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Vulnerability to Decubitus Ulcers and Their Association With Healthcare Utilization: Evidence From Nationwide Inpatient Sample Dataset From 2016 to 2020 in US Hospitals

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Objective: The aim of the study is to identify vulnerable populations at risk of developing decubitus ulcers and their resultant increase in healthcare utilization to promote the use of early prevention methods.

Methods: The National Inpatient Sample of the United States was used to identify hospitalized patients across the country who had a length of stay of 5 or more days (N = 9,757,245, weighted N = 48,786,216) from 2016 to 2020. We examined the characteristics of the entire inpatient sample based on the presence of decubitus ulcers, temporal trends, risk of decubitus ulcer development, and its association with healthcare utilization, measured by discounted hospital charges and length of stay. The multivariate survey logistic regression model was used to identify predictors for decubitus ulcer occurrence, and the survey linear regression model was used to measure how decubitus ulcers are associated with healthcare utilization.

Results: Among 48,786,216 nationwide inpatients, 3.9% had decubitus ulcers. The percentage of inpatients with decubitus ulcers who subsequently experienced increased healthcare utilization rose with time. The survey logistic regression results indicate that patients who were Black, older, male, or those reliant on Medicare/Medicaid had a statistically significant increased risk of decubitus ulcers. The survey linear regression results demonstrate that inpatients with decubitus ulcers were associated with increased hospital charges and longer lengths of stay.

Conclusions: Patients with government insurance, those of minority races and ethnicities, and those treated in the Northeast and West may be more vulnerable to pressure ulcers and subsequent increased healthcare utilization. Implementation of early prevention methods in these populations is necessary to minimize the risk of developing decubitus ulcers, even if upfront costs may be increased. For example, larger hospitals were found to have a lower risk of decubitus ulcer development but an increased cost of preventative care. Hence, it is imperative to explore and use universal, targeted preventative methods to improve patient safety.

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We used secondary data, and all the patient's information is encrypted and unable to be identified. This study was approved for a waiver from the institutional review board, Soonchunhyang University (202302-SB-014-01).

Key Words: decubitus ulcer, NIS sample, healthcare utilization, patient safety, health services research

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BACKGROUND

Decubitus ulcers, also known as pressure ulcers, occur when an area of the body is exposed to prolonged pressure; in hospitalized patients, they may occur because of prolonged immobility, pressure, or friction leading to tissue ischemia and necrosis.[1,2] Long-term pressure leads to decreased blood flow that can be further exacerbated by friction resulting in the development of decubitus ulcers.[3] This condition affects more than 2.5 million Americans yearly and is a common problem in hospitals and long-term care facilities that is often associated with a decreased quality of life and increased healthcare costs.[1,2,4,5] Common risk factors include continued immobility, comorbidities like diabetes, incontinence, cerebro/cardiovascular diseases, sensory loss, malnutrition, and poor perfusion.[1] Another study found that pressure ulcers located on the heel of the foot are more often associated with diabetes and peripheral vascular disease than sacral pressure ulcers.[6] These results were reflected in a similar study investigating heel pressure ulcers.[7] Medications that may increase the risk of pressure ulcers due to cutaneous adverse effects include vasopressors (notably norepinephrine and vasopressin), anticholinergics medications (due to their sedative adverse effects), sedatives, and corticosteroids.[6,8–10]

Hospital-acquired decubitus ulcers pose substantial financial burdens on hospitals, with an estimated annual cost of 11 billion dollars, and are not eligible for coverage under Medicare or Medicaid.[2] Some researchers have estimated that the cost of hospital-acquired pressure ulcers is more than $26.8 billion and requires early detection to mitigate these costs.[11] Surgical treatment of pressure ulcers is rarely followed by readmission, but any readmission tends to happen within 2 to 3 months after the operation and costs between $58 and $72,000.[12] Previous research estimates that pressure ulcers increase the length of hospital stays from 3 days in patients without ulcers to 7 days.[2,5] In that study, the older and malnourished patients were found to be at a significantly increased risk for pressure ulcers.[5] Another study found that roughly 8.5% of patients with surgeries over 3 hours long developed hospital-acquired pressure ulcers.[13] However, some literature suggests that community-acquired pressure ulcers are more common than hospital-acquired pressure ulcers.[14] Previous research using data from the 2005–2014 National Inpatient Sample found that hospital-acquired pressure ulcers were often associated with extended hospital stays, increased costs, and more significant mortality and were more frequently observed in older patients, larger hospitals, patients with Medicare/Medicaid, and those with underlying comorbidities.[15]

