

Implementation of a new policy results in a decrease of pressure ulcer frequency

ERIK H. DE LAAT¹, LISETTE SCHOONHOVEN¹, PETER PICKKERS², ANDRÉ L. VERBEEK³
AND THEO VAN ACHTERBERG¹

¹Nursing Science Section, Centre for Quality of Care Research, ²Department of Intensive Care, and ³Department of Epidemiology and Biostatistics, Radboud University Nijmegen Medical Centre, Nijmegen, The Netherlands

Abstract

Objective. To determine the effects of a new policy on the efficiency of pressure ulcer care.

Design. Series of 1-day pressure ulcer surveys before and after the implementation.

Setting. A 900-bed University Medical Centre in The Netherlands.

Participants. On the days of the surveys, 657 patients were included before the implementation, 735 patients at 4 months after the implementation, and 755 patients at 11 months after the implementation.

Intervention. Implementation of a hospital guideline for pressure ulcer care combined with the introduction of viscoelastic foam mattresses on the efficiency of the prevention and treatment of pressure ulcers.

Main outcome measures. Comparisons before versus after the implementation were made regarding the care behaviour of nurses and the frequency of patients with pressure ulcer.

Results. Inadequate prevention decreased from 19 to 4% after 4 months and to 6% after 11 months ($P < 0.001$), and inadequate treatment decreased from 60 to 31% ($P = 0.005$). Excluding the use of mattresses as a positive indicator for care behaviour, we found no significant increase in adequate care to prevent pressure ulcers. Also, in adequate treatment activities, we found no significant difference. Overall, we found a significant decrease in hospital-acquired pressure ulcer frequency from 18 to 13% ($P = 0.003$) after 4 months and 11% ($P < 0.001$) after 11 months.

Conclusion. The number of pressure ulcer patients in hospital can successfully be reduced. General measures such as the introduction of adequate mattresses and guidelines for prevention and treatment are promising tools in this respect.

Keywords: decubitus ulcer, epidemiology, guidelines adherence, guidelines implementation, support surfaces, survey

Pressure ulcers (Table 1) are a persistent problem in hospitalized patients. In The Netherlands, prevalence figures range from 13% in university hospitals to 23% in general hospitals [1] and are comparable with prevalence figures in the United States (10–15%) [2,3] and Europe (8–23%) [4]. Pressure ulcers result in patient suffering [5], more frequent and longer hospital admissions, more intensive nursing and medical care, and a financial burden to the health care system [6].

Many studies [7–11] showed that the measures taken to prevent and treat pressure ulcers vary greatly and that compliance with existing guidelines are inadequate. Several factors appear to play a role: lack of knowledge about these guidelines and lack of accompanying skills of nurses, vagueness about responsibilities for the management of pressure ulcers, and the fact that pressure ulcers are seldom viewed as a priority in health care institutions [12].

In this study, we wanted to determine the effects of the implementation of a specific hospital guideline for pressure

ulcer care combined with the introduction of a high quality pressure reducing viscoelastic foam mattress on care behaviour and the frequency of pressure ulcer patients (pressure ulcer frequency). Therefore, we measured changes in adequate prevention and treatment as well as the frequency of pressure ulcer patients before and 4 and 11 months after the introduction of this new policy.

Methods

Design

Before and after the implementation series of 1-day measurements were used to determine the effect of this new policy on the efficiency of pressure ulcer care and pressure ulcer frequency. We compared care behaviour of nurses and the pressure ulcer frequency patients.

