ORIGINAL INVESTIGATION

Quality of Care for Hospitalized Medicare Patients at Risk for Pressure Ulcers

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Background: No state peer review organization has attempted to identify processes of care related to pressure ulcer prediction and prevention in US hospitals.

Objective: To profile and evaluate the processes of care for Medicare patients hospitalized at risk for pressure ulcer development by means of the Medicare Quality Indicator System pressure ulcer prediction and prevention module.

Methods: A multicenter retrospective cohort study with medical record abstraction was used to obtain a total of 2425 patients aged 65 years and older discharged from acute care hospitals after treatment for pneumonia, cerebrovascular disease, or congestive heart failure. Six processes of care for prevention of pressure ulcers were evaluated: use of daily skin assessment; use of a pressure-reducing device; documentation of being at risk; repositioning for a minimum of 2 hours; nutritional consultation initiated for patients with nutritional risk factors; and staging of pressure ulcer. The associations between processes of care and incidence of pressure ulcer were determined with Kaplan-Meier survival analyses.

Results: National estimates of compliance with process of care were as follows: use of daily skin assessment, 94%; use of pressure-reducing device, 7.5%; documentation of being at risk, 22.6%; repositioning for a minimum of 2 hours, 66.2%; nutritional consultation, 34.3%; stage 1 pressure ulcer staged, 20.2%; and stage 2 or greater ulcer staged, 30.9%.

Conclusion: These results suggest that US hospitals and physicians have numerous opportunities to improve care related to pressure ulcer prediction and prevention.

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PRESSURE ULCERS continue to present a major health problem for hospitalized older adults. Prevalence rates have ranged from 3.0% to 15.0% for those in acute care hospitals.[1] The elderly account for approximately 70.0% of all pressure ulcers.[2] When age is coupled with additional risk factors, the incidence of pressure ulcers significantly increases.[3] Although the average cost to heal a pressure ulcer is relatively low (ranging from $5000 to $70 000, depending on the stage of pressure ulcer) compared with that for other health conditions, it is conservatively estimated that the total national cost for treating pressure ulcers is $1.3 billion annually and rising.[4]

The absence or presence of pressure ulcers is used by the US Health Care Financing Administration (HCFA) survey and certification in long-term care as one benchmark of quality care.[5] This is related to the interdisciplinary principles that guide both the prevention and treatment of pressure ulcers. Pressure ulcers have also been associated with in-hospital mortality when patient characteristics and severity of illness are unadjusted in the regression models. Allman et al[3] noted that hospitalized older adult patients with pressure ulcers were 2 times more likely to die within 30 days after discharge. A study by Thomas et al[6] also noted that in-hospital pressure ulcers were associated with greater risk of death at 1 year after hospital discharge. Thus, pressure ulcers can play an important role in predicting in-hospital mortality.

With the burgeoning older adult population and spiraling health care costs, the prediction and prevention of pressure ulcers is paramount. Although prediction tools and prevention strategies do not guarantee that every pressure ulcer in hospitals will be prevented, HCFA is interested in ensuring that optimal pressure ulcer prediction and preventive care is provided for Medicare patients at risk for pressure ulcers. Before this study, no

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METHODS

SELECTION OF QUALITY INDICATORS

The MQIS program was developed by HCFA to improve the quality of health services to hospitalized Medicare beneficiaries. The hallmark of MQIS is the development of quality indicators. These quality indicators are quantitative measures used to monitor and evaluate processes of care. HCFA selected Qualidigm, Middletown, Conn (the peer review organization for Connecticut), to develop an MQIS pressure ulcer prediction and prevention module. The Qualidigm team conducted an extensive literature review and reviewed Agency for Health Care Policy and Research guideline 3 on the prediction and prevention of pressure ulcers in adults to identify processes of care for consideration as quality indicators by both local clinicians and national experts. The national expert panel consisted of 3 of us (R.A., N.B., and G.R.). The national expert panel provided invaluable feedback in assisting the Qualidigm team to identify quality indicators for feasibility testing.