Studies examining the costs of preventing and treating pressure ulcers have yielded different averages, but prevention has consistently proven to be the more cost-effective alternative.[16] Preventative measures include appropriate support surfaces, dressings,

staffing, and mobilization, while treatment often requires additional medications, surgeries, laboratory examinations, and extended hospital stays.[17] Prevention and early detection may be essential for high-risk patients; nursing home patients with diabetes, for example, have a high prevalence of late-stage pressure ulcers.[17,18] Prevention and treatment cannot focus solely on patient behavior but should also involve home care and interdisciplinary actions.[19] For example, previous literature states that having a caregiver to help increase the number of repositionings was effective in preventing the development of pressure ulcers.[20] In emergency departments, researchers have found that early prevention is critical, especially for patients older than 75 years and arriving by ambulance or those presenting with hypotension.[21] Early prevention in emergency departments is also cited by other researchers who have found that assessing pressure ulcer risk in the emergency department is a crucial step to mitigating pressure ulcers once hospitalized.[22]

Previous research has shown that differences exist in pressure ulcer risk, incidence, and outcomes according to specific patient characteristics.[15,23–26] For example, hospitalized African Americans, Asians, and Pacific Islanders are more likely to have a pressure ulcer than White patients.[23] Medicaid patients are also more likely to experience a pressure ulcer than patients with private insurance.[23] Medicare patients in long-term care hospitals, inpatient rehabilitation, and skilled nursing facilities had an increased incidence of new or worsened pressure ulcers if they were older, male, or Black.[24] They postulate that African Americans may be receiving care from lower-quality nursing homes than other populations, emphasizing the need for reform specifically within nursing homes that primarily serve Black individuals.[24] These results align with those of another study, which found a higher prevalence of nonhealing ulcers in Black nursing home patients in comparison with White patients.[25] In one study, there was no significant association between race and pressure ulcers, but household income was a significant factor.[26] When access to health care was accounted for, race became an insignificant factor whereas household income remained significant. This could be attributable to the limited access that low-income patients have to resources such as customizable wheelchairs, which assist in proper positioning.[26]

Despite the demand for early prevention, current risk assessment tools are contentious and lack robust evidence to substantiate their efficacy in reducing the occurrence of pressure ulcers.[27] For example, the 2015 American College of Physicians guideline on preventing pressure ulcers indicates limited support for risk assessments, while strongly advocating for the use of preventative measures such as the use of static mattresses.[28] Because of the challenges associated with identifying the risk of pressure ulcer development,[27,28] this retrospective study seeks to identify vulnerable populations to assist hospitals and practitioners in managing pressure ulcer incidence and associated costs. Using the 2016–2019 National Inpatient Sample (NIS) data, we aim to compare the likelihood of pressure ulcer development, associated costs, and lengths of stay based on socioeconomic factors and geographic regions. Populations with an increased risk of pressure ulcer development or those experiencing disproportionate healthcare charges or hospitalization may benefit from early preventative action.[16,17,21,22,29]

METHODS

Data Collection

The latest 2016–2020 NIS data were used to obtain a population-based estimate for all inpatients nationwide. Among all 2016–2020 NIS samples (N = 34,955,252), as shown in Figure 1, we first identified primary and subdiagnosis of decubitus ulcers using the *International Classification of Diseases*, *Tenth Version* (*ICD-10*) codes for decubitus ulcers (L89). We only included patients with a length of stay equal to or exceeding 5 days, following the methodology adopted by OECD indicators for patient safety (n = 10,375,565).[30] Then, after patients with missing variables were excluded, we obtained our final patient sample (N = 9,757,245, national estimates = 48,786,216) (Fig. 1).

