

Pressure Ulcers in German Nursing Homes and Acute Care Hospitals: Prevalence, Frequency, and Ulcer Characteristics

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In German healthcare facilities, research-based knowledge of pressure ulcers and their relation to patient characteristics is limited. To provide information for national and international comparison on pressure ulcers and related issues, two cross-sectional surveys were conducted among 21,574 German hospital patients and nursing home residents (147 institutions total) in 2002 and 2003. Prevalence and frequency rates of pressure ulcers in people at risk (Braden score of 20) in different institution types were compared and descriptive data on severity, location, history, and origin of 3,857 wounds were analyzed to examine the relationship between age, body mass index, and Braden score and the frequency and severity of wounds. The studies found that among all persons at risk, pressure ulcer prevalence was 21.1% and that the number of pressure ulcers per person was higher in hospitals (1.91, 24.6%) than in nursing homes (1.42, 13.9%). In addition, in hospital patients and nursing home residents, 36.4% and 46.7% of wounds, respectively, were grade 2 severity and higher. In both types of institutions, the most common pressure ulcer locations were the lower back and the heels. In hospital patients, 51.4% of pressure ulcers were facility-acquired, compared to 60.2% in nursing homes. In hospital patients and nursing home residents, 7.4% and 29.7% of wounds, respectively, had existed for more than 3 months. The studies also found that persons with lower Braden scale scores had more ulcers and more severe pressure ulcers. Analysis of wounds in this large patient population provides more detailed information about the problem of pressure ulcers and should help improve prevention and treatment.

KEYWORDS: nursing, pressure ulcers, location, severity, nursing home residents, hospital patients

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Pressure ulcers present some of the predominant challenges in institutional care. Many studies^{1,2} and within³ different societies have been conducted to measure the prevalence of pressure ulcers in different care facilities. The results of those studies indicate a great variance of pressure ulcer prevalence, ranging from less than 10%⁴ to more than 30%⁵ depending on the setting or population examined. Prevalence figures serve as quality indicators, allowing the evaluation of institutional care.⁶ In industrialized countries in particular, institutions must be responsive to the growing challenge of providing high quality care to aging populations, bal-

ancing various forms of progress in medical treatment⁷ and limited financial resources⁸ while controlling expenses. Pressure ulcer management is an important factor in this endeavor.

The Problem

Reported prevalence and incidence rates underscore the pressure ulcer problem but additional information that takes into account quantity, location, and grade of severity is required for an accurate and detailed analysis. Focusing on these issues is important because of their clinical relevance — for example, predominant location

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may be directly related to certain preventive measures and devices such as special supportive surfaces. Although some studies address these issues, comparing data from different studies remains problematic due to the absence of comparable study designs and methodologies.⁹ More information about the impact of these issues in hospital patients and nursing home residents is needed. To that end, this article provides information about frequency, severity, location, origin, and history of pressure ulcers in German nursing home residents and hospital patients based on the results of two nationwide surveys. Survey data are analyzed and compared with published national and international study findings to confirm and/or expand existing knowledge of pressure ulcer characteristics.

Literature Review

For clarification, the European Pressure Ulcer Advisory Panel (EPUAP)¹⁰ states, “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.”

Severity. Most systems (eg, EPUAP¹⁰) use four grades to denote pressure ulcer severity (see Table 1). Definitions of each stage or grade may differ in details; this should be considered when comparing results of different studies and points to the need to develop objective measures of pressure-induced tissue damage.¹¹ Different published studies offer no clear indication that one specific grade is the most common. Some studies conducted in acute care facilities seem to reveal that grade 1 pressure ulcers are found more often than ulcers of other grades^{1,12-14} and that sometimes grade 1 wounds comprise more than 50% of all ulcers.^{15,16} Other studies find that grade 2 pressure ulcers are most common¹⁷⁻²⁰ or that only a small rate difference exists between grade 1 and grade 2 pressure ulcers.²¹ All prevalence studies reviewed seem to agree that at least 70% to 80% of all pressure ulcers are grade 1 or grade 2 (rather than grade 3 or higher).

