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Incidence, risk factors, and clinical impact of non-home discharge following surgical management of proximal humerus fractures

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Abstract

Introduction: There has been a reported increase in the number of proximal humerus fractures being surgically managed. In an attempt to manage increasing costs associated with increasing volume, there is a need for identification of factors associated with discharge destinations.

Methods: The 2012–2016 American College of Surgeons—National Surgical Quality Improvement Program database was queried using Current Procedural Terminology codes for open reduction internal fixation, hemiarthroplasty, and total shoulder arthroplasty being performed for proximal humerus fractures.

Results: Five hundred and seventy-six (21.5%) patients had nonhome discharge disposition. Following adjusted analysis, age > 65 years ($p < 0.001$), partially dependent functional health status prior to surgery($p = 0.027$), inpatient surgery ($p = 0.010$), American Society of Anesthesiologists (ASA) grade>II ($p < 0.001$), transfer from nursing home/chronic care facility ($p < 0.001$), undergoing a total shoulder arthroplasty versus open reduction internal fixation ($p = 0.012$), length of stay > 2 days ($p < 0.001$), and the occurrence of any predischarge complication ($p < 0.001$) were significant predictors associated with a nonhome discharge disposition.

Conclusion: The study identifies significant risk factors associated with a nonhome discharge and assesses clinical impact of nonhome discharge destination on postdischarge outcomes. Providers can utilize these data to preoperatively risk stratify those at an increased risk of a nonhome discharge, counsel patients on discharge expectations, and tailor a more appropriate postoperative course of care.

Keywords

discharge disposition, proximal humerus fractures, trauma, risk factor, postdischarge outcomes

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Introduction

Proximal humerus fractures are one of the most common type of fragility fractures, accounting for 4–6% of all fractures in the United States.[1,2] These fractures tend to characteristically occur in osteoporotic bones of elderly females,[2] with a peak incidence between the ages of 60 and 90 years. With an increase in longevity worldwide, the number of proximal humerus fractures presenting acutely to emergency departments/hospitals is expected to rise.[3] Though historically treated using a nonoperative approach, there has been a recent increase in surgical management of displaced proximal humerus fractures.[4–7]

While the treatment algorithm remains controversial, it is important to mention the high healthcare resource utilization associated with these fractures.[8]

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Past literature reports that a significant proportion of patients undergoing treatment (nonoperative or operative) for proximal humerus fractures require postacute rehabilitation following discharge.[9] Though studies have explored factors associated with nonhome discharges to postacute care facilities in arthroplasty,[10–12] spine,[13,14] and hip fracture literature,[15] current evidence on proximal humerus fractures remains lacking.

In the light of the latter findings, as well as an increasing number of proximal humerus fractures anticipated to be treated surgically over the coming years, we sought to analyze a well-audited national surgical database to identify independent predictors for a discharge to a facility other than home. Furthermore, we also have analyzed the clinical impact of nonhome discharge on postdischarge outcomes.

Methods

Database

The 2012–2016 American College of Surgeons—National Surgical Quality Improvement Program (ACS-NSQIP) database was utilized for this study. The ACS-NSQIP database contains surgical outcomes data from more than 500 participating hospitals in the United States. The data are recorded by trained surgical and clinical reviewers, using a strict review protocol, with an inter-reviewer disagreement rate of below 2%. Details of the review protocol can be found elsewhere.[16] Since data were collected from a deidentified database, the study was deemed exempt from Institutional Review Board review.

Current Procedural Terminology (CPT) codes for open reduction internal fixation (ORIF) (CPT-23615, CPT-23680), hemiarthroplasty (HA) (CPT-23616), and total shoulder arthroplasty (TSA) (CPT-23472) being performed for proximal humerus fractures were used to retrieve records from the database. The records were then filtered to remove patients undergoing a procedure for arthropathies, rotator cuff tears, and malignancies. Furthermore, patients with polytrauma were also excluded to ensure a relevant study population of isolated proximal humerus fractures was analyzed. Those patients who expired prior to discharge or had missing data were also excluded from the study. A total of 2674 patients undergoing operative management for isolated proximal humerus fractures comprised the final study cohort.

Definition of variables

A complete list of baseline demographic and clinical characteristics that were collected from the database can be seen in Table 1. These included age, gender, race, body mass index, comorbidities (as defined by NSQIP), admission status, ASA Class, transfer status, and time to operation (≤ 1 day and > 1 day). Intraoperative data included procedure type (ORIF, HA, or TSA), type of anesthesia (general versus regional/other), and total operative time (0–90, 91–120, and > 120 min). Postoperative data variables included length of stay (0–2 days, > 2 days) and occurrence of any predischarge complication (as defined by NSQIP).

The study cohort was divided into two groups based on our main outcome variable—discharge destination. Discharge destinations were defined as (1) home versus (2) nonhome. The "nonhome" group included discharge to (1) skilled-care facility, (2) unskilled facility, (3) chronic care facility/assisted living facility, (4) separate acute care, and (5) rehabilitation facilities.

