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Risk Factors for Hospital-Acquired Incontinence in Elderly Female Hip Fracture Patients

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Background. The objective of this study was to estimate the incidence of, and identify risk factors for, incontinence in female hip fracture patients. The study was a secondary analysis of data abstracted from medical records in hospitals in Pennsylvania, Texas, New Jersey, and Virginia.

Methods. The study included women aged 60 years and older who were admitted to one of the study hospitals with hip fracture. Measurements included incontinence at discharge as recorded in the medical records, demographic information, cognitive and functional status, and two measures of severity of illness (Charlson Comorbidity Index and Sickness at Admission Scale score).

Results. Data from 6516 women were analyzed. Twenty-one percent (n = 1365) became incontinent during hospitalization. After adjusting for confounders (i.e., age, race, malnutrition, comorbidity, and severity of illness), admission from a nursing home or other long-term care facility (odds ratio [OR] 1.68, 95% confidence interval [CI] 1.29–2.19), confusion (OR 3.44, 95% CI 2.79–4.24), use of a wheelchair or device for walking (OR 1.53, 95% CI 1.29–1.83), and prefracture dependence on others for ambulation (OR 2.51, 95% CI 1.64–3.85) significantly increased the odds of developing incontinence during hospitalization.

Conclusion. Hospital-acquired incontinence affects 21% of female hip fracture patients. Certain easily identifiable patient characteristics place female hip fracture patients at high risk. Interventions to increase staff awareness of this vulnerable population need to be tested to minimize the incidence of hospital-acquired incontinence.

THERE are few recent prevalence estimates of incontinence in hospitalized patients. In 1987, approximately 24% of patients between 65 and 74 years of age and 48% of patients 75 years and older had at least one episode of incontinence during hospitalization (1). In 1991, the age-standardized prevalence for hospitalized women aged 65 years and older was 16.8 per 10,000 population per year for whites and 9.7 per 10,000 population for blacks (2). Incontinence is often overlooked in hospitalized elderly patients (3). Researchers analyzing Veterans Administration administrative data found that although 43% of the patients were incontinent, only 3.4% of cases had incontinence as a discharge diagnosis (4).

Urinary incontinence in elderly adults, both men and women, is associated with cognitive impairment and immobility (5, 6). It is also associated with higher body mass index, diabetes, chronic obstructive pulmonary disease, poor overall health, and prior hysterectomy in older women who live in the community (7). An association between urinary incontinence and fractures in women has been noted (8).

Few studies have investigated the incidence of incontinence in frail older adults. One study investigating urinary incontinence in nursing home residents reported that 22% of women residents who were continent at admission were incontinent one 1 year later. In that study, the development of urinary incontinence by 1 year after admission was found to be associated with presence of dementia, inability to walk independently at 2 months, and poor adjustment to the nursing home at 2 weeks (9). In a study with hospitalized hip fracture patients, the incidence of urinary incontinence in women was 24% (10).

It is estimated that by 2050, 6.26 million people worldwide will experience a hip fracture (11). Each year in the United States, elderly people, the majority of whom are women, fracture a hip in a fall. One in every six women in the United States will experience a hip fracture in her lifetime (12). Because the number of elderly women admitted to hospitals for hip fracture is high, measures that result in decreased frequency of complications (such as incontinence) could result in a significant decrease in patient suffering and in the costs associated with hospital, rehabilitation, nursing home, and home-based care.

The purpose of this study was to estimate the incidence of hospital-acquired incontinence in elderly hip fracture patients and to determine the risk factors associated with the development of incontinence.

Methods

We performed a secondary analysis of data collected in the course of a retrospective cohort study on surgical blood transfusion (13). The aims of the original study were to identify patient-related, procedure-related, and institution-related risk factors for perioperative transfusions in patients with hip fracture and to compare the operative death rates between patients who received transfusions to those who did not.