Address reprint requests to Erik H. De Laat, Nursing Science Section, Centre for Quality of Care Research, Radboud University Nijmegen Medical Centre, PO Box 9101, 6500 HB, Nijmegen, The Netherlands. E-mail: e.delaat@zorg.umcn.nl

Table 1 Pressure ulcers: definition and classification [European Pressure Ulcer Advisory Panel (EPUAP) 1998]

A pressure ulcer is an area of localized damage to the skin and underlying tissue caused by pressure, shear, friction, and/or a combination of these

- Grade I: non-blanchable erythema of intact skin. Discoloration of the skin, warmth, oedema, induration, or hardness may also be used as indicators, particularly in individuals with darker skin
- Grade II: partial thickness skin loss involving epidermis, dermis, or both. The ulcer is superficial and presents clinically as an abrasion or blister
- Grade III: full thickness skin loss involving damage to or necrosis of subcutaneous tissue that may extend down to, but not through underlying fascia
- Grade IV: extensive destruction, tissue necrosis, or damage to muscle, bone, or supporting structures with or without full thickness skin loss

Sample

The study was carried out in the 900-bed Radboud University Nijmegen Medical Centre, The Netherlands. The Ethics Committee of the hospital approved the study and waived the need for a written informed consent.

Patients hospitalized on the days of the pressure ulcer surveys, who understood the Dutch language and agreed to the screening, were included in the study. If a patient was unable to give permission, a legal representative was asked for approval. Patients residing on the paediatric wards and psychiatric unit were not included in the study.

In a period of 30 months, six prevalence measurements were carried out. The 'before implementation group' consisted of 657 patients who were studied in two separate measurements in a year. One year later, 4 months after the implementation of the guideline, we included 735 patients. Eleven months after the implementation, we included 755 patients. These numbers were sufficient to detect a decrease from 20 to 15% in pressure ulcer prevalence with sufficient statistical precision ($\alpha = 0.05$, $\beta = 0.20$). To obtain these numbers, two successive measurements were needed in each of the two groups after the implementation.

Intervention

The intervention in this study was the implementation of the new pressure ulcer policy. A specific hospital guideline for pressure ulcer care ('guideline') was developed. This guideline was a specification of international guidelines for pressure ulcer care [13,14] updated with recent scientific research [15]. A pressure ulcer consultant was appointed and established a network of contact nurses (one on every ward). This contact nurse was trained by the nurse consultant and introduced the new guideline in a staff meeting or clinical lesson. Also, after the official introduction of the guideline, the existence of the guideline was announced in several hospital media (newspaper, intranet). Furthermore, all hospital bed frames were equipped with a high quality pressure reducing viscoelastic foam mattress.

Measurements and instruments

For this study, we used the patient data form of the Dutch national pressure ulcer survey [16]. Nurses in the study hospital

were trained to use this instrument. This form included four categories of data to be collected. The first category concerned patient characteristics. The second category was a risk inventory for pressure ulcers using the Braden scale [16]. Recent studies have shown that the predictive validity of currently used risk assessment instruments, e.g. the Braden scale is insufficient in hospitalized patients [17–19]. In our study, we used the items of the Braden scale to describe our population and to detect differences between patient groups on the items mobility, activity, sensory perception, and friction and shear. From these factors, we know they are related to the occurrence of pressure ulcers [20].

The third category of data involved grading the pressure ulcers according to internationally accepted grading systems [13,14] in four grades of increasing severity (Table 1). A grade I pressure ulcer should be considered as an alert for potential skin damage. Preventive measures must be intensified, but it is not a wound that has to be treated [21]. For each pressure ulcer, the duration of existence, the origin, and the dressing used were noted. The last category assessed preventive interventions like the type of support surface used and repositioning. Repositioning was defined as planned repositioning at least every 3 hours [15].

The form was extended with an item concerning the report of a pressure ulcer. In accordance with the guideline, pressure ulcers must be reported in the patient record, and a care plan should be written out. When a pressure ulcer was present, the report of the pressure ulcer was checked in the patient's record.