Location. No clear trend as to ulcer location has been noted. In some prevalence studies, the majority of wounds are found in the sacrum area²²⁻²⁴ and although wounds are quite common in the lower limbs, especially the heel area, study results show that pressure ulcers occur in many other locations, including the elbow, hip, ischi-

TABLE 1
EUROPEAN PRESSURE ULCER ADVISORY PANEL PRESSURE ULCER CLASSIFICATION

Grade 1	Non-blanchable erythema of intact skin. Discoloration of the skin, warmth, edema, induration, or hardness also may 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 clinically presents as an abrasion or blister
Grade 3	Full-thickness skin loss involving damage to or necrosis of subcutaneous tissue that may extend down to, but not through, underlying fascia
Grade 4	Extensive destruction, tissue necrosis, or damage to muscle, bone, or supporting structures with or without full-thickness skin loss

Source: <http://www.epuap.org/gltreatment.html>.

um, shoulder, spinous process, ankle, toe, head, or face. Several surveys show that pressure ulcers on the heels are almost as common as sacrum area wounds^{19,20,25}; others have shown that elbow pressure ulcers are common.^{26,27}

Origin. Most study findings indicate that pressure ulcers develop while the person is in a healthcare institution.¹³ Studies that note high nosocomial²⁸ and institutionally acquired²³ pressure ulcer prevalence rates confirm these findings. However, often these study results do not provide any information about the actual origin of individual wounds.

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KEY POINTS

- Pressure ulcers are a universal concern.
- The authors conducted two nationwide prevalence studies in acute care facilities and nursing homes.
- In addition to differences between acute care and nursing home facilities, it was found that persons with a low Braden scale score had more ulcers and more severe ulcers.
- The prevalence of facility-acquired pressure ulcers remains high and, at least in long-term care facilities, many of these wounds appear to exist for long periods of time (>3 months).

History. In acute care setting studies, pressure ulcers have usually existed for fewer than 2 weeks.^{1,29} In long-term care (nursing homes or home care), a history of more than 3 months is common.³⁰

Pressure ulcers and patient demographics. Although studies regarding several characteristics of pressure ulcers and their relation to each other^{29,31} and to patient/resident demographics³² are available, data from German nursing home residents and hospital patients are scant with regard to these issues. Therefore, the purpose of this pressure ulcer study was to address the following concerns:

- What is the pressure ulcer prevalence rate and pressure ulcer frequency in German nursing homes and hospitals?
- What are the severity, location, origin, and history of pressure ulcers and are there differences between institutions regarding any of these factors?
- What, if any, is the association between certain patient/resident demographics (eg, age, body mass index [BMI], and Braden score) and wound severity and frequency?

Data from the annual pressure ulcer prevalence surveys of 2002 and 2003, conducted in the Federal Republic of Germany by the Department of Nursing Science, Charité Medical University, Berlin, were analyzed separately for each year, but no significant differences regarding the focus issues were detected. Therefore, for the purpose of this article, data from both prevalence studies were analyzed together to obtain a sufficient sample size.

Methods and Procedures

In April 2002 and April 2003, hospitals and nursing homes throughout the Federal Republic of Germany were invited to participate anonymously in a prevalence study. Data collection methods and questionnaire formats were based on a well-developed and tested study design.³³ Before the study, the instrument had been used and tested in 11 hospitals in a large city. It included questions regarding patient demographics and occurrence and characteristics of pressure ulcers. The Braden scale was used to measure the risk of developing pressure ulcers and ulcer grade was determined using the EPUAP system.¹⁰

Sample. Of the 3,000 hospitals and 8,000 nursing homes invited, 87 hospitals and 60 nursing homes

participated. Participating institutions were located in 12 of the 16 German states. Participants included 4,846 residents in 60 nursing homes and 16,728 patients in 87 hospitals. Participating facilities included a variety of university and small community hospitals and nursing homes (nursing home populations ranged from 40 to more than 300 residents). In hospitals, 77.2% of admitted patients participated; in nursing homes the participation rate was 80.2%.