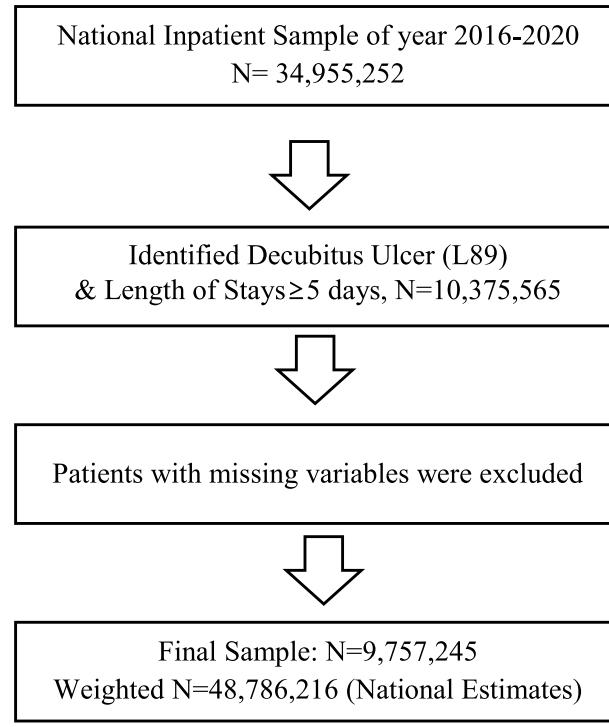

FIGURE 1. Flowchart of patient sample selection.

Variables

The main objective of this study was to examine the characteristics of patients according to the presence of decubitus ulcers, temporal trends, and risk of decubitus ulcer development. We also evaluated the association between hospital charges, length of stays, and decubitus ulcers. The primary variable was the presence of a decubitus ulcer during hospitalization, identified with *ICD-10* code L89. Because of the skewed distribution of hospital charges and length of stays, we calculated the natural logarithm of those variables. In this study, we adjusted patient- and hospital-level confounders. Patient characteristics include age, sex, race, annual median household income, and primary payer (Medicare, Medicaid, private insurance, self-pay, others). Hospital characteristics include bed size, ownership, teaching status, and region where the patients are treated.

Statistical Analysis

Sampling weights were used for all statistical analyses to ensure the representation of all nationwide patients with decubitus ulcers. First, we examined the characteristics of the final sample dataset, accounting for both patient and hospital factors. The patient and hospital characteristics are presented as weighted frequency (percentage) or means (SD). Subsequently, we investigated the temporal trend among patients with decubitus ulcers as well as the differences in hospital charges and lengths of stay associated with the condition (Table 1). The odds ratios (ORs) and corresponding 95% confidence intervals (95% CIs) for having a decubitus ulcer were

TABLE 1. Temporal Trend of Hospital Charges and Length of Stay by Decubitus Ulcer

	2016	2017	2018	2019	2020
n	1,901,051	1,953,701	1,978,579	1,999,806	1,924,108
Weighted n (national estimates)	9,505,247	9,768,504	9,892,894	9,999,030	9,620,541
Decubitus ulcer					
No	9,155,217	9,391,074	9,509,614	9,613,455	9,228,481
Yes	350,030	377,430	383,280	385,575	392,060
% of yes	3.82%	4.02%	4.03%	4.01%	4.25%
Total charges by year	94,432	99,655	105,069	111,501	121,928
By decubitus ulcer					
No	93,290	98,462	103,966	110,408	120,535
Yes	124,291	129,355	132,434	138,765	154,723
Length of stays	10.26	10.27	10.32	10.37	10.74
By decubitus ulcer					
No	10.13	10.14	10.20	10.25	10.60
Yes	13.70	13.60	13.46	13.47	14.09

calculated using the survey logistic regression analysis (Table 2). Table 2 presents the differences in the odds of having a decubitus ulcer across different patient and hospital groups.

Finally, using the multivariate survey linear regression analysis, we explored how decubitus ulcers are associated with hospital charges and lengths of stay (Table 3). All analyses were conducted using SAS statistical software (version 9.4; SAS Institute, Inc, Cary, NC). The statistical tests used in this study were all 2-sided, and statistical significance was calculated at a P value less than 0.05.

RESULTS

Patient Characteristics

A total of 9,757,245 inpatients were identified in the 2016–2020 NIS data (weighted N = 48,786,216, Table 4). Among the sample population, 3.9% had decubitus ulcers. Inpatients with decubitus ulcers were more often found in the Black, older, and Medicare populations. Table 4 provides a comprehensive overview of patient characteristics in greater detail.

