 (0.6)	345 (25.1)	22 (0.4)	338 (28.0)	1081 (18.3)
Total	697 (62.1)	987 (69.1)	155 (4.0)	1045 (76.1)	103 (1.9)	915 (75.0)	3901 (66.0)

position. Adequate prevention of heel PUs requires a complete relief of pressure/shear at the heel zone. This is necessary because of the combination of a microcirculatory system, which is very susceptible to pressure and shearing alterations, and the normal physiological changes of the skin in aged patients. Moreover, the heel surface is too small to spread pressure through devices.³² In fact, the principle of elevating the heels from the mattress by a device such as a (wedge-shaped) cushion, a heel pad or a heel boot is recommended and should be easily attainable.¹⁷

Other international studies reported similar worrisome findings concerning the use of adequate PU prevention in hospitals. In a Swedish study, the majority of patients at risk for or with PUs did not get appropriate prevention while in bed or sitting in a chair.³³ Bours *et al* found that only half of the patients who needed a pressure-redistributing mattress were positioned on such a support surface and that less than 33% of the patients needing to be repositioned were actually being turned.¹⁸ Lyder *et al* evaluated national estimates of compliance with the process of care for patients at risk for PU. They found that a pressure-reducing device was used for only 7.5% of those patients and that 66.2% were repositioned.

³⁴ Baumgarten *et al* (2010) studied the use of pressure-redistributing support surfaces among elderly hip fracture patients.³⁵ They found that this surface was present in only 36.4% of their observations. A European pilot survey revealed that only 9.7% of the patients in need of prevention received adequate preventive care.⁹ A Belgian study, investigating the use of hospital administrative data to evaluate the knowledge-to-action gap in PU preventive care, found that Belgian hospitals frequently failed to provide appropriate prevention.³⁶ In that study, 17.5% of the patients who should have been placed on a dynamic mattress were not. However, in that study no detailed information is given on the preventive strategies as a rather rough algorithm was constructed to evaluate PU prevention.³⁶

Generally, there is a limited use of effective preventive interventions for PUs in hospitals, which reflects a rather low quality of PU preventive care resulting in adverse outcomes for patients. This finding is striking because several initiatives have been taken to address the gap between research evidence and clinical practice, which is one of the most persistent problems in the provision of quality healthcare.³⁷ Evidence-based guidelines¹⁶ and e-learning packages on PU classification and prevention

are freely and easily accessible, and educational meetings have also been organised. These strategies have not had the expected outcome. Other strategies such as the use of reminders and feedback or a combination of different strategies may be more effective.³⁸ First, it is important to identify barriers for adequate prevention, such as knowledge, attitude or clearly defined responsibilities, priority, availability of equipment, costs.^{37–39} To increase their effectiveness, implementation strategies should address these barriers.⁴⁰ The use of tailored multifaceted implementation strategies is another possible option. These strategies may probably improve PU care and patient outcomes since they have been shown to have potential.^{41 42}

Limitations

The present study was the largest study inventorying the PU prevalence and preventive interventions in Belgian hospitals based on direct patient observations. Almost 70% of all Belgian hospitals participated and approximately half of the eligible wards participated including almost 20 000 patients. This may possibly have an influence on the representativeness of the sample.

The data on the use of PU prevention materials were based on the observations and reports of the nurses. The repositioning frequency was based on the report in the patient chart and provides only an impression on its reporting. It is possible that these data are overestimations of the actually executed prevention and that the real figures are somewhat lower.

The algorithm to define adequate preventive measures was based on the Belgian evidence-based PU prevention guideline. However, we need to take into account that there is still a lack of evidence about the effectiveness of PU preventive measures.⁴³

CONCLUSION

The overall prevalence of PUs Category I–IV was 12.1% in Belgian hospitals. Only 10% of the patients received adequate PU prevention. This study indicates that it is possible to improve the quality of preventive care. Consequently, the incidence of PUs might decrease. The biggest improvement can be gained in the prevention while sitting and the prevention specific for heels. An interesting challenge for the hospitals is to effectively disseminate and implement PU prevention guidelines to individual wards and to address barriers. This may probably improve the quality of PU care and patient outcomes.

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Competing interests None.

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