Data collection. Researchers trained the coordinators of all participating hospitals and nursing homes regarding data gathering and each coordinator subsequently trained fully qualified (at least 3 years' nursing training) nurses on staff. All trained nurses received standard pictures and definitions of each ulcer grade. The prevalence study was conducted on one specific day in each of the participating institutions during the second week of April 2002 and 2003, respectively. The trained nurses examined all patients or residents in selected wards of their institutions. Each participant, either personally or represented by a relative, was required to provide his/her informed consent. Completed questionnaires were sent to the Charité Medical University, where they were reviewed for remarks and completeness and prepared for data analysis. Permission to conduct the study was obtained from the ethical medical committee of the state of Berlin. Descriptive statistics were entered into Statistical Analysis by SPSS® for Windows® (SPSS Inc., Chicago, Ill); percent, means, and standard deviations were calculated.

Data analysis. The National Pressure Ulcer Advisory Panel definition of prevalence was used: "Prevalence measures all cases of a condition (eg, pressure ulcers) among those at risk of developing the condition. Measures of prevalence are made at one point in time."³⁴ Using the Braden scale for defining a risk of developing pressure ulcer (≤ 20 points) allowed researchers to standardize the different populations in nursing homes and hospitals.³⁵ To enable comparisons between different types of institutions regarding prevalence rate and wound frequency, only patients and residents at risk (Braden score ≤ 20) were included in the prevalence equation denominator. Because identifying grade 1 pressure ulcers is difficult, rates of pressure ulcers excluding grade 1 are also reported (see Table 2 and Table 3). Severity, location, origin, and history percentages were

TABLE 2
PRESSURE ULCER PREVALENCE AND NUMBER OF ULCERS: AT RISK INDIVIDUALS ONLY (BRADEN SCORE ≤ 20)

	Institution	Persons at risk with pressure ulcers (N)	Prevalence in the group at risk	Number of wounds in the group at risk (n)	Number of wounds or persons with pressure ulcers (factor)	Total Sample
Including grade 1	Nursing home	406	13.9%	578	1.42	2,913
	Hospital	1,436	24.6%	2,748	1.91	5,834
	Total	1,842	21.1%	3,326	1.81	8,747
Excluding grade 1	Nursing home	207	7.1%	306	1.48	2,913
	Hospital	681	11.7%	1,378	2.02	5,834
	Total	888	10.2%	1,684	1.91	8,747

TABLE 3
PRESSURE ULCER PREVALENCE BY ULCER GRADE: AT RISK INDIVIDUALS ONLY (BRADEN SCORE ≤ 20)

	Institution	Percentage of persons with				Total (N = 100%)
		1 ulcer	2 ulcers	3 ulcers	>3 ulcers	
Including grade 1	Nursing home	69.0	22.9	5.2	3.0	406
	Hospital	49.4	28.6	13.1	8.8	1,436
	Total	53.7	27.4	11.3	7.5	1,842
Excluding grade 1	Nursing home	67.1	21.7	7.2	3.9	207
	Hospital	50.4	24.4	14.1	11.2	681
	Total	54.3	23.8	12.5	9.5	888

data collection, the hospital patient's average length of stay was about 8 days; average length of stay from admission to survey in nursing home residents was 2 years. The mean Braden score was 20.2 (SD 3.9) in hospitals and 17.8 (SD 4.5) in nursing homes. In hospitals and nursing homes, 34.9% and 60.1% of study participants, respectively, had a Braden score of 20 points or less.

Prevalence and frequency in the at-risk group. Table 2 shows the prevalence rates and the frequency of pressure ulcers (with and without pressure ulcer

grade 1). Differences emerged regarding pressure ulcer risk assessment in the various kinds of institutions. When classified by a Braden score of 20 or less, approximately 60% of all nursing home residents and 35% of all hospital patients were considered to be at risk. In order to compare standardized groups in both kinds of institutions, only those at risk were analyzed for the comparison of the prevalence rate and the observed number of wounds.