Temporal Patterns of Decubitus Ulcer Patients, Hospital Charges, and Length of Stay

Table 1 displays the temporal trends of patients with decubitus ulcers and their healthcare utilization between 2016 and 2020. The proportion of patients with decubitus ulcers grew (3.82%–4.25%) over the study period. In addition, hospital charges among patients with decubitus ulcers significantly increased, from $124,291 in 2016 to $154,723 in 2020. Similarly, the length of stay for patients with decubitus ulcers also experienced a substantial increase, from 13.70 in 2016 to 14.09 in 2020.

Odds of Having a Decubitus Ulcer During Hospitalization

The ORs of having a decubitus ulcer obtained from a weighted multiple survey logistic regression model are shown in Table 2. Black patients had higher odds of having a decubitus ulcer during hospitalization than White patients (OR, 1.528; 95% CI, 1.514–1.541). Compared with patients with private insurance, patients with Medicare and Medicaid had higher odds of having a decubitus ulcer, while patients with self-pay were associated with lower odds of experiencing a decubitus ulcer. In addition, older patients, patients who died during hospitalization, and patients within specific regions (Northeast and West) were associated with statistically significant increased odds of decubitus ulcers (Table 2).

Association of Decubitus Ulcer With Hospital Charges and Length of Stay

Table 3 shows the associations observed between decubitus ulcers and hospital charges as well as length of stay. Our analysis revealed statistically significant differences among hospitalized patients. Patients with a decubitus ulcer were associated with a 17.3% increase in hospital charges compared with their counterparts. Furthermore, the presence of a decubitus ulcer was associated with a 21.5% increased length of stay.

DISCUSSION

As anticipated, consistent with previous literature,[1,2,4,5,14,15] decubitus ulcers were significantly associated with increased costs and prolonged hospital stays. We discovered that hospital charges were on average approximately $20% to 30,000 higher for patients with pressure ulcers compared with those without, and lengths of stay were approximately 3 to 4 days longer. The odds of having a pressure ulcer and in-hospital mortality were significantly associated, also resulting in higher costs and longer stays. Therefore, managing and preventing pressure ulcers is necessary to improve health outcomes and the quality of care for patients.[1,2,4,5,31] Specific patterns emerged, demonstrating that specific populations, such as those with government insurance, belonging to minority races, or residing in the Northeast or West, are at increased risk of pressure ulcers and their subsequent complications. As described in previous literature, we found that the odds of developing pressure ulcers increased with age, and patients covered by Medicare or Medicaid were more likely to have pressure ulcers than patients with private insurance.[5,15,21,23,24]

In our study, patients with Medicare or Medicaid were significantly more likely to develop a pressure ulcer than patients with private insurance. Medicare patients had nearly twice the odds of pressure ulcer development compared with private insurance patients. Despite the higher OR for pressure ulcer development, patients with Medicare or Medicaid were not associated with higher costs compared with patients with private insurance. In addition, patients with Medicare or Medicaid were slightly more likely to have longer hospital stays but were charged less than those with private

insurance. This suggests that insurance status may play a significant role in patient outcomes and should be further investigated to determine whether interventions are required.

Our results indicate that Black and Hispanic patients had significantly higher odds of developing a pressure ulcer than White patients, while Asians or Pacific Islanders were less likely to develop a pressure ulcer. Previous literature has reported an increased

TABLE 2. Odds of Having a Decubitus Ulcer During Hospitalization From the Logistic Regression Analysis