To determine whether nurses acted in accordance with the new guideline (compliance), a decision rule was used, based on objectively observable measures described in the guideline. Adequate prevention was defined as the presence of a pressure-reducing mattress and a repositioning schedule in pressure ulcer patients or patients at high risk for pressure ulcers. Encouragement to change position or, if necessary, assistance to repositioning had to be confirmed by patient or nurse. If only one of these measures was present, prevention was judged as moderately adequate. If no measures were present, prevention was judged as inadequate. Adequate treatment was defined as the presence of a dressing according to the guideline and a care plan in the patient's record, besides the presence of adequate prevention. If all or three of these measures were present, treatment was judged as 'adequate'. If two of these measures

were present, treatment was judged as moderate. If only one or no measure was present, treatment was judged as inadequate.

Procedure of pressure ulcer surveys

A team of eight registered nurses, each visiting a part of the 30 participating nursing units, and a team of contact nurses gathered the data for this pressure ulcer survey together. Before the survey, both teams were trained to fill out the forms, handle the risk assessment, and grade pressure ulcers according to the pressure ulcer classification.

A skin assessment was only performed in patients at risk. Patients were considered at risk if (i) they scored 3 points or less on the items of sensory perception or mobility of the Braden scale for risk assessment or (ii) the patient had a known pressure ulcer or (iii) there was any doubt about one of the two criteria. All patients who did not meet these criteria were considered not at risk and pressure ulcer free. Together, the contact nurse and one of the eight registered nurses assessed the patients. The patient was asked whether regular turning or assistance to it was a daily routine. In case of a pressure ulcer, the patient was asked where the pressure ulcer did arise in- or outside the hospital. If the patient was incapable of answering the question, we asked the nurse or looked it up in the patient's record.

Statistical analyses

In this study, on the effects of policy implementation, only patients who acquired pressure ulcers during the admission were of interest. Therefore, we excluded the patients from the

analysis who reported that the origin of the pressure ulcer occurred before admission to the hospital. Pressure ulcer frequency was defined as the percentage of patients with a pressure ulcer in the total sample included in this study. According to the European Pressure Ulcer Advisory Panel (EPUAP) statement on measurement of disease frequencies, pressure ulcer frequencies should be reported in two formats; the first including all pressure damage (including areas of non-broken skin; i.e. grade I) and the second excluding grade I pressure ulcers. If a patient had more than one pressure ulcer, only the most severe ulcer was used to classify the patient [21].

The frequency of compliance with the new policy and the pressure ulcer frequency in the preintervention period were compared with the frequencies 4 and 11 months after the implementation. Differences were tested using two-sided chi-square tests.

Between the before- and after-implementation period, the old standard hospital mattresses were replaced by high-grade pressure-reducing mattresses. This resulted in a higher chance of a correct application of a special mattress after the implementation for all patients, independent of the care behaviour of nurses. Therefore, we analysed the compliance to the guideline with and without the choice of the mattress.

All statistical analyses were performed using the Statistical Package for Social Sciences (SPSS 12.0.1).

Results

A total of 2147 patients were included for analysis. Table 2 summarizes the patient characteristics before and 4 and 11

Table 2 Patient characteristics ($n = 2147$) before and after implementation

Patients	Before ($n = 657$)	After 4 months ($n = 735$)	After 11 months ($n = 755$)
Sex			
Female	346 (53)	397 (54)	423 (56)
Male	311 (47)	338 (46)	332 (44)
Age in years mean (SD)	58 (18.2)	57 (19.0)	55 (18.9) ¹
Length of stay in days median (range)	7.5 (0–239)	8.0 (0–265)	7.0 (0–278)
Risk factors			
Age >65 years	266 (41)	296 (40)	275 (36)
Surgery past 2 weeks	210 (32)	204 (28)	211 (28)
Diabetes	38 (6)	23 (3)	34 (5)
Very limited or completely immobile	152 (23)	173 (24)	159 (21)
Very limited response or completely unresponsive	42 (6)	56 (8)	49 (7)
Bedfast or chairfast	212 (32)	241 (33)	216 (29)
Very moist or constantly moist	56 (9)	48 (7)	76 (10)
Very poor or inadequate food intake	109 (17)	118 (16)	133 (18)
Friction and shear	241 (37)	248 (34)	217 (29) ²

After 11 months, 11 months after implementation; after 4 months, 4 months after implementation; before, before implementation. Values represent number of patients (percentage) unless otherwise mentioned.

