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Prevalence of pressure ulcers on hospital admission among nursing home residents transferred to the hospital

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Abstract

The purpose of this study was to compare the prevalence of pressure ulcers among newly hospitalized nursing home residents and among newly hospitalized patients from nonnursing home settings. Study participants were at least 65 years old and admitted through the emergency department to one of two study hospitals. Research nurses ascertained the presence of pressure ulcers (stage 1–4) by visual skin assessment on the third day following admission to the hospital unit. Other data were collected by clinical examination, interview, and medical record review. The prevalence of preexisting pressure ulcers at the time of admission was 26.2% among those admitted from a nursing home and 4.8% among those admitted from another living situation (odds ratio 5.5, 95% confidence interval 4.3–7.1). After adjustment for confounders, the association between admission from a nursing home and pressure ulcer prevalence on admission was reduced (odds ratio 1.51, 95% confidence interval 1.03–2.23). These results indicate that admission from a nursing home is a potent marker for pressure ulcer risk and that the excess risk is largely mediated by the higher prevalence of pressure ulcer risk factors among patients admitted from a nursing home. The results highlight the importance of continuity of care across transitions between care settings.

Pressure ulcers can occur in all age groups but are a particular problem in elderly persons living in a variety of settings. Because pressure ulcers are associated with significant morbidity and increased health care costs,^{1–3} the identification of persons with pressure ulcers and of those at risk for pressure ulcers is an important component of preventive care in the elderly.

By virtue of nursing homes' admission criteria, residents of nursing homes are, on average, more dependent and impaired than elderly persons residing in the community. They are also more likely to suffer from chronic diseases, such as cancer and arthritis, which are associated with mobility limitation. Furthermore, nursing home residents transferred from a nursing home to an acute care hospital represent an older and more dependent subset of the general nursing home population.^{4,5} This suggests that many of the factors that increase the risk of pressure ulcers, including immobility and incontinence, may be more common in residents of nursing homes compared with those living in a community setting. As a result of this, one might expect that newly hospitalized patients from nursing homes would have an increased prevalence of

pressure ulcers at admission compared with elderly patients admitted from a community setting.

The purpose of this study, which was carried out among patients newly admitted to hospital medical units, was to compare the prevalence of pressure ulcers at the time of admission among patients admitted from a nursing home to the prevalence in patients from nonnursing home settings. We hypothesized that the higher prevalence of pressure ulcers among patients admitted from a nursing home is mediated by a higher prevalence of pressure ulcer risk factors in this group. Increased understanding of factors related to the prevalence of pressure ulcers at hospital admission can help to identify patients requiring timely initiation of treatment. Also, because pressure ulcers at hospital admission are a risk factor for the development of pressure ulcers during the hospital stay,⁶ prompt detection and treatment of pressure ulcers on admission can help to reduce the incidence of hospital-acquired pressure ulcers.

METHODS

Study design

This was a secondary analysis of data from a study conducted in two large inner city hospitals in Philadelphia, PA between 1998 and 2001. Study methods have been described in detail.⁶ Briefly, patients were at least 65 years old, admitted through the emergency department (ED) to one of the study hospitals, and still in the hospital on day 3, where day 1 was the day of inpatient admission. Each eligible patient was asked to give verbal consent to participate in the study. If the patient was unable to give informed consent, the patient's next of kin or authorized representative was contacted to obtain proxy consent. The Institutional Review Board of the University of Pennsylvania approved the study protocol.