Variables	OR	95% CI	
Race			
White	Reference		
Black	1.528	1.514	1.541
Hispanic	1.020	1.007	1.033
Asian or Pacific Islander	0.929	0.908	0.951
Others	1.152	1.131	1.173
Age groups			
<40	Reference		
40<50	2.079	2.039	2.12
50<60	2.453	2.413	2.495
60<70	2.778	2.731	2.825
70≥	3.264	3.208	3.322
Sex			
Male	1.154	1.146	1.161
Female	Reference		
Median household income			
0–25th percentile	1.003	0.993	1.014
26th–50th percentile	0.973	0.963	0.983
51st–75th percentile	0.970	0.960	0.980
76th–100th percentile	Reference		
Primary payer			
Medicare	1.943	1.919	1.967
Medicaid	1.432	1.412	1.452
Private insurance	Reference		
Self-pay	0.733	0.710	0.756
Others	1.119	1.090	1.148
Died during hospitalization			
No	Reference		
Yes	2.226	2.198	2.254
Bed size of the hospital			
Small	Reference		
Medium	0.975	0.966	0.985
Large	0.948	0.940	0.956
Ownership of hospital			
Government, nonfederal	1.044	1.030	1.058
Private, nonprofit	1.059	1.048	1.070
Private, investor-own	Reference		
Teaching status of the hospital			
Nonteaching	Reference		
Teaching	1.044	1.036	1.052
Region of hospital			
Northeast	1.048	1.038	1.059
Midwest	Reference		
South	0.977	0.968	0.986
West	1.100	1.088	1.112
Year	1.012	1.009	1.014

TABLE 3. Association of Decubitus Ulcer With Hospital Charges and Length of Stay

	Ln Total Charges		Ln Length of Stays	
Variables	Estimate	*P*	Estimate	*P*
Decubitus ulcer				
No	Reference			
Yes	0.173	<0.0001	0.215	<0.0001
Race				
White	Reference			
Black	0.038	<0.0001	0.032	<0.0001
Hispanic	0.186	<0.0001	0.013	<0.0001
Asian or Pacific Islander	0.151	<0.0001	0.038	<0.0001
Others	0.123	<0.0001	0.049	<0.0001
Age groups				
<40	Reference			
40<50	0.132	<0.0001	−0.063	<0.0001
50<60	0.238	<0.0001	−0.043	<0.0001
60<70	0.312	<0.0001	−0.032	<0.0001
70≥	0.201	<0.0001	−0.077	<0.0001
Sex				
Male	0.099	<0.0001	0.045	<0.0001
Female	Reference			
Median household income				
0–25th percentile	−0.127	<0.0001	−0.002	0.001
26th–50th percentile	−0.092	<0.0001	−0.002	<0.0001
51st–75th percentile	−0.062	<0.0001	−0.002	0.001
76th–100th percentile	Reference			
Primary payer				
Medicare	−0.078	<0.0001	0.011	<0.0001
Medicaid	−0.090	<0.0001	0.060	<0.0001
Private insurance	Reference			
Self-pay	−0.094	<0.0001	−0.027	<0.0001
Others	−0.074	<0.0001	0.016	<0.0001
Died during hospitalization				
No	Reference			
Yes	0.631	<0.0001	0.258	<0.0001
Bed size of the hospital				
Small	Reference			
Medium	0.184	<0.0001	0.018	<0.0001
Large	0.367	<0.0001	0.068	<0.0001
Ownership of hospital				
Government, nonfederal	−0.583	<0.0001	0.027	<0.0001
Private, nonprofit	−0.499	<0.0001	−0.014	<0.0001
Private, investor-own	Reference			
Teaching status of the hospital				
Nonteaching	Reference			
Teaching	0.364	<0.0001	0.079	<0.0001
Region of hospital				
Northeast	0.154	<0.0001	0.044	<0.0001
Midwest	Reference			
South	0.084	<0.0001	0.033	<0.0001
West	0.465	<0.0001	0.033	<0.0001
Year	0.051	<0.0001	0.005	<0.0001