Results

Patient demographics. The average age of patients in hospitals was 63.6 years (SD 1.91); in nursing homes, the average age of participants was 81.9 years (SD 12.2). Average nursing home patient BMI (23.6, SD 4.9) was lower than in hospitals (25.7, SD 5.9). Slightly more men than women participated in the hospitals (55.8%) in comparison to nursing homes, where women dominated (79.3%). From admission to

calculated for all wounds, not for residents or patients (see Figures 1, 2, and 3). Finally, the demographic data of all 21,574 participants were descriptively analyzed regarding age, BMI, and Braden score with the frequency and the severity of pressure ulcer wounds (see Table 4). If patients or residents had two or more pressure ulcers of different severity, the ulcer with highest grade (most severe ulcer) was included.

The prevalence with (without) grade 1 ulcers was 21.1% (10.2%) for all 8,747 persons at risk. Regardless of whether grade 1 pressure ulcers were considered, the prevalence in nursing homes was significantly lower than in hospitals (13.9% compared to 24.6% including grade 1; 7.1% compared to 11.7% excluding grade 1; $P < 0.001$). In all persons at risk, the average number of wounds per person was 1.81. If grade 1 pressure ulcers were excluded, the number was slightly higher (1.91).

TABLE 4
PATIENT AND RESIDENT DEMOGRAPHICS: ALL STUDY PARTICIPANTS WITH PRESSURE ULCERS

	Nursing Home				Hospital				Total				
	n	Age	BMI*	Braden Score	N	Age	BMI*	Braden Score	N	Age	BMI*	Braden Score	
		Mean	Mean	Mean		Mean	Mean						
Number of pressure ulcers	4,399	81.7	23.8	18.2	14,962	62.5	25.9	20.8	19,361	66.9	25.4	20.2	
Patients with number of wounds	1	313	84.6	22.2	14.5	924	73.4	24.6	16.1	1,237	76.2	24.0	15.7
	2	101	80.2	22.3	13.3	499	75.1	25.2	15.3	600	76.0	24.8	15.0
	3	21	80.5	22.4	13.0	210	77.2	24.3	13.7	231	77.5	24.2	13.6
	4	12	83.0	22.3	11.8	133	76.1	23.6	12.8	145	76.6	23.5	12.7
Patients with (worst) grade pressure ulcers	1	222	84.5	22.4	14.5	987	74.6	24.7	16.2	1,209	76.4	24.3	15.9
	2	127	83.9	22.2	14.5	496	74.3	25.2	14.8	623	76.3	24.6	14.8
	3	67	79.4	21.8	13.4	198	74.3	24.0	13.9	265	75.6	23.4	13.8
	4	31	81.5	22.3	11.0	85	76.1	23.0	12.5	116	77.6	22.8	12.1

* BMI = Body mass index

The frequency of wounds per hospital patient including and excluding grade 1 pressure ulcers was higher (1.91 and 2.02, respectively) than in nursing homes per resident (1.42 and 1.48, respectively).

Table 3 gives more detailed information about the frequency of wounds in all pressure ulcer patients (1,842 including and 888 excluding grade 1). Including (and excluding) grade 1, approximately 53.7% (54.3%) of the persons had one ulcer, 27.4% (23.8%) had two ulcers, 11.3% (12.5%) had three ulcers, and 7.5% (9.5%) had four or more ulcers. Regardless of grade 1 status, more hospital patients had multiple ulcers than nursing home residents. Approximately half of all patients in hospitals had more than one ulcer; including grade 1, 8.8% of patients had more than three pressure ulcers, and 11.2% had four or more severe pressure ulcers ranging from grade 2 to grade 4.

Location and severity. The most common location of pressure ulcers was the sacrum/lower back (47.3% of ulcers in hospital patients, 53.8% of ulcers in nursing home residents) (see Figure 1). Approximately 25% of all wounds were found in the heel area (25.3% of hospital patients; 22.9% of nursing home residents). Elbow, hip, and ankle wounds occurred in about 5% of all persons with pressure ulcers. Although no differences between settings were noted for ulcers in the ankle area, wounds in the elbow area were more com-

mon for hospital patients than for nursing home residents (7.3% and 1.7%, respectively); wounds in the hip area were more common for nursing home residents than for hospital patients (5.7% and 2.6%, respectively).