A series of pilot studies were conducted in Connecticut, New York, Pennsylvania, Virginia, and Puerto Rico to ascertain the high correlates for pressure ulcer quality indicators. The pilot studies were also conducted to refine the data collection instrument, sampling strategies, and quality indicators before national sampling. The final quality indicators were as follows: the proportion of immobile patients with at least 1 other risk factor for the development of a pressure ulcer, who received a daily skin assessment within 48 hours of arrival; the proportion of bed- or chair-bound patients who were treated with a pressure-reducing device within 48 hours of arrival; the proportion of immobile patients with at least 1 other risk factor who were documented as being at risk within 48 hours of arrival; the proportion of bed- or chair-bound patients who were repositioned every 2 hours within 48 hours of arrival; the proportion of patients weighing less than 80% of ideal body weight and/or having a total lymphocyte count of 1.8×10^9/L or less and/or albumin level less than 35 g/L who received a nutritional consultation within 48 hours of arrival; and the proportion of patients who acquired a stage 1, stage 2, or greater pressure ulcer in whom the pressure ulcer was staged.

SAMPLE SELECTION

The sample was identified by HCFA from the Medicare National Claims History File. This file contains patient records from all hospitals in the United States; thus, it provides a rich repository of data for Medicare patients throughout the country. HCFA identified a representative sample of patients discharged from an acute care hospital (community and teaching) with a principal diagnosis of pneumonia (*International Classification of Diseases, Ninth Revision, Clinical Modification* [*ICD-9-CM*] codes 482.0-482.9, 485, 486, and 507), congestive heart failure (*ICD-9-CM* code 428.0), or cerebrovascular accident (*ICD-9-CM* codes 434.91 and 436). These 3 diagnoses were selected because of a higher probability that older adults would be immobile for a period of their hospitalization. Additional inclusion criteria included a length of stay of 5 days or longer, immobility, or the need for assistance with ambulation. From January 1, 1996, to December 31, 1996, 2425 potential cases were selected. The optimal number of patients was derived from power calculations of an SD for compliance of 0.5 and an α of .05.

After the cases were procured, the exclusion criteria were applied. Patients were excluded if they had a principal diagnosis of pressure ulcer (*ICD-9-CM* code 707.0), stage 2 to 4 pressure ulcer on admission, or age younger than 65 years.

other state peer review organization, to our knowledge, had attempted to identify processes of quality care related to pressure ulcer prediction and prevention for hospitalized older adult patients at risk for the development of pressure ulcers in US hospitals. Thus, HCFA set out to assess the quality of hospital-based pressure ulcer prediction and prevention care via performance of quality measures identified as important by the literature and expert opinion. This report presents the results of the Medicare Quality Indicator System (MQIS) pressure ulcer prediction and prevention module.

RESULTS

CASE SELECTION

A total of 2425 potential pressure ulcer cases were abstracted. Of these patients, the majority had a length of stay of 5 days or longer (n=2355) and were immobile or required assistance to ambulate (n=1923). Of the 2425 in the sample, 257 were excluded because of age younger than 65 years (n=35) or admission to the hospital with a pressure ulcer of stage 2 or greater (n=222). (Some of these 257 patients had already been excluded based on length of stay and their mobility status.) No patients were excluded because of the principal diagnosis of pressure ulcer (*ICD-9-CM* code 707.0). Therefore, the final study sample was composed of 1803 patients. The majority of patients had a principal diagnosis of pneumonia (n=1029) or cerebrovascular accident (n=582). The mean length of stay for patients was 10.2 days (range, 5-66 days).

PATIENT CHARACTERISTICS

The prearrival hospital data (**Table 1**) showed that most patients came from home, followed by skilled or intermediate facilities or other facilities or long-term care hospitals. The mean age for the sample was 79.8 years, with the majority of patients being aged 75 to 84 years. The sample was predominantly white. There were more women than men. The majority of patients were discharged to home (n=924), skilled or intermediate care facilities (n=581), and other facilities or long-term care hospitals (n=150). For patients at high risk (>3 risk factors), in-hospital mortality accounted for 8.1% (n=146) of the sample.