TABLE 4. General Characteristics of the Study Sample

	Total	Decubitus Ulcer				
		Yes		No		
		n	%	n	%	*P*
n	9,757,245	377,675		9,379,570		
Weighted n (national estimates)	48,786,216	1,888,375	3.9%	46,897,842	96.1%	
Race						
White	32,419,138	1,229,365	3.8%	31,189,773	96.2%	<0.0001
Black	8,269,291	395,245	4.8%	7,874,046	95.2%	
Hispanic	5,031,349	157,095	3.1%	4,874,254	96.9%	
Asian or Pacific Islander	1,237,139	40,835	3.3%	1,196,304	96.7%	
Others	1,829,300	65,835	3.6%	1,763,465	96.4%	
Age groups						
<40	9,161,183	111,900	1.2%	9,049,283	98.8%	<0.0001
40<50	3,876,294	103,180	2.7%	3,773,114	97.3%	
50<60	7,035,559	228,980	3.3%	6,806,579	96.7%	
60<70	9,692,093	406,105	4.2%	9,285,988	95.8%	
70≥	19,021,086	1,038,210	5.5%	17,982,876	94.5%	
Sex						
Male	24,015,976	977,755	4.1%	23,038,221	95.9%	<0.0001
Female	24,770,240	910,620	3.7%	23,859,621	96.3%	
Median household income						
0–25th percentile	15,738,868	624,235	4.0%	15,114,633	96.0%	<0.0001
26th–50th percentile	12,760,783	481,205	3.8%	12,279,578	96.2%	
51st–75th percentile	11,201,832	423,700	3.8%	10,778,133	96.2%	
76th to 100th percentile	9,084,733	359,235	4.0%	8,725,498	96.0%	
Primary payer						
Medicare	26,556,389	1,404,740	5.3%	25,151,649	94.7%	<0.0001
Medicaid	8,983,253	224,660	2.5%	8,758,593	97.5%	
Private insurance	10,153,089	200,910	2.0%	9,952,179	98.0%	
Self-pay	1,614,150	22,445	1.4%	1,591,705	98.6%	
Others	1,479,335	35,620	2.4%	1,443,715	97.6%	
Died during hospitalization						
No	47,143,786	1,736,885	3.7%	45,406,902	96.3%	<0.0001
Yes	1,642,430	151,490	9.2%	1,490,940	90.8%	
Bed size of the hospital						
Small	9,048,110	369,565	4.1%	8,678,546	95.9%	<0.0001
Medium	13,547,895	537,970	4.0%	13,009,926	96.0%	
Large	26,190,211	980,840	3.7%	25,209,370	96.3%	
Ownership of hospital						
Government, nonfederal	5,981,096	216,220	3.6%	5,764,876	96.4%	<0.0001
Private, nonprofit	36,219,298	1,425,840	3.9%	34,793,458	96.1%	
Private, investor-own	6,585,822	246,315	3.7%	6,339,507	96.3%	
Teaching status of the hospital						
Nonteaching	12,803,121	499,535	3.9%	12,303,586	96.1%	0.003
Teaching	35,983,096	1,388,840	3.9%	34,594,256	96.1%	
Region of hospital						
Northeast	9,966,528	408,595	4.1%	9,557,933	95.9%	<0.0001
Midwest	10,392,581	400,835	3.9%	9,991,746	96.1%	
South	20,095,702	750,415	3.7%	19,345,287	96.3%	
West	8,331,405	328,530	3.9%	8,002,875	96.1%	

risk of pressure ulcer development in African Americans, Asians, and Pacific Islanders, partially contradicting our results.[23–25] All minority races and ethnicities were significantly associated with increased hospital charges and prolonged lengths of stay compared with White patients.

These findings contradict previous research by Saunders et al[26] that found race to be an insignificant factor while income may have a more significant role in pressure ulcer incidence. We found that the opposite since race was found to be statistically significant. Our findings are significant because they highlight relevant

racial and ethnic health disparities, indicating that minority races are associated with increased odds of decubitus ulcers and face greater costs and lengths of stay. Some research has shown that pressure ulcer risk is increased in minority races and that minorities have lower quality care.[23–25] Whether implicit bias or differences in treatment play a role in the differences seen by race was not explored in our study due to limitations in the dataset since it does not describe differences in nursing or wound care. However, our findings indicate a need to delve into such problems and explore differences in receipt of quality care by race and ethnicity.

Unlike past studies, our findings indicate that income is less associated with pressure ulcer development.[26] Patients in the 0 to 25th percentile for median household income had slightly higher odds of developing pressure ulcers, but this finding was statistically insignificant. Patients in the 26th to 50th and 51st to 75th percentile were associated with significantly lower odds of pressure ulcer development compared with patients in the 76th to 100th percentile. In addition, all income groups below the 76th to 100th percentile were associated with significantly lower hospital charges and shorter lengths of stay. Our findings indicate that income status may not be relevant for assessing pressure ulcer risk.