Wound severity (n = 3,857) is shown in Figure 2. Most wounds were classified as grade 1; they were found in 10% more hospital patients (63.6%) than nursing home residents (53.6%). Approximately 25% of all wounds were grade 2 with only small differences in number of patients between both kinds of institutions. More than 20% of all wounds in nursing home residents were deep ulcers (15.6% of residents had grade 3 and 6.4% had grade 4). Deep ulcers were less common in hospital patients (9.3% had grade 3 ulcers and 3.8% had grade 4).

Figure 3 combines severity and location data to identify the location most severely affected in both types of institutions. The majority of all observed wounds in the elbow area were superficial grade 1 wounds; whereas, the hip area had more severe ulcers. More than 50% of hip ulcers in nursing home residents were grade 3 and grade 4.

Origin and history of pressure ulcer wounds. Most wounds developed during institutional stay — 51.4% of the pressure ulcers were acquired during hospital stay and 60.2% during nursing home residence; 10% of hospital patients' wounds and 6.1% of nursing home

residents' ulcers were of unknown origin. All other wounds developed outside the institution. More than half of the wounds in hospital patients (57.4%) and 26.4% of wounds in nursing home residents developed less than 2 weeks before the survey day. In 43.9% of nursing home residents, wounds had developed 2 weeks to 3 months before the survey, in hospital patients, 35.2%. Long-term persistence of pressure ulcers was not common in hospital patients (7.4%) in comparison to nursing home residents, where 29.4% of all wounds had been present for longer than 3 months.

Characteristics of persons with multiple and different degrees of severe pressure ulcers.

No generally accepted system exists to classify persons according to their pressure ulcers — ie, if they have one or more or different grades of severe pressure ulcers. To assimilate data, Table 4 shows the number of ulcers, mean age, mean BMI, and mean Braden score of persons suffering from none, one, two, three, and more than three pressure ulcers and of persons having a grade 1, grade 2, grade 3, or grade 4 pressure ulcer.

A difference with regard to age and frequency of pressure ulcers was noted among hospital patients. The average age of patients without any pressure ulcers was 62.5 years; patients with one pressure ulcer were, on average, 73.4 years and even older if they had more than one ulcer. These differences were not as distinct in nursing homes. The BMI scores showed little differences between the worst pressure ulcer grade and the number of pressure ulcers, regardless of the kind of institution, and ranged from 23.0 to 25.9 in hospitals and from 21.8 to 23.8 in nursing homes.

The mean Braden score was a sensitive parameter regarding the number or grade of pressure ulcers. The scores for hospital patients and nursing home residents

without any pressure ulcer were 20.8 and 18.2, respectively. In both types of institutions, the scores dropped by approximately 4 points if a person had one or a less severe pressure ulcer. Patients and residents with two ulcers had mean Braden scores of 15.3 and 13.3, respectively. Patients and residents with more than three wounds had mean Braden scores of 12.8 and 11.8, respectively. Hospital patients with severe pressure ulcer wounds (grade 4) had a Braden score 12.5; nursing home residents, 11.0.

Discussion

When interpreting data in Tables 2, 3, and 4 and Figures 1, 2, and 3, it is important to remember that different denominators had to be used because the examined persons in each setting noticeably differed with regard to their individual Braden scale risk assessments. If these groups are standardized — in this case, according to a Braden score of 20 points or less — comparisons of the prevalence rate and the frequency (see Table 2 and Table 3) are more meaningful. When comparing frequency and ulcer grade with personal demographics (see