Table 1. Selected Characteristics of the Study Population ($N = 6516$)

Characteristic	*n*	%	*M*	*SD*	Median
Sickness at Admission Scale Score			5.2	4.3	4.5
Length of Stay (days)			15.3	12.4	13.0
Length of Foley Catheter Use (days)			8.2	6.1	7.0
Age			80.3	8.6	81.0
<80 years	2774	42.6			
≥80 years	3742	57.4			
Race					
Caucasian	5722	87.8			
African American	429	6.6			
Other	365	5.6			
Geographic Site					
Pennsylvania	1833	28.1			
Texas	1800	27.6			
New Jersey	1764	27.1			
Virginia	1119	17.2			
Type of Surgery					
Internal fixation	4053	62.3			
Arthroplasty	2285	35.1			
Total hip replacement	172	2.6			
Missing	6				
Length of Stay (days)					
0–12	3242	49.8			
13–30	2888	44.3			
>30	386	5.9			
Preadmission Residence					
Own home	5099	79.0			
Retirement home or congregate housing	349	5.4			
Nursing home or other long-term care facility	1005	15.6			
Missing	63				
Confusion					
Yes	1308	20.1			
No	5208	79.9			
Prefracture Walking Ability					
Independent	4531	71.4			
Independent, wheelchair or device	1575	24.8			
Dependent on others	242	3.8			
Missing	168				
Prefracture ability to transfer from bed to chair					
Unable	291	4.6			
Able	6024	95.4			
Missing	201				
Malnutrition					
No malnutrition	5628	86.6			
Underweight	624	9.6			
Malnourished	245	3.8			
Missing	19				
Charlson Comorbidity Index					
0	3516	54.0			
1 or more	3000	46.0			
Urinary Foley Catheter Used During Hospitalization					
No	1570	24.1			
Yes	4946	75.9			
Urinary Tract Infection During Hospitalization					
No	5416	83.2			
Yes	1096	16.8			
Missing	4				
Urinary Incontinence at Discharge					
No	4890	78.6			
Yes	1508	21.4			
Missing	118				
Discharge Disposition					
Home	2276	35.0			
Nursing home or skilled care facility	2250	34.6			
Rehabilitation facility or unit	1621	24.9			
In-hospital death	191	2.9			
Retirement home	102	1.6			
Other	70	1.0			
Missing	6				

Study Population

The study included patients aged 60 years and older who underwent surgical repair of a fractured hip at one of 20 hospitals between 1983 and 1993. Patients were not eligible for the original study if they refused blood transfusion for religious reasons; had metastatic cancer, multiple myeloma, or an above-the-knee amputation; were a paraplegic or quadriplegic; or if the fracture was the result of trauma causing multiple injuries requiring surgery. All men and any women patients who were incontinent prior to hip fracture or who had a Foley catheter prior to admission were excluded from all analyses because they were not at risk for hospital-acquired incontinence. The participating hospitals included university, community, and Veterans Administration medical centers and were located in New Jersey, Pennsylvania, Virginia, and Texas.

Data Collection

Data were abstracted from the medical record covering the time of admission through the 30th day following surgery, or time of discharge if prior to 30 days postsurgery. Information was collected on multiple demographic and clinical characteristics. Trained study personnel collected data using a standardized pretested form. A random sample of charts was reviewed for quality assurance.

Study Variables

The determination of the outcome variable, hospital-acquired incontinence, was made on the basis of the answer to the following question on the chart abstraction form: "Was the patient continent of bowel or bladder at discharge?" (yes/no). Patients who were documented as incontinent at discharge were considered to be cases of hospital-acquired incontinence.

Confusion was defined in the chart abstraction form as confusion, disorientation, global intellectual impairment, or memory loss preceding the hip fracture. Two measures of prefracture mobility (i.e., walking and transfers) were considered. Walking ability prior to the hip fracture was defined at three levels: patient was able to walk independently; patient was able to walk with a device or use wheelchair independently; and patient was dependent or totally unable to walk. Transfer ability prior to the hip fracture was defined as being able to transfer from bed to chair.