Compared with the Midwest, Northeast and West were significantly associated with increased odds of pressure ulcers. Patients in the Northeast and West had the highest hospital charges and longest lengths of stay. Though not studied in this dataset, other studies have found that patients in rural hospitals were less likely to develop pressure ulcers.[32] Concerning our study, the Northeast and West regions have a high concentration of urban populations,[33] which could help explain the higher odds of pressure ulcers observed in these regions. Moreover, the Northeast and West are composed of states with high diversity indexes such as California, Nevada, Maryland, the District of Columbia, New York, and New Jersey, suggesting that there is a much higher likelihood that random selection may result in the inclusion of individuals from many different racial backgrounds.[34,35] Past literature has identified disparities in treatment and patient outcomes primarily in minority-serving hospitals,[36–38] and our results also demonstrate differences that are observed according to racial backgrounds. Therefore, the observed regional differences may be influenced by a combination of racial and rural/urban factors, which warrants further investigation.

Other relevant hospital factors include the size and type of hospital. Government, nonprofit, and teaching hospitals had slightly, but significantly, higher odds of pressure ulcers compared with private investor-owned or nonteaching hospitals. However, government and nonprofit hospitals had lower charges than investor-owned hospitals, while teaching hospitals had higher charges than nonteaching hospitals. Medium and large hospitals were associated with statistically significant, but small odds of decubitus ulcers compared with small hospitals but were associated with much larger charges. These results contradict previous research, which found that large hospitals were associated with a higher risk of pressure ulcers.[15] Given that pressure ulcer prevention requires a multifaceted, costly (though less than the cost of treatment), and interdisciplinary approach,[16–19] the decreased odds of pressure ulcers in larger hospitals, but increased costs, may be reflective of greater resource utilization for ulcer prevention. For instance, other research has demonstrated that magnet hospitals, hospitals that have high nursing credentials, have lower odds of pressure ulcers than nonmagnet hospitals.[39] Large hospitals and hospitals in systems that have adopted magnet status tend to have greater rates of magnet achievement than smaller hospitals or decentralized hospitals.[40]

Limitations

While this study has established significant associations between pressure ulcer risk and various patient and hospital factors, it is important to acknowledge certain limitations. First, the *ICD-10* codes used by the NIS dataset may have restricted patient selection and potentially overlooked patients with incomplete or inaccurate information.[41] Second, the absence of clinical details regarding disease severity, such as ulcer staging, may impact the implications of our findings in real-life situations. In addition, we did not include information on comorbidities, which previous research has shown to be associated with pressure ulcer risk. Hospital charges also may not be reflective of hospitals' final reimbursement, especially if considering differences in insurance coverage or maximum payments in the diagnosis related groups used by Medicare and Medicaid. Financial assistance programs could also affect patients' out-of-pocket costs. Finally, because of dataset limitations, we were unable to analyze hospital response to pressure ulcers. Further information on hospital resource allocation and interventions for pressure ulcer prevention could help strengthen our findings, but such data were not available in the NIS dataset. Previous studies have also suggested that nurse staffing levels may directly impact patient care, and the inclusion of staffing information could help clarify our results.

CONCLUSIONS

Decubitus ulcers, or pressure ulcers, are a prevalent and expensive condition among hospitalized patients, which often lead to prolonged hospital stays and increased overall costs. Although preventative methods exist, there is a lack of practical risk assessment tools to help identify vulnerable patients. Our study sought to evaluate potential risk factors for pressure ulcer development and their impact on healthcare utilization to identify vulnerable populations and promote early prevention. Patients with government insurance, those of minority races or ethnicities, and those treated in the Northeast and West faced the greatest odds of decubitus ulcer development, increased costs, and prolonged stays. Larger hospitals had a lower likelihood of having patients with pressure ulcers but had higher charges, which may be attributable to the cost of prevention efforts. Previous research has repeatedly illustrated the cost-effectiveness of pressure ulcer prevention, emphasizing the importance of implementing and investing in preventative measures. Research should continue to delve into health inequalities to identify areas for growth and ways to eliminate biases or barriers to care. Possible solutions will need to look into prevention strategies that can be universally applied. The populations identified in this study require further research and targeted interventions to reduce the risk of pressure ulcers.

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