¹ $t(1410) = 2.8, P < 0.005$.

² $\chi^2(1) = 10.11, P < 0.002$.

Table 3 Outcomes on care behaviour and pressure ulcer frequency

Patients included in this study (<i>n</i> = 2147)	Before (<i>n</i> = 657)	After 4 months (<i>n</i> = 735)	After 11 months (<i>n</i> = 755)
Patients selected for screening (<i>n</i> = 1091)	343/657 (52)	390/735 (53)	358/755 (47)
Patients in which prevention was needed (<i>n</i> = 915)	271/657 (41)	338/735 (46)	306/755 (41)
Prevention (mattress included) ¹			
Adequate	15/271 (6)	28/338 (8)	21/306 (7)
Moderate	205/271 (76)	295/338 (87)	266/306 (87)
Inadequate	51/271 (19)	15/338 (4)	19/306 (6)
Prevention (mattress excluded)			
Adequate	19/271 (7)	32/338 (10)	28/306 (9)
Inadequate	252/271 (93)	306/338 (91)	278/306 (91)
Patients in which treatment was needed (<i>n</i> = 176)	72/271 (11)	52/735 (7)	52/755 (7)
Treatment (mattress included) ²			
Adequate	9/72 (13)	16/52 (31)	14/52 (27)
Moderate	20/72 (28)	21/52 (40)	20/52 (39)
Inadequate	43/72 (60)	15/52 (29)	18/52 (35)
Treatment (mattress excluded)			
Adequate	2/72 (3)	1/52 (2)	2/52 (4)
Moderate	9/72 (13)	15/52 (29)	12/52 (23)
Inadequate	61/72 (85)	36/52 (69)	38/52 (73)
Frequency of pressure ulcer patients ³			
Grades I–IV	121/657 (18)	98/735 (13)	82/755 (11)
Grades II–IV	72/657 (11)	52/735 (7)	52/755 (7)

After 11 months, 11 months after implementation; after 4 months, 4 months after implementation; before, before implementation.

Values represent number of patients (percentage). The terms (in)adequate and moderate are defined in the text.

¹The changes in compliance with prevention activities (mattress included) were significant ($P < 0.000$). Without mattress, these changes were statistically insignificant.

²The changes in compliance with treatment activities (mattress included) were significant ($P < 0.016$). Without mattress, these changes were statistically insignificant.

³Groups I–IV, frequency of pressure ulcers patients grades I – IV in all patients ($n = 2147$). The decreases in prevalence were significant ($P < 0.009$). Groups II–IV, frequency of pressure ulcers patients grades II – IV in all patients ($n = 2147$). The decreases in prevalence were significant ($P < 0.011$).

months after the implementation. The table summarizes a small but statistically significant lower age (11 months difference) after the implementation. The number of patients selected for screening and the presence of friction and shear forces differed statistically significantly as a result of the implementation of the new guideline and the new mattresses. One thousand and ninety-one patients were selected for a skin assessment (Table 3).

Care behaviour in prevention

Of the patients assessed ($n = 1091$), 915 patients (84%) were at risk for pressure ulcer development or had a pressure ulcer grade I. The remaining 176 patients (16%) had a grade II pressure ulcer or worse.

In the patients at risk or with a pressure ulcer grade I ($n = 271$), a pressure-reducing mattress and a repositioning schedule were required. The frequency of inadequate preventive measures decreased from 19 to 4% at 4 months and 6% at 11 months after the implementation of the guideline. This

decrease resulted in a significant increase ($P < 0.001$) in the group that received moderately adequate prevention from 76 before to 87% at both 4 and 11 months and a small increase of adequate measures from 6 before to 8 and to 7% at 4 and 11 months, respectively.