Clinical characteristics and risk factors for pressure ulcers (**Table 2**) showed that the majority of patients in the sample were bed or chair bound and had had at least 1 stay in a specialty intensive care unit. A large proportion of the sample had a nutritional impairment. Urinary incontinence and fecal incontinence were not a major clinical problem for the sample. Moreover, the presence of coma,

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DATA COLLECTION

Hospitals from across the United States were requested to provide copies of the medical records of the identified cases, which were forwarded to 1 of 2 clinical data abstraction centers (DynKePRO, York, Pa, and FMAS, Rockville, Md) to ensure a representative sample of the US Medicare population. Trained medical abstractors collected the data from the submitted records by means of the electronic data collection instrument. Any duplicate or unrequested cases were deleted. The κ statistics were calculated for the inclusion criteria, exclusion criteria, clinical characteristics, and performance of quality indicators. Data element reliability was continuously tested and improved by reabstracting random samples of cases and determining reasons for abstraction-reabstraction disagreements before finalization of the data collection instrument that was used in the national study. The κ statistics ranged from 0.83 (mobility on admission) to 1.0 (length of stay) for confirmation of inclusion and exclusion criteria and from 0.60 (documented at risk) to 0.87 (turn every 2 hours) for quality indicators, indicating moderate to excellent interrater reliability.

DATA ELEMENTS

Two categories of variables were used in this study: inclusion and exclusion criteria indicators and process of care indicators. Both the inclusion and exclusion criteria and process of care indicators were previously listed. Demographic and clinical characteristic and risk factor variables usually associated with pressure ulcers were collected from the medical records. Demographic variables included prearrival setting, age, race, sex, and discharge disposition. Clinical characteristic and risk factor variables included bladder and bowel incontinence, serum albumin level less than 35 g/L, motor deficit, abnormal skin hydration, wound drainage, stay in a specialty care unit (ie, intensive care unit), comatose state, less than 80% of ideal body weight, and total lymphocyte count of 1.8×10^9/L or less.

DATA ANALYSIS

On receipt of the data, logic and consistency checks for inclusion and exclusion criteria were run on both claims and abstracted data elements. Descriptive statistics were used to describe the sample. Compliance with each quality indicator was determined by calculating the proportion of patients in the study set who adhered to the quality indicator within 48 hours of arrival to the hospital. The use of 48 hours was based on several studies that demonstrated occurrence of pressure ulcers between admission and 48 hours after hospitalization.[7,8] Moreover, 48 hours was selected to ensure that hospitals would have ample time to complete the admission process.

To evaluate the association between quality indicator compliance and the development of pressure ulcers during a 3-week period, a Kaplan-Meier survival analysis was conducted. The log-rank test was used to determine significant differences in the stratification of the survival distributions.

Two outcome measures were established for this study. The first outcome measure was compliance with the quality indicators and the second was the development of pressure ulcers. Because of the sample size, all pressure ulcers (stages 1-4) were truncated to provide adequate power to evaluate this outcome. Although there is a wide variance in defining the stage 1 pressure ulcer,[9] it was included in the analysis because treatment must be implemented for all 4 stages of ulceration.

abnormal skin hydration or dry skin, wound drainage, and hip fractures were not prevalent in this sample. Patients had at least 2 risk factors (n=609), with the majority (659) having 3 or more risk factors.

INCIDENCE AND PREVALENCE

One hundred sixty-four patients had a preexisting stage 1 pressure ulcer on arrival to the hospital; of these, 32 (19.5%) progressed to a stage 2 pressure ulcer or greater. A total of 317 patients acquired a pressure ulcer of any stage while in the hospital; 238 patients developed at least 1 stage 1 pressure ulcer. Thus, the incidence of stage 1 pressure ulcers was 13.2%. Thirty-eight (16.0%) of the patients with a stage 1 pressure ulcer progressed to a more advanced stage. One hundred ten patients developed at least 1 stage 2 or greater pressure ulcer during their hospital course, yielding an incidence rate of 6.1% for the more advanced pressure ulcers. Three patients (2.7%) with a stage 2 or greater pressure ulcer progressed to a more advanced stage.

COMPLIANCE WITH QUALITY INDICATORS

The compliance varied depending on the quality indicator (**Table 3**). Compliance was 94.0% on quality indicator 1 (daily skin assessment), 7.5% on indicator 2 (use of a pressure-reducing device), 22.6% on indicator 3 (documentation of being at risk), 66.2% on indicator 4 (repositioning), 34.3% on indicator 5 (nutritional consultation), 20.2% on indicator 6a (staging of stage 1 ulcer), and 30.9% on indicator 6b (staging of stage 2 ulcer).