Data collection

Trained research nurses ascertained the presence or absence of pressure ulcers (stages 1–4) by performing a thorough visual skin assessment on day 3 following admission to the hospital unit. Day 3 was chosen for reasons related to the aim of the parent study, which was to identify risk factors for pressure ulcers early in the hospital stay. Four sources of information were used to differentiate pressure ulcers that were present before the patient was admitted to the hospital (preexisting pressure ulcers) from pressure ulcers that were acquired after admission (hospital-acquired pressure ulcers): interview with patient or patient's family; interview with nurse or other hospital caregiver; hospital chart; and transfer form, if the patient had been transferred from another facility. On the basis of these sources of information, each pressure ulcer was classified as definitely hospital-acquired, possibly hospital-acquired, or preexisting using a set of rules that have been described previously.⁶ According to these rules, a pressure ulcer was considered to be preexisting if at least one source reported that it was present at admission and no source reported that it was absent. In addition, all stage 4 pressure ulcers were considered to be preexisting even if one or more sources reported that the pressure ulcer was absent at admission. Results concerning possibly or definitely hospital-acquired pressure ulcers have been reported previously.⁶ The current study considers only preexisting pressure ulcers.

During the skin examination, the research nurse recorded clinical observations including cognitive impairment (presence of confusion or stupor), whether the patient was chair- or bedbound, and whether the patient needed help turning in bed during the skin examination. Urinary or fecal incontinence was considered to be present if moisture due to urine or soiling due to stool, respectively, was observed by the research nurse during the skin examination. In addition, for approximately 23% of patients for whom medical record abstraction was performed, urinary or fecal incontinence was considered to be present if there was a record of incontinence in the chart, even if moisture or soiling was not observed by the research nurse.

An interview with the patient or proxy respondent was used to obtain information on weight and height, prehospital residential status, and history of previous hospitalizations. Patients were classified as being at low risk, moderate risk, or high risk of nutrition-related complications, based on history of recent weight loss and on the presence of physical signs (subcutaneous fat depletion, muscle wasting, ankle or sacral edema, and ascites).⁷ Body mass index (BMI) was defined as weight/height². Self-reported or proxy-reported information on height and weight was solicited as part of the interview of the patient (or proxy in the case of cognitively impaired patients). Height and weight were also available by medical record abstraction for approximately 23% of the patients. When both sources were available but disagreeing, the medical record value was used. For approximately 10% of patients, BMI could not be calculated because height or weight information was missing in both sources. We used multiple imputation as implemented in SAS v 8.0 (SAS Institute, Cary, NC; 2000) (PROC MI) to estimate missing BMI.⁸⁻⁹ Categories of BMI were created according to the National Institutes of Health standards.¹⁰

Statistical analysis

The prevalence of preexisting pressure ulcers was estimated by dividing the number of patients with one or more pressure ulcers on admission to the hospital by the total number of patients. The chi-square test was used to compare the distribution by pressure ulcer stage and by pressure ulcer site between patients admitted from nursing home and those admitted from other settings. Multiple logistic regression analysis was performed, with admission from a nursing home as the exposure variable, the presence of one or more pressure ulcers on admission as the outcome variable, and adjusting for confounding variables (age, cognitive impairment, chair- or bedbound, inability to turn in bed, incontinence of stool, incontinence of urine, and risk of nutrition-related complications). A confounder was defined as a variable whose inclusion changed the odds ratio (OR) for the association between pressure ulcers and admission from a nursing home by more than 10%.

Results

Of 3,233 eligible patients, three were excluded because information pertaining to their residence before hospital admission was missing. Of the remaining 3,230 patients, 283 (8.8%) were admitted from a nursing home, 2,906 (90.0%) were admitted from home, and 41 (1.3%) were admitted from another location. For this analysis, patients admitted from home and other nonnursing home settings were combined.

Study participants were predominantly female (61%) and African American (70%), and 18.2% were aged 85 or more (Table 1). Patients admitted from a nursing home were more likely to be chair- or bedbound, to be cognitively impaired, and to need help turning in bed. Also, these patients were more likely than patients from other settings to be incontinent of stool, to be incontinent of urine, and to have a moderate or high risk of nutrition-related complications.