Care behaviour in treatment

We found a decrease in inadequate treatment from 60% before the implementation to 31% at both 4 and 11 months after the implementation of the new policy in 176 patients who had a grade II pressure ulcer or worse (Table 3). This decrease resulted in a significant increase ($P = 0.005$) of moderately adequate treatment from 28% before the implementation to 40 and 39% and an increase of adequate treatment from 13 before to 31 and 27% at 4 and 11 months, respectively.

To determine if the implementation had any effect on care behaviour by nurses apart from the use of the new mattresses, we also examined the changes in compliance without considering the new mattresses as an indicator. This analysis showed

a non-significant trend of increasing adequate repositioning from 7 to 10% at 4 months and 9% at 11 months after the implementation. For inadequate treatment, a decreasing trend of 16% at 4 months and 12% at 11 months after the implementation of the guideline was demonstrated.

Pressure ulcer frequencies

Before the implementation, we found a pressure ulcer frequency of 18% (grades I–IV). Four months after the implementation of the new policy, we found a pressure ulcer frequency of 13% ($P = 0.003$), and 11 months after the implementation the pressure ulcer frequency was 11% ($P < 0.000$) (Table 3). The latest results in a difference between frequencies of 7% between ‘before the implementation’ and 11 months after the implementation. Defining pressure ulcers as grades II–IV, a significant decrease ($P < 0.011$) from 11 to 7% at after both 4 and 11 months was calculated.

Discussion

This study demonstrates that the implementation of a guideline for pressure ulcer care and new mattresses results in a significant decrease in the pressure ulcer frequency (grades I–IV) of 5 and 7% at 4 and 11 months, respectively. More relevantly, when defining pressure ulcers as grades II–IV ulcers, the decrease was 4% both at 4 and 11 months, respectively. However, despite the time and energy spent on education and training of the nurses, we found that the change in care behaviour was not significant when the use of the new standard mattresses was not taken into account. In contrast to a recent randomized clinical trial of Russell *et al.* [22], our study suggests that the replacement of the new viscoelastic mattresses has to be considered as the key component of the intervention.

Moreover, nursing care is difficult to measure because there are a lot of ‘in-between’ activities, such as occasional assistance in position changes if a nurse finds a patient in an uncomfortable position. Strictly, this is an intervention but it was not counted as such. We cannot rule out that these ‘in-between’ activities increased after the implementation because there was more attention for the prevention of pressure ulcers. Also, there may have been an increase in other interventions we have not measured. For example, a leaflet was developed for the patient and his family or friends with advice and instructions on preventive actions. Another strategy was stimulating family or friends to take the patient for a little walk (if allowed) instead of staying in bed during visiting hours. Perhaps the effect of this additional attention on the prevention of pressure ulcers is larger than assumed. A recent study of Bours *et al.* [23] shows the effect of calling attention to the pressure ulcer problem in hospitals. Monitoring pressure ulcer frequencies and giving feedback result in an improvement in quality of care, and it is very important to continue conducting surveys to avoid attention moving away from this topic, which may in turn lead to a deterioration in the quality of pressure ulcer care.

Because turning patients at high risk for pressure ulcer is indisputable [13,14], and preventing pressure ulcers by turning patients is a standard part of basic nursing care, every nurse should know this standard. Before the implementation of the guideline, the interval between two body positions was defined as 2 hours. Defloor concluded [15,24] that turning every 4 hours on a viscoelastic foam mattress makes the most effective and feasible preventive method in terms of incidence, effort, and cost. The hospital pressure ulcer committee was hesitant to implement this finding and decided to set the interval in the new guideline on 3 hours, because more frequent turning would result in better prevention. Nevertheless, this new policy still resulted in 11% grades I–IV and 7% grades II–IV pressure ulcer frequency. Related to this discussion, we found a more serious problem: only one in ten patients who needed (assistance in) repositioning received this measure. During the surveys, we asked patients at risk if regular turning was advised or the ward nurse was asked if repositioning was administered in case the patient was not able to turn himself. Even if there was a potential risk for a socially desirable answer on this question, we found that only 10% of the patients were treated according to the guideline. An astonishing result, but in accordance with other studies [1]. A recent study into barriers to the implementation of pressure ulcer guidelines found that lack of consistent leadership was a major barrier [25]. Therefore, we recommend to ensure strong nursing leadership in future pressure ulcer improvement projects.