QUALITY INDICATOR COMPLIANCE AND PRESSURE ULCER DEVELOPMENT

The relationship between quality indicator compliance and pressure ulcer development was studied for quality indicators 2 through 5 for a 3-week period (**Table 4**). The research team determined from clinical experience and the literature that 3 weeks would be an appropriate amount of time to capture pressure ulcer prevention measures for any given hospitalized patient who had an extended stay. In general, older patients with longer stay had higher incidence rates of pressure ulcers. In fact, the Kaplan-Meier analysis showed a total incidence rate of pressure ulcer of 32% at 21 days (Table 4). Because skin assessment (quality indicator 1) had a high compliance rate (94.0%), it was excluded from the bivariate analysis. Patients who received a pressure-reducing device (quality indicator 2) within 48 hours of arrival to the hospital had a higher incidence of pressure ulcer development during week 1, with no statistical differences noted

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Table 1. Demographics*

Characteristic	No. (%)
Age, y†	
65-74	507 (28.1)
75-84	759 (42.1)
≥85	537 (29.8)
Sex	
Female	1047 (58.1)
Male	756 (41.9)
Race	
White	1508 (83.6)
Black	162 (9.0)
Hispanic	62 (3.4)
Unable to determine	71 (3.9)
Prearrival setting	
Home	1151 (63.8)
Acute care hospital	27 (1.5)
Skilled nursing/intermediate care facility	374 (20.7)
Others	246 (13.6)
Unidentified	5 (0.3)

*N = 1803.
†Mean ± SD, 79.8 ± 7.97 years.

Table 2. Clinical Characteristics and Risk Factors*

Variable	No. (%)	UTD	Missing
Bed/chair bound	1207 (66.9)	0	0
Requires assistance to ambulate	596 (33.1)	0	0
Bladder incontinence	348 (19.3)	7	0
Bowel incontinence	179 (9.9)	5	0
Albumin <35 g/L	653 (36.2)	0	560
Motor deficit	335 (18.6)	2	0
Abnormal skin hydration	273 (15.1)	1	0
Wound drainage	14 (0.8)	2	0
Hip fracture	28 (1.6)	0	0
Specialty care unit stay	855 (47.4)	0	0
Comatose	66 (3.7)	10	0
Ideal body weight <80%	47 (2.6)	0	1318
Total lymphocyte count ≤1.8 × 10^9/L	1180 (67.4)	0	225

*N = 1803. UTD indicates unable to determine.

for weeks 2 and 3. Patients who were documented at risk for pressure ulcers (quality indicator 3) had a significantly higher incidence of pressure ulcer development during the 3-week period. Moreover, patients who were turned every 2 hours (quality indicator 4) also had a significantly higher incidence of pressure ulcer development during the same 3-week period. The implementation of a nutritional consultation (quality indicator 5) was associated with a lower incidence of pressure ulcer development, although this association was not statistically significant.

COMMENT

The results of this national quality-of-care study demonstrated that there are numerous opportunities for improvement in both the prediction and prevention of pressure ulcers in hospitalized Medicare beneficiaries. Overall, the incidence rate of stage 2 or greater pressure ulcers was 6.1%, which appears to be much lower than that reported by other hospital pressure ulcer studies. These studies have reported incidence rates of pressure ulcers between 8.1% and 12.9%,[1,10] which suggests that health care providers in hospital settings are implementing prevention strategies. Thus, there appears to be a decrease in the incidence rate of stage 2 or greater pressure ulcers in hospitals subsequent to 1996. Another explanation for lower rates of stage 2 or greater pressure ulcers may be underascertainment. No studies could be found for comparison that used methods similar to those in this study. However, many studies that use abstraction as the major method of data collection are vulnerable to misclassification of pressure ulcers or nonrecording of preventive measures in the medical records. This study showed that 19.5% of older adults hospitalized with a stage 1 pressure ulcer progressed to a stage 2 or greater pressure ulcer. Moreover, of older adult patients who developed a stage 1 pressure ulcer while in the hospital, 16.0% progressed to a stage 2 or greater ulcer. Although the incidence rate was lower than that in other reported studies, the findings suggest the need for hospital staff to remain vigilant in identifying older adults at risk and implementing prevention strategies.