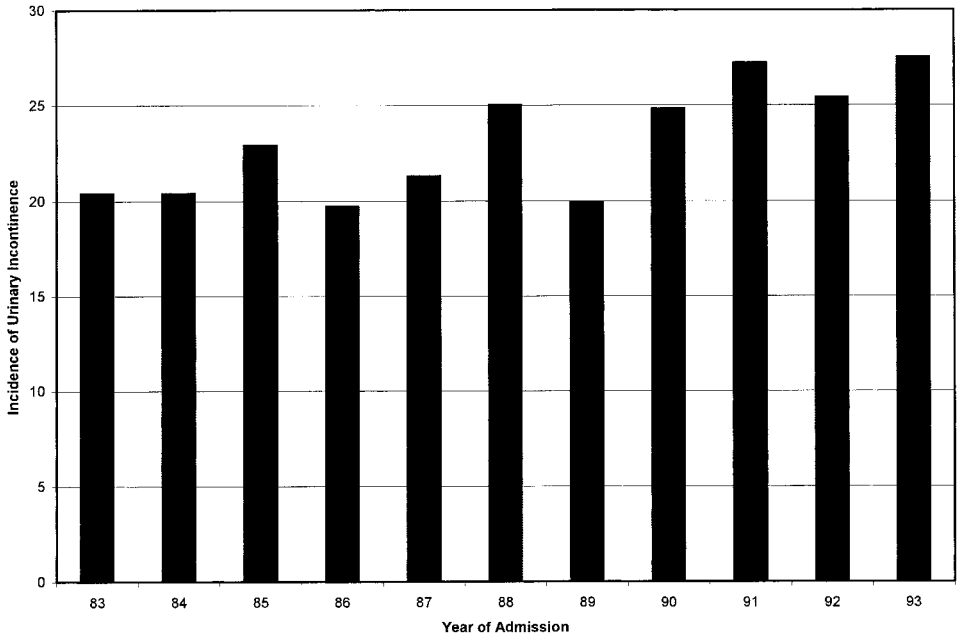

Figure 1. Urinary incontinence in hospitalized female hip fracture patients, 1983–1993.

Malnutrition, as determined in the course of the admission physical exam and as documented in the medical record, was defined at three levels: no malnutrition, underweight, or malnourished/cachectic. Two measures of patients' overall health status were also included: Charlson Comorbidity Index, which was originally designed to predict mortality in hospitalized patients (14), and the Sickness at Admission Scale (hip fracture version), developed specifically to predict mortality in hip fracture patients (15). The Charlson Comorbidity Index scores in this study ranged from 0 to 7 and were highly skewed toward low values; therefore, a dichotomous variable (0 vs 1 or more) was created (13).

Data Analysis

The initial step in the analysis consisted of characterizing study subjects by demographic characteristics, such as age and race, and by clinical characteristics, such as site of fracture and type of surgery performed. The crude cumulative incidence of hospital-acquired incontinence was defined as the number of patients with incontinence at discharge divided by the number of patients who had no incontinence and no Foley catheter prior to admission. The incidence of incontinence was examined in subgroups defined by the risk factors of interest (i.e., admission from nursing home or other long-term care facility, confusion, and impaired mobility), and the significance of the association of the risk factors with incontinence was ascertained using chi-square tests.

To determine if there were differences over time in the unadjusted relative risks for the risk factors of interest, data from 1983–1988 and 1989–1993 were analyzed separately. When the relative risks for the two time periods differed by more than 10%, the unadjusted relative risks and 95% confidence intervals for both time periods were reported.

Multivariate analysis was performed using multiple logistic regression, with the presence of incontinence at discharge (yes/no) as the outcome variable. To control for possible within-hospital correlation, we used the Generalized Estimating Equations (GEE) approach to carry out logistic regression as implemented in the SAS Genmod (SAS Institute, Cary, NC) procedure. The measure of association was the adjusted odds ratio and its 95% confidence interval. Potential confounders (i.e., age, race, malnutrition, severity of illness, and comorbidity) that were identified in the univariate analysis as being significantly ($p < .10$) associated with the outcome were entered one by one and were retained in the model if the p value was less than .10. For continuous variables (e.g., age, severity of illness), we examined linearity by including a quadratic term in a logistic regression model; none of these terms was found to be significant, so they were entered as continuous variables in models.

Results

Of the 9598 hip fracture patients in our data set, 7539 were women. Of these, 1023 were incontinent at admission or had a Foley catheter prior to admission and were thus excluded from further analyses, leaving 6516 women for the present analyses. Demographic and clinical characteristics of the sample are shown in Table 1. The median length of stay was 13 days (range 0–216 days). The median length of stay for those admitted from 1983–1988 was 14 days as compared to 11 days for those admitted from 1989–1993 ($p = .001$). More than three-quarters of the patients had an indwelling Foley catheter, and 16.8% had a urinary tract infection at some time during the hospital stay. The median length of indwelling catheter use was 7 days, range 0–70 days.