Of the 3,230 patients examined, 214 (6.6%, 95% confidence interval [CI] 6.4–6.8%) had one or more preexisting pressure ulcers. The mean number of pressure ulcers among patients with preexisting pressure ulcers was 1.6 (standard deviation [SD] 0.8); the mean was identical in patients admitted from a nursing home and those admitted from another setting. Among patients with at least one preexisting pressure ulcer, 57.0% had one pressure ulcer, 26.2% had two, and 16.8% had three; the distribution was almost identical among patients admitted from a nursing home as among patients admitted from another setting (data not tabulated).

There were 342 pressure ulcers among the 214 patients with at least one pressure ulcer. Almost half of the preexisting pressure ulcers were stage 2 (46.8%); 6.1% were stage 1, 7.0% were stage 3, and 3.5% were stage 4 (Table 2). Stage 1 pressure ulcers were less common, and stages

3 and 4 pressure ulcers were more common, among patients admitted from a nursing home than among patients admitted from other settings ($p=0.003$). More than one-third, although confirmed pressure ulcers, were unstageable because they were obscured by necrotic tissue or by a bandage. The most common pressure ulcer sites were the sacrum (39.2%), the heel (19.6%), the ischium (14.6%), and the trochanter (5.0%). The distribution of sites was similar in the two groups ($p=0.8$).

The prevalence of preexisting pressure ulcers was 26.2% among those admitted from a nursing home and 4.8% among those admitted from another living situation (Table 1) (OR 5.5, 95% CI 4.3–7.1). After adjustment for confounders, the association between admission from a nursing home (vs. admission from another setting) and pressure ulcer prevalence on admission was reduced, but was still significant (OR 1.51, 95% CI 1.03–2.23) (Table 3). Being chair- or bedbound, inability to turn in bed unassisted, fecal incontinence, and higher risk of nutrition-related complications were all strongly and significantly related to prevalence of pressure ulcers on admission.

DISCUSSION

In this study, patients admitted from a nursing home were more than five times more likely to have a preexisting pressure ulcer on admission to the hospital than those admitted from another setting (usually home). Adjusting for confounders reduced the OR substantially, suggesting that much of the excess prevalence can be attributed to the higher prevalence of pressure ulcer risk factors among patients admitted from a nursing home. However, even after adjusting for risk factors, the OR of a preexisting pressure ulcer was 50% higher in patients admitted from a nursing home than in patients admitted from another setting, and the OR was statistically significant. The presence of pressure ulcers was strongly and significantly associated with being chair- or bedbound, inability to turn in bed, fecal incontinence, and nutritional risk. These results are consistent with previous research,^{11–13} and are not surprising because these variables were selected as confounders because of their known status as pressure ulcer risk factors. The fact that transfer from a nursing home is strongly associated with pressure ulcer prevalence at the time of hospital admission may be at least partly explained by the fact that many of the risk factors for nursing home admission (e.g., functional dependence, mobility impairment, and incontinence) are also pressure ulcer risk factors.

The prevalence of pressure ulcers on admission to the hospital, as reported in five studies from Germany, Denmark, the United Kingdom, and the United States, ranges between 1.1 and 6.6%.^{14–18} Because these studies included hospital patients of all ages and did not report age-specific prevalences, these results cannot be compared with the results of our study, which was limited to patients aged 65 and over. In the five previous studies, the primary aim was to estimate incidence or prevalence of pressure ulcers among patients during their hospitalization, and the results concerning pressure ulcers at admission were secondary. Only one study, by Williams et al.,¹⁹ has focused specifically on pressure ulcers on admission to a hospital. In that study of 267 patients admitted to a military medical facility in Hawaii, the prevalence at the time of admission was 12.7%. This is higher than the 6.6% observed in the current study, even though our study limited eligibility to an age group (65 and over) that is at higher risk. The higher prevalence in the Williams et al. study might be explained by the fact that the majority of patients were surgical patients, whereas our study was limited to medical patients. Also, in the Williams et al. study, patients were transported from a variety of locations throughout the Pacific Rim for medical or surgical evaluation. According to the authors, these patients most probably represent a population that is sicker than normal active-duty hospital patients and pressure ulcers might have developed during the long transport to the Hawaii Medical Center.¹⁹ The number of pressure ulcers among patients with at least one pressure ulcer on admission was higher in our study (mean 1.6) than in the Williams et al. study (mean 1.2). In both studies,

approximately 10% of the pressure ulcers observed were stage 3 or 4. However, in the Williams et al. study, the proportion of stage 1 pressure ulcers was much higher (52.5%) than in our study (6.1%).