The costs for the replacement of a hospital mattress by a high-quality pressure reducing viscoelastic foam mattress amount to approximately €400 per mattress. Although a cost-benefit analysis was not included in this study, we emphasize that the investment in a viscoelastic foam mattress led to a considerable cost saving. The lifespan of a mattress is 10 years. A less expensive foam hospital mattress, but without the pressure decreasing qualities, costs about €200 per mattress. The difference of approximately €200 divided by 3650 amounts to €0.05 per day. This amount is considered negligible compared with each pressure ulcer prevented.

Two potential weaknesses of our study design should be addressed. Firstly, incidence measures are a stronger measure for the effectiveness of prevention than prevalence or frequency measures. However, a hospital-wide survey is more feasible than an incidence study with a long follow-up time. We measured and reported the data according to the methodological and practical recommendations in the statement on prevalence and incidence monitoring of EPUAP [21]. The compliance with the one-day surveys was very high. Because we wanted to explore the effect of measures within a hospital population, we only included hospital-acquired pressure ulcers in our analyses. It is known that the origin of pressure ulcers is underreported in nursing charts and that nurses may give socially desirable responses to this question. To minimize this bias, we asked the patient for the origin of the pressure ulcer. Only if the patient could not answer this question, we asked the nurse or looked it up in the patient’s record.

Secondly, patients could have been counted twice in successive measurements. Since the mean length of stay was 8.3 days,

it was assumed that at least a period of 4–5 weeks between the measurements was sufficient to reduce patients twice counted to a minimum. Nevertheless, incidental extreme outliers could be counted double and could not be excluded because participation of the patient was anonymous.

Conclusion

The pressure ulcer frequency in hospital can successfully be reduced. General measures such as the introduction of adequate mattresses and guidelines for prevention and treatment are promising tools in this respect.

Acknowledgements

This work was supported in part by funding from The Health Care Insurance Board in The Netherlands (00135). There are no financial arrangements with profit organizations whose services or products, or whose competitors' services or products, are a subject of discussion or evaluation in this article.