The failure of this study to significantly associate prevention strategies with the decreased incidence of pressure ulcers illustrates the multivariate nature of pressure ulcer development. It is possible that we did not measure the appropriate constructs necessary to capture the process-outcome link. This appears to be highly unlikely, because the quality indicators selected were based on current literature, which appeared to have excellent face validity. Numerous research studies suggest that process-outcome links are extremely difficult to identify. These results clearly underscore the multivariate causal pathway to pressure ulcer development and the lack of good evidenced-based research in pressure ulcer prevention.

Quality indicator compliance within 48 hours varied greatly depending on the process of care profiled. Daily skin assessment (quality indicator 1) was the only quality indicator with a high compliance rate (94.0%) within 48 hours of hospitalization. This is probably related to the general practice of nursing staffs completing a general skin assessment as part of the hospital admission intake assessment. Independent of daily skin assessments, the hospital compliance rates were relatively low. The percentage of bed- or chair-bound older adults receiving a pressure-reducing device (quality indicator 2) within 48 hours was very low, at 7.5%. Given the potential for a pressure ulcer to develop within a relatively brief period, patients at risk must be identified and appropriate pressure-reducing devices implemented. The lack of documentation (22.6%) of patients at risk (quality indicator 3) and the low proportion (66.2%) repositioned every 2 hours (quality indicator 4) demonstrate the need for hospitals to increase both prediction and prevention strategies. This is consistent with the findings of Bergstrom et al,[10] who demonstrated that when risk assessments were not conducted, written orders for turning were less likely to occur. Moreover, the low proportion (34.3%) of nutritionally compromised patients who received a nutritional consultation suggests that greater emphasis must be placed on completing nutri-

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Table 3. Quality Indicator (QI) Compliance*

Quality Indicators	Study Sample	Eligible		Compliance Within 48 h	
		No. (%)	UTD	No. (%)	UTD
QI 1: % of patients immobile, with ≥1 risk factor for development of pressure ulcer, receiving daily skin assessment within 48 h of admission	1803	1701 (94.3)	91	1599 (94.0)	3
QI 2: % of patients bed/chair bound placed on pressure ulcer–reducing device within 48 h of admission	1803	1063 (59.0)	0	80 (7.5)	88
QI 3: % of patients immobile with ≥1 risk factor who are documented at risk within 48 h of admission	1803	1701 (94.3)	91	384 (22.6)	64
Q1 4: % of patients bed/chair bound repositioned every 2 h within 48 h of admission	1803	1062 (58.9)	0	703 (66.2)	11
QI 5: % of patients with <80% ideal body weight and/or total lymphocyte count of $\leq 1.8 \times 10^9$/L and/or albumin <35 g/L receiving nutritional consultation within 48 h of admission	1803	1381 (76.2)	85	473 (34.3)	12
QI 6a: % of patients with acquired stage 1 ulcer who had ulcer staged within 48 h of identification	317	238 (75.1)	9	48 (20.2)	0
QI 6b: % of patients with acquired stage 2 ulcer who had ulcer staged within 48 h of identification	317	110 (34.7)	8	34 (30.9)	0

*UTD indicates unable to determine.

Table 4. Cumulative Incidence of Pressure Ulcer by Hospital Days Stratified by Quality Indicator Compliance*

Factor	No. of Patients at Time 0†	Incidence Estimate, %			P‡	OR	95% CI
		Day 7	Day 14	Day 21			
Pressure ulcer development	1802	13.1	25.9	32.5	NA	NA	NA
Q1 2, pressure-reducing device	974						
Yes		17.9	25.0	35.3	.48	1.19	0.74-1.91
No		11.7	26.5	35.8			
QI 3, documented at risk	1696						
Yes		18.8	37.4	42.1	<.001	1.61	1.26-2.05
No		11.6	22.6	29.8			
QI 4, reposition every 2 h	1050						
Yes		15.4	28.7	39.3	.02	1.45	1.06-1.98
No		9.3	23.9	30.5			
QI 5, nutritional consultation	1636						
Yes		15.2	24.0	31.2	.32	0.93	0.72-1.21
No		14.5	30.0	34.5			

*OR indicates odds ratio; CI, confidence interval; NA, not applicable; and QI, quality indicator.
†Excludes patients for whom compliance or incidence of pressure ulcers was unable to be determined.
‡Log rank test.

tional assessments, especially in light of the large proportion of patients (76.2%) identified to be nutritionally compromised in this study. This action would not be as likely to be missed if formal risk assessments were completed. Research studies have demonstrated that older patients with low dietary intake of protein and low serum albumin levels are more likely to be at risk for the development of pressure ulcers.[10] Thus, if older adults are identified as being nutritionally compromised and appropriate nutritional supplements are introduced, a decrease in the incidence of pressure ulcers may result.