Twenty-one percent of the women had hospital-acquired incontinence at discharge. Incidence was 19.4% for 1983–

Table 2. Incidence of Hospital-Acquired Incontinence at Discharge by Patient Characteristics

Patient Characteristics	Incidence (%)	Unadjusted Relative Risks	95% Confidence Interval	*p* Value
Age				.001
<80	11.2	Referent	—	
≥80	29.1	2.59	2.31–2.92	
Race				.001
Caucasian	20.7	Referent	—	
African American	33.0	1.59	1.28–1.84	
Other	18.6	0.90	0.72–1.12	
Preadmission Residence				.001
Own home	15.8	Referent	—	
Retirement Home or Congregate Housing	28.1	1.78	1.49–2.13	
Nursing home or other long-term care facility	48.3	3.05	2.79–3.35	
Confusion				.001
No	13.8	Referent	—	
Yes	52.4	3.78	3.47–4.12	
Prefracture Walking Ability				.001
Independent	15.1	Referent	—	
Independent, wheelchair or device	31.2	2.06	1.87–2.29	
Dependent on others	55.5	3.68	3.20–4.21	
Prefracture Ability to Transfer from Bed to Chair				.001
Able	18.7	Referent	—	
Unable	53.0	2.83	2.51–3.20	
Malnutrition				.001
No malnutrition	20.8	Referent	—	
Underweight	21.4	1.03	0.88–1.21	
Malnourished	36.8	1.77	1.49–2.11	
Charlson Comorbidity Index				.001
0	14.0	Referent	—	
1 or more	30.3	2.16	1.96-2.39	
Sickness at Admission Scale Score				.001
<2.4	10.0	Referent	—	
2.4–4.49	16.3	1.64	1.37–1.97	
4.5–6.99	25.2	2.52	2.13–2.99	
≥7.0	34.3	3.44	2.93–4.04	

1988 and 22.3% for 1989–1993. The incidence of hospital-acquired incontinence, by year, from 1983 to 1993 is shown in Figure 1. Incidence of incontinence combined over all of the study years by study variables is shown in Table 2. Higher incidence was significantly associated with being aged 80 years or older; being African American; not being admitted from one's own home; confusion; prefracture use of a wheelchair or device for walking, or dependence on another person for walking; prefracture inability to transfer from bed to chair; malnutrition; having a Charlson Comorbidity Index score of 1 or more; and increasing Sickness at Admission Scale score.

When comparing the unadjusted relative risks for the risk factors of interest for the periods 1983–1988 and 1989–1993, admission from a nursing home or other long-term care facility was the only risk factor for which the difference between the two relative risks exceeded 10%. The unadjusted relative risk was 2.81 (95% CI 2.43–3.27) for women admitted between 1983 and 1988 and 3.27 (95% CI 2.92–3.68) for women admitted between 1989 and 1993.

After controlling for age, race, malnutrition, Charlson Comorbidity Index score, and Sickness at Admission Scale score (Table 3), it was found that patients admitted from a nursing home or other long-term care facility had significantly higher odds of incontinence than patients admitted from their own homes (odds ratio [OR] 1.68, 95% confidence interval [CI] 1.29–2.19). Incontinence was also significantly associated with confusion (OR 3.44, 95% CI 2.79–4.24). Patients who independently used a wheelchair or a device for walking (OR 1.53, 95% CI 1.29–1.83) and patients who were dependent on others for ambulation (OR 2.51, 95% CI 1.64–3.85) were significantly more likely to have hospital-acquired incontinence than those who ambulated independently before admission. When our other measure of mobility (i.e., prefracture ability to transfer from bed to chair) was included in the model, it did not contribute significantly to prediction of incontinence and thus was not retained in the model.

Discussion

Twenty-one percent of the women developed incontinence during their hospitalization. After adjustment for age, race, malnutrition, comorbidity, and severity of illness, women who were admitted from a nursing home or other long-term care facility, who were confused, who required a wheelchair or device for walking, or who were dependent on others for ambulation were at high risk for becoming incontinent.

Limitations in the data collection method should be noted. First, there may be inaccuracies in the study variables

Table 3. Results of Logistic Regression Analysis of Hospital-Acquired Incontinence on Patient Characteristics ($N = 6178$)

Characteristic	Adjusted Odds Ratio[†]	95% Confidence Interval
Age (years)	1.53	1.29–1.83
Race		
Caucasian	Referent	—
African American	1.82	1.42–2.33
Other	1.09	0.91–1.30
Preadmission Residence		
Own home	Referent	—
Retirement home or congregate housing	1.39	0.99–1.94
Nursing home or other long-term care facility	1.68	1.29–2.19
Confusion	3.44	2.79–4.24
Prefracture Walking Ability		
Independent	Referent	—
Independent, wheelchair or device	1.53	1.29–1.83
Dependent on others	2.51	1.64–3.85
Malnutrition		
No malnutrition or underweight	Referent	—
Malnourished	1.58	1.16–2.15
Charlson Comorbidity Index ≥1	1.19	1.05–1.36
Sickness at Admission Scale Score	1.04	1.03–1.06