In this study, we were not able to ascertain the time of onset of pressure ulcers that were observed at the time of admission to the hospital. For patients admitted from a nursing home, it is reasonable to assume that most pressure ulcers were present at the time that the resident was discharged from the nursing home. This is supported by the fact that 99% of the pressure ulcers in that group were stage 2 or higher. However, it is also possible that some pressure ulcers observed at hospital admission were not acquired in the nursing home but developed during ambulance transport from the nursing home to the hospital.²⁰

A major strength of this study is the large sample size. The fact that almost 70% of study patients were African American is a strength, given the dearth of knowledge about pressure ulcers in minority groups.² Also, pressure ulcer status was ascertained by direct observation by specially trained research nurses. In a related substudy, the sensitivity and specificity of our research nurses' ascertainment of pressure ulcers from digital photographs (with consensus assessment by two wound experts as the gold standard) were 97 and 81%, respectively.²¹ One limitation of the study is related to the fairly insensitive measures of some of the pressure ulcer risk factors. For example, our measures of cognitive impairment, incontinence, and activity were based on a single brief observation by the research nurse. Furthermore, the risk factors were assessed approximately 48 hours after admission to the inpatient unit, whereas the outcome, preexisting pressure ulcers, refers to the period before admission. Although the patient's status with respect to risk factors such as nutrition, BMI, and immobility is likely to have been stable over a 48-hour period, the possibility of inadequately controlled confounding cannot be excluded. The possibility of residual confounding is also increased by the fact that information on certain pressure ulcer risk factors, such as comorbidity and medication use, was not available in this data set. This was a result of the fact that, in the parent study, medical record abstraction was only performed for patients with hospital-acquired pressure ulcers and for a subset of the noncases. Thus, for the present analysis, which was based on the entire cohort, we only had access to information collected during the assessment by the research nurse. Another limitation is that, because the parent study focused on hospital-acquired pressure ulcers, patients with < 3 days of hospital stay were not included. Thus, the results of this study should not be generalized to patients with very short stays and who, therefore, may have less severe illnesses. Also, the results of the study may not be generalizable to countries other than the United States, because cultural factors and differences in health care funding may affect the timing and criteria for nursing home admission, and may affect the criteria for transfer from nursing home to hospital. About one-third of the pressure ulcers were unstageable because they were obscured by necrotic tissue or a dressing. However, it is probable that these pressure ulcers were stage 2 or higher because the presence of necrotic tissue or of a dressing is suggestive of a more severe wound. Finally, it should be remembered that the data for this study were gathered between 1998 and 2001. The prevalence of pressure ulcers in acute care settings has remained fairly stable over this time period,²² although we cannot exclude the possibility that the prevalence of pressure ulcers at the time of admission to the hospital has changed.

Our results indicate that patients from a nursing home are more than five times more likely to have a pressure ulcer on admission to the hospital than other patients. Even if this association is not causal, it is clear that admission from a nursing home is an important marker for pressure ulcer risk. In a busy setting such as the ED, elderly nursing home residents often arrive without family or friends and enter the hospital setting without an advocate for their comfort and safety. Hospital staff's awareness of admission from a nursing home as a strong correlate of preexisting pressure ulcers, and a strong predictor of hospital-acquired pressure ulcers, could permit the

timely implementation of preventive and treatment measures once the patient arrives at the hospital.