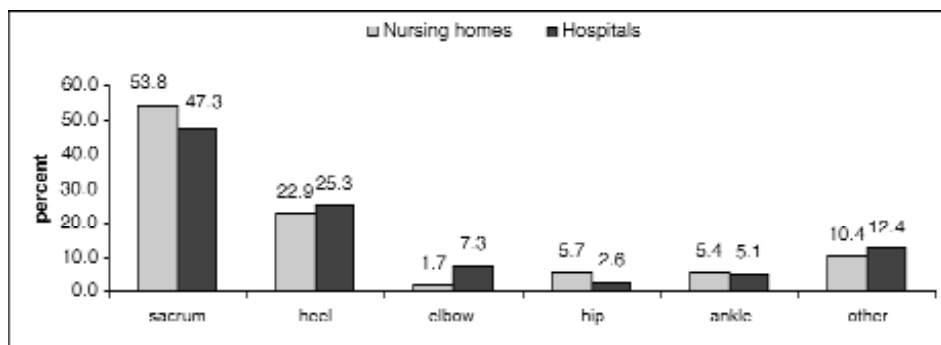


Figure 1. Pressure ulcer location distribution (n = 3,857).

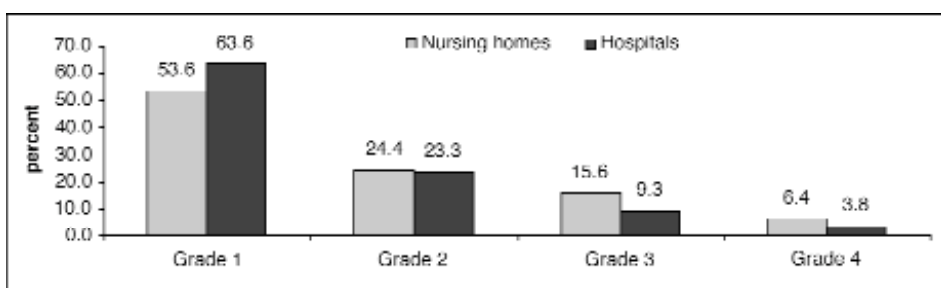


Figure 2. Pressure ulcer severity distribution (n = 3,857).

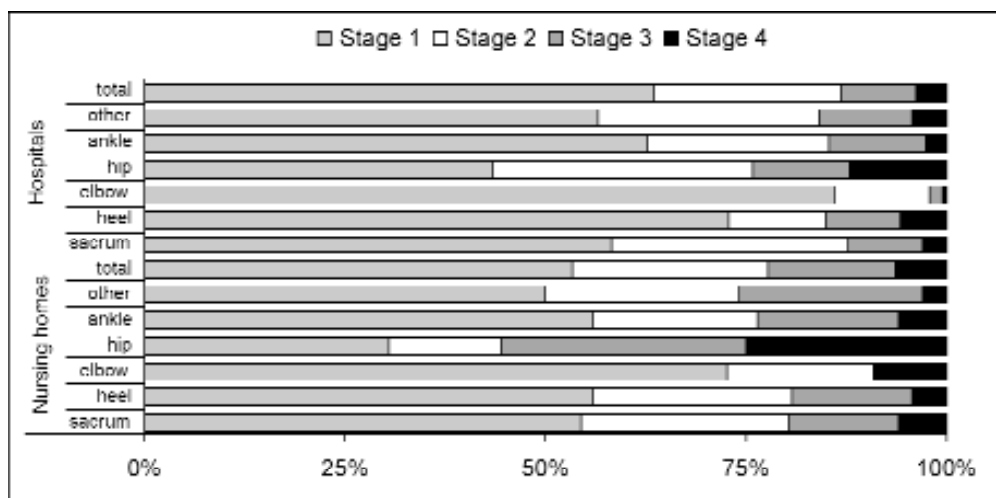


Figure 3. Pressure ulcer severity by ulcer location (n = 3,857).

Table 4), all patients and residents needed to be considered. This reveals the fact that even though a group is not at risk (according to the Braden score), pressure ulcers are present. This common problem is most likely due to the fact that so far no risk assessment scale is 100% predictive. A detailed analysis of this dilemma will be addressed by the authors in a future article.