[†]Each variable is adjusted for the effects of all the others.

due to the reliance on medical records to obtain patient data. Also, incontinence was defined as urinary, fecal, or both. It was not possible to determine the frequency of urinary incontinence alone. Fecal incontinence alone, however, occurs in only 2% of community-based older women (16, 17). In one study of nursing home residents, the odds of fecal incontinence in the presence of urinary incontinence was 12.6 times higher than the odds of fecal incontinence in the absence of urinary incontinence, indicating that fecal incontinence usually occurs with urinary incontinence (18). Thus, it is likely that nearly all patients classified as incontinent in this study had urinary incontinence alone or in conjunction with fecal incontinence. Finally, the incidence of hospital-acquired incontinence may have been underestimated due to the use of information in medical records, which is usually based on the admission history and examination. Therefore, our report that 21% of the women developed incontinence during their hospitalization is likely a conservative estimate.

The median length of hospital stay in this study was 13 days. In contrast, the 1997 Hospital Discharge Annual Survey showed that in the northeast and southern regions of the United States, the length of stay for fractures of the neck of the femur was 8 days (19). We found that for two of the three risk factors of interest (confusion and mobility), the relative risks were almost identical for the earlier and later segments of our study period. For the other risk factor (admission from a nursing home or other long-term care facility), the relative risks were only slightly different. This finding supports the stability of the associations over time and our ability to generalize the study results to the current era.

Women who had lived in a nursing home or other long-term care facility were at higher risk than women who lived at home. It may be that institutionalized women relied on caregivers to maintain continence through toileting or prompted voiding schedules. The same level of support may not have been present during the acute care stay. The majority of the women lived in their homes prior to the hip fracture, and more than one third returned home after hospitalization. Hospital-acquired incontinence can have an impact on family caregivers. In one study, caregivers stated that they were unprepared for the nature and length of post discharge caregiving activities related to continence (20).

The presence of confusion increased the risk of hospital-acquired incontinence. This finding is similar to that of Dolan and colleagues who found that hip fracture patients who were delirious at the time of admission had poorer functional outcomes up to 24 months after the hospitalization than those who were not delirious on admission (21). Delirium may be associated with incontinence by fostering dependency on others or through the use of physical restraints.

Use of a wheelchair and dependence on others for walking prior to the fracture also increased the risk of incontinence. In earlier studies, impaired mobility (9) and need for help with personal care (22) have been associated with incontinence whereas improved mobility has been associated with remission of incontinence (9). In addition, faster gait is associated with decreased incontinence in older women (7) suggesting that women who are able to provide themselves with timely access to toilets are at less risk for incontinence.

Little is known about racial or ethnic variations in the incidence of urinary incontinence during hospitalization. In our sample, African American women had a significantly higher incidence of hospital-acquired incontinence (33%) than Caucasians (21%) or women of another race (19%, $p = .001$). Even after controlling for other risk factors, the incidence among African Americans was significantly higher than among Caucasians. This finding warrants further investigation.

Urinary incontinence is a distressing condition. It can limit a person's social activities and interpersonal relationships. Disposable pads may be the most frequently used method of incontinence management for and by older adults (23). Older women, however, express feelings of embarrassment and shame over being incontinent and needing help in changing pads (24). Many do not volunteer information about incontinence, and physicians in turn often do not ask (25). Therefore, it may be that a number of continent women who enter the hospital with a hip fracture are discharged with the fracture repaired, but with incontinence. By not seeking and using preventive or restorative therapies, older adults and their caregivers can perpetuate incontinence even though it may be a reversible condition.

Clinical intervention research is needed to determine if nursing and medical strategies during hospitalization that take these changes into account (i.e., provision of bedside commodes, urinals especially designed for women, and medications to reduce detrusor instability) help to reduce the incidence of hospital-acquired incontinence.

Aggressive medical and nursing intervention can improve hip fracture patient outcomes through the use of care maps during hospitalization, including urinary and bowel regimens (26). Risk factors, such as those examined in this study, identifiable early in the hospitalization can cue the medical and

nursing staff to initiate actions to prevent or minimize incontinence so it does not become an immutable condition.

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