References

- Bours GJ, Halfens RJ, Abu-Saad HH, Grol RT. Prevalence, prevention, and treatment of pressure ulcers: descriptive study in 89 institutions in the Netherlands. *Res Nurs Health* 2002; **25**: 99–110.
- Amlung SR, Miller WL, Bosley LM. The 1999 National Pressure Ulcer Prevalence Survey: a benchmarking approach. *Adv Skin Wound Care* 2001; **14**: 297–301.
- Barczak CA, Barnett RI, Childs EJ, Bosley LM. Fourth National Pressure Ulcer Prevalence Survey. *Adv Wound Care* 1997; **10**: 18–26.
- Clark M, Defloor T, Bours G. A pilot study of the prevalence of pressure ulcers in European hospitals. In Clark M, ed. *Pressure Ulcers: Recent Advances in Tissue Viability*. Salisbury: Quay Books MA Healthcare Ltd, 2004: 8–28.
- De Laat EH, Scholte op Reimer WJ, van Achterberg T. Pressure ulcers: diagnostics and interventions aimed at wound-related complaints: a review of the literature. *J Clin Nurs* 2005; **14**: 464–472.
- Severens JL, Habraken JM, Duivenvoorden S, Frederiks CM. The cost of illness of pressure ulcers in the Netherlands. *Adv Skin Wound Care* 2002; **15**: 72–77.
- Buss IC, Halfens RJ, Abu-Saad HH, Kok G. Evidence-based nursing practice: both state of the art in general and specific to pressure sores. *J Prof Nurs* 1999; **15**: 73–83.
- Gunningberg L, Lindholm C, Carlsson M, Sjoden PO. Risk, prevention and treatment of pressure ulcers – nursing staff knowledge and documentation. *Scand J Caring Sci* 2001; **15**: 257–263.
- Larcher Caliri MH, Miyazaki MY, Pieper B. Knowledge of pressure ulcers by undergraduate nursing students in Brazil. *Ostomy Wound Manage* 2003; **49**: 54–63.
- Law J. Pressure ulcer prevention: education for nursing home staff. *Br J Nurs* 2003; **12**: 566–569.
- Russell LJ, Reynolds TM. How accurate are pressure ulcer grades? An image-based survey of nurse performance. *J Tissue Viability* 2001; **11**: 67, 70–75.
- Halfens RJ, Haalboom JR. A historical overview of pressure ulcer literature of the past 35 years. *Ostomy Wound Manage* 2001; **47**: 36–43.
- Agency for Health Care Policy and Research. Pressure ulcers in adults: prediction and prevention. In *Clinical Practice Guideline Number 3*. Rockville: U.S. Department of Health and Human Services, Public Health Service, Agency for Health Care Policy and Research, 1992: 92-0047.
- European Pressure Ulcer Advisory Panel. A policy statement of the prevention of pressure ulcers from the European Pressure Ulcer Advisory Panel. *Br J Nurs* 1998; **7**: 888–890.
- Defloor T. The effect of position and mattress on interface pressure. *Appl Nurs Res* 2000; **13**: 2–11.
- Bours GJ, Halfens RJ, Lubbers M, Haalboom JR. The development of a national registration form to measure the prevalence of pressure ulcers in the Netherlands. *Ostomy Wound Manage* 1999; **45**: 28–33, 36–38, 40.
- Defloor T, Grypdonck MF. Validation of pressure ulcer risk assessment scales: a critique. *J Adv Nurs* 2004; **48**: 613–621.
- Schlomer G. Dekubitusrisikoskalen als Screeninginstrumente – Ein systematischer Überblick externer Evidenz [Use of risk scales for decubitus ulcers as screening instruments – a systematic review of external evidence]. *Z Arztl Fortbild Qualitatssich* 2003; **97**: 33–46.
- Schoonhoven L, Haalboom JR, Bousema MT et al. Prospective cohort study of routine use of risk assessment scales for prediction of pressure ulcers. *Br Med J* 2002; **325**: 797.
- Defloor T. The risk of pressure sores: a conceptual scheme. *J Clin Nurs* 1999; **8**: 206–216.
- Defloor T, Clark M, Witherow A et al. EPUAP statement on prevalence and incidence monitoring in pressure ulcers occurrence 2005. *EPUAP Rev* 2005; **6**: 74–80.
- Russell LJ, Reynolds TM, Park C et al. Randomized clinical trial comparing 2 support surfaces: results of the Prevention of Pressure Ulcers Study. *Adv Skin Wound Care* 2003; **16**: 317–327.
- Bours GJ, Halfens RJ, Candel MJ, Grol RT, Abu-Saad HH. A pressure ulcer audit and feedback project across multi-hospital settings in the Netherlands. *Int J Qual Health Care* 2004; **16**: 211–218.
- Defloor T, Bacquer DD, Grypdonck MH. The effect of various combinations of turning and pressure reducing devices on the incidence of pressure ulcers. *Int J Nurs Stud* 2005; **42**: 37–46.
- Clarke HF, Bradley C, Whytock S, van der Handfield SWR, Gundry S. Pressure ulcers: implementation of evidence-based nursing practice. *J Adv Nurs* 2005; **49**: 578–590.

Accepted for publication 04 October 2005