The 1,842 at-risk persons (Braden score ≤ 20) in the analysis of 3,857 pressure ulcers revealed that prevalence and frequency of pressure ulcers were higher in hospital patients than in nursing home residents. Regardless of whether grade 1 pressure ulcers were considered or not, approximately 50% of all hospital patients with pressure ulcers had multiple ulcers. Because the ulcers probably did not develop at the same time, the existence of one pressure ulcer could be easily regarded as a high risk indicator. Most of the pressure ulcers in the study were grade 1; therefore, findings of other studies¹⁷⁻²⁰ where grade 2 ulcers had the highest proportion could not be confirmed. It must be emphasized that identifying grade 1 pressure ulcers is difficult.²⁹ This has to be considered when studies with a high proportion of grade two ulcers are compared to those results. More severe (higher grade) pressure ulcers were more common in nursing home residents than in hospital patients.

Lower back area (sacrum) pressure ulcers were predominant in this study and present in almost 60% of nursing home residents. This confirms most of the findings of other researchers.²²⁻²⁴ The most remarkable

difference in the location of ulcers between both kinds of institutions was found in the hip and elbow areas. Although the percentage of ulcers in the hip area was quite low in comparison to heels and sacrum, the large number of severe ulcers in that area was notable and may indicate inadequate use of appropriate positioning or

preventive measures.

More than half of all wounds developed while in an institution; in nursing home residents, more than 60% of ulcers occurred while residents were in the facility. These data speak to the potential to improve prevention inside the institution using training and the introduction and evaluation of guidelines and standards to reduce pressure ulcer prevalence rates. Finally, 30% of all wounds in nursing home residents existed for more than 3 months but comparisons with hospital patients are difficult because length of stay in nursing home residents (average >2 years) is much longer than in hospitals (average 8 days).

Comparing demographics of patients with and without pressure ulcers showed that hospital patients with a pressure ulcer are older, have a slightly lower BMI, and have a considerably lower Braden score than patients without a pressure ulcer. The BMIs and Braden scores were generally lower in nursing home residents than in hospital patients; they also showed only small differences in the BMI but a great difference in the Braden score. Patient age in the institutions was the same. Differences between hospital patients and nursing home residents regarding age and BMI were not significant where people had one, many, or superficial or severe ulcers. With respect to the number and severity of the ulcers, the Braden score proved to be much more important. The more frequent and the more severe the pressure ulcers, the lower the Braden score of the persons concerned.

Limitations

Although the facility participation rate was low, it still yielded a diverse facility base and a substantial participant base from which to draw conclusions. Most states of the Federal Republic of Germany participated, as well as almost every kind and size of healthcare organization. Participation was voluntary, however, and no random or quota procedure had been used. Therefore, no final statement about the quality of representation can be made. However, thus far, results of every annual survey conducted since 2001 more or less confirm the findings.

Conclusion

The wound analyses of the pressure ulcer surveys of 2002 and 2003 provided more detailed information about the problem of pressure ulcers in German healthcare institutions and allowed researchers to draw more complete conclusions regarding prevention and treatment in each type of institution. Most of the findings in German nursing homes and hospitals were similar to those of other international studies. Only small differences between the two types of institutions studied were found regarding issues such as ulcer location, origin, and severity but differences increased when ulcer history, number of ulcers per person, and prevalence rates were considered. Epidemiological data such as pressure ulcer prevalence are necessary for healthcare planners and administrative representatives — detailed analyses of pressure ulcers may be even more interesting for practitioners and clinicians who can readily apply the following findings:

More than half of all people with pressure ulcers have two or more wounds — the existence of one wound appears to be a strong indicator for the development of more wounds.

The Braden score can be used not only to distinguish persons at risk of developing a pressure ulcer based on a certain sum score or cut-off point, but also to distinguish people with single pressure ulcers, superficial wounds, and multiple, severe wounds.

The high percentage of chronic wounds persisting for 3 months or longer in nursing home residents may indicate a need for alternative treatment methods.

More data are required to be able to analyze whether, for example, certain ulcer characteristics are related to patient demographic data. Therefore, annual data col-

lection will continue in the facilities that participated in this study, enabling researchers to collect more detailed data and conduct focused analyses. - OWM

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