The transfer of nursing home residents to acute care settings occurs more frequently because of the initiation of Medicare's prospective payment system,^{23,24} and more than one quarter of nursing home residents are transferred to an acute care hospital every year.^{4,5} Among nursing home residents, having a pressure ulcer is associated with a higher probability of hospitalization.⁴ Furthermore, many nursing home residents are transferred to hospitals without adequate transfer documentation,²⁵ and pressure ulcers are underreported in transfer documentation.²⁶ Our results highlight the importance of maintaining the continuity of care across transitions between care settings^{25,27} and of improving the safety of nursing home residents who require transfer to a hospital.

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Table 1

Characteristics of study participants

Characteristic	All patients (<i>n</i> =3,230) (%)	Patients admitted from nursing home (<i>n</i> =283) (%)	Patients admitted from other settings (<i>n</i> =2,947) (%)	Prevalence ratio* (95% CI)
Age 85 years or more	18.2	36.4	16.4	2.2 (1.9–2.6)
Female	60.9	68.9	60.2	1.1 (1.1–1.2)
African American	69.5	82.0	68.3	1.2 (1.1–1.3)
Hospitalization in previous 6 months	36.8	50.7	35.5	1.4 (1.3–1.6)
Cognitive impairment	9.7	46.9	6.3	7.5 (6.2–9.0)
Chairbound or bedbound	25.0	82.2	19.6	4.2 (3.8–4.6)
Unable to turn from back to side in bed	24.5	71.3	20.0	3.6 (3.2–3.9)
Incontinent of stool	7.6	31.1	5.4	5.8 (4.6–7.3)
Incontinent of urine	9.9	25.9	8.3	3.1 (2.5–3.9)
High risk of nutrition-related complications	5.3	11.4	4.7	2.4 (1.7–3.5)
BMI < 18.5	9.7	19.1	8.8	2.2 (1.7–2.8)
Pressure ulcer on admission to the hospital	6.6	26.2	4.8	5.5 (4.3–7.1)

BMI, body mass index; CI, confidence interval.

* Ratio of the proportion with the characteristic among patients admitted from a nursing home to the proportion with the characteristic among patients admitted from other settings.

Table 2

Characteristics of pressure ulcers

Characteristic	All pressure ulcers (<i>n</i> =342) (%)	Pressure ulcers among patients admitted from a nursing home (<i>n</i> =117) (%)	Pressure ulcers among patients admitted from other settings (<i>n</i> =225) (%)
Pressure ulcer stage*			
Stage 1	6.1	0.9	8.9
Stage 2	46.8	45.3	47.6
Stage 3	7.0	12.8	4.0
Stage 4	3.5	4.3	3.1
Unstageable (necrotic tissue)	14.3	12.0	15.6
Unstageable (dressing)	22.2	24.8	20.9
Pressure ulcer site**			
Sacrum	39.2	39.1	39.3
Heel	19.6	22.2	18.2
Ischium	14.6	14.5	14.7
Trochanter	5.0	5.1	4.9
Lateral malleolus	2.9	2.6	3.1
Other	18.7	16.2	20.0

* $p=0.003$ by chi-square test.

** $p=0.8$ by chi-square test.

Table 3Results of logistic regression ($n=3,159$)*

Variable	Odds ratio**	95% confidence interval	p-value
Admitted from a nursing home	1.51	1.03–2.23	0.037
Age (years)			0.367
65–74	Reference	—	
75–84	1.32	0.89–1.95	
85 or more	1.14	0.73–1.79	
Cognitive impairment	1.46	0.99–2.14	0.058
Chairbound or bedbound	4.79	3.09–7.42	< 0.0001
Unable to turn in bed	2.38	1.57–3.61	< 0.0001
Incontinent of stool	1.92	1.28–2.88	0.002
Incontinent of urine	1.08	0.72–1.62	0.721
Risk of nutrition-related complications			< 0.0001
Low	Reference	—	
Moderate	2.21	1.56–3.12	
High	2.35	1.41–3.93	

* The outcome variable for this analysis was the presence of one or more pressure ulcers stage 1 or higher at the time of admission to the hospital.

** The odds ratio for each variable was adjusted for all the other variables.