The results from this study also suggest that, for Medicare beneficiaries, extended stays longer than 7 days in the acute care hospital greatly increase the incidence of pressure ulcers. Clearly, the majority of patients who spend extended stays in the acute care setting are most likely the sickest, accounting for more than 30% of the pressure ulcer incidence. Hospitals and physicians must remain vigilant in the prevention of pressure ulcers in patients with longer stays. Clearly, these patients provide the physician with not only a greater opportunity to use preventive measures but, if an ulcer develops, ample time to treat and heal the pressure ulcer.

An interesting finding in this study was the inability to demonstrate an association between quality indicator compliance and a decreased incidence of pressure ulcer development. In fact, older adults who received a pressure-reducing device (quality indicator 2) and/or were documented at risk (quality indicator 3) and/or were turned every 2 hours had a higher incidence of pressure ulcer development. These results suggest that, although the patients were treated with pressure-reducing devices, we did not evalu-

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ate the quality of products used. It is conceivable that the support surfaces used did not truly reduce pressure. The research team had no mechanisms established to guarantee that patients documented to be turned every 2 hours were actually turned. The study was also unable to capture prevention strategies (or lack thereof) used before admission to the hospital unit. These inverse relationships may also be attributed to the lack of appropriate risk adjustments or the study's inability to capture confounding variables. Thus, the ulcerations may have been developing before arrival on the unit. The study did not capture decision processes used by the hospitals to determine which older adults received prevention strategies. It is conceivable that hospital staff implemented prevention strategies on the most vulnerable patients too late or without sufficient prevention strategies, accounting for the inverse relationship. Of interest, the use of a nutritional consultation was associated with decreased incidence of pressure ulcers, although the difference was not statistically significant. This finding does not suggest that a nutritional consultation is equated with the patient actually receiving nutritional supplementation; rather, it suggests a nutritional consultation may sensitize the staff that the older adult is at risk for pressure ulcer development. This finding suggests, however, that nutrition may play a significant role in pressure ulcer prevention.

This study had several limitations. First, because of the retrospective nature of the study, we were unable to capture observational data. Patients may have received additional prevention strategies that were not captured on the data collection instrument. The inability to identify prevention strategies used (or not used) and the time from processing until the patient arrived on the hospital unit were not captured. Thus, it is possible that the pressure ulcer occurred independent of arrival to the hospital unit. To this end, the study was dependent on chart compliance by the hospitals. The lack of an effective risk adjustment model also limited the study, and the research team could not identify an effective risk adjustment instrument. The Charlson Comorbity Index[11] and the Acute Physiology and Chronic Health Evaluation II score[12] have been used to adjust for risk in previous pressure ulcer studies; however, they were not designed for pressure ulcer risk adjustment nor validated in a frail elderly population. These instruments were designed and validated for use in critical care to predict mortality; thus, their use in pressure ulcer prediction and prevention studies is questionable. The low rate of compliance with the quality indicators may be attributed to the negative associations. Finally, the low incidence (6.1%) of pressure ulcer development greatly limited the statistical power that could be applied to causal modeling, thereby explaining our inability to completely evaluate the process-outcome association. A further limitation of our study was the inclusion of stage 1 pressure ulcers, since a large variation exists in defining this ulcer. The literature notes that there is no standard definition for the stage 1 pressure ulcer as compared with other ulcers.[9] Thus, it is possible that some clinicians may have improperly classified the stage 1 pressure ulcer.

In summary, this study examined the quality of care delivered to older adults at risk for pressure ulcer development in hospitals throughout the United States. We identified numerous opportunities for hospitals and physicians to improve the prediction and prevention of pressure ulcers. Our findings also suggest that nutritional consultation may prevent pressure ulcer development by sensitizing the physician and staff that the patient is at risk for pressure ulcer development.

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