The following variables were assessed as part of analyzing the clinical impact of a nonhome discharge on postdischarge outcomes: (1) postdischarge wound complications (superficial/deep/organ-space surgical site infections (SSIs)), (2) postdischarge respiratory complications (pneumonia, unplanned intubation, and postoperative ventilator use > 48 h), (3) postdischarge cardiac complications (myocardial infarction, cardiac arrest), (4) postdischarge thromboembolic complications (deep venous thrombosis, pulmonary embolism), (5) postdischarge renal complications (urinary tract infection, progressive renal insufficiency), (6) postdischarge septic complications (septic shock, sepsis), (7) postdischarge stroke, and (8) postdischarge bleeding requiring transfusion. An additional variable "Any postdischarge complication" was defined as the presence of the occurrence of at least one of the abovementioned complications. We also studied 30-day readmissions, 30-day reoperations, and 30-day mortality as part of assessing the effect of discharge destination on postoperative outcomes following discharge.

Statistical analysis

Baseline characteristics of the study population were defined using descriptive analysis.

Pearson-Chi square tests were run to assess for unadjusted significant associations present between preoperative/operative/postoperative variables and a nonhome discharge. All variables, from unadjusted analysis, with a p-value of less than 0.1 were then entered into a multivariate logistic regression model. Following multivariate analysis, all variables with a p-value < 0.05 were considered significant independent predictors of a nonhome discharge.

Unadjusted analysis, using Pearson-Chi square tests, was used to analyze the presence of significant associations between discharge destination and postdischarge outcomes. Variables with $p < 0.05$ from unadjusted

Table 1. Comparison of clinical characteristics between "home" and "nonhome" discharge groups. All variables with a $p < 0.1$ were entered into a multivariate logistic regression model and adjusted for each other.

Clinical characteristics	Home	Nonhome	P-value
Preoperative data			
Age(years)			<0.001
≤65	1127 (53.7%)	90 (15.6%)	
66–80	805 (38.4%)	250 (43.4%)	
81–89	159 (7.6%)	197 (34.2%)	
≥90	7 (0.3%)	39 (6.8%)	
Gender			<0.001
Male	579 (27.6%)	93 (16.1%)	
Female	1519 (72.4%)	483 (83.9%)	
Race			<0.001
White	1669 (79.6%)	514 (89.2%)	
Black or African-American	45 (2.1%)	17 (3.0%)	
Asian	41 (2.0%)	9 (1.6%)	
American Indian or Alaska Native	15 (0.7%)	4 (0.7%)	
Native Hawaiian or Pacific	3 (0.1%)	0 (0%)	
Unknown/Not Reported	325 (15.5%)	32 (5.6%)	
Body mass index (BMI) (kg/m^2)			<0.001
≤24.99	608 (29.0%)	217 (37.7%)	
25.0–29.99	625 (29.8%)	135 (23.4%)	
30.0–34.99	434 (20.7%)	106 (18.4%)	
≥35.00	431 (20.5%)	118 (20.5%)	
Comorbidities			
Diabetes mellitus			<0.001
IDDM	147 (7.0%)	63 (10.9%)	
NIDDM	224 (10.7%)	80 (13.9%)	
Smoking within the past one year	418 (19.9%)	63 (10.9%)	<0.001
Dyspnea			<0.001
At rest	5 (0.2%)	4 (0.7%)	
With moderate exertion	77 (3.7%)	42 (7.3%)	

(continued)

Table 1. Continued

Clinical characteristics	Home	Nonhome	P-value
Functional health status prior to surgery			<0.001
Independent	2037 (97.1%)	490 (85.1%)	
Partially dependent	44 (2.1%)	70 (12.2%)	
Totally dependent	4 (0.2%)	12 (2.1%)	
Unknown	13 (0.6%)	4 (0.7%)	
Ventilator dependent	0 (0%)	1 (0.2%)	0.056
History of severe COPD	113 (5.4%)	62 (10.8%)	<0.001
CHF in 30 days before surgery	12 (0.6%)	13 (2.3%)	0.002
Hypertension requiring medication	1073 (51.1%)	422 (73.3%)	<0.001
Acute renal failure	3 (0.1%)	2 (0.3%)	0.315
Currently on dialysis	4 (0.2%)	2 (0.3%)	0.482
Disseminated cancer	9 (0.4%)	4 (0.7%)	0.417
Open wound/wound infection	38 (1.8%)	33 (5.7%)	<0.001
Chronic steroid use	69 (3.3%)	33 (5.7%)	0.007
>10% weight loss in last six months	4 (0.2%)	8 (1.4%)	<0.001
Bleeding disorders	73 (3.5%)	54 (9.4%)	<0.001
Transfusion ≥ 1 units of packed RBCS before surgery	15 (0.7%)	37 (6.4%)	<0.001
Prior systemic sepsis			<0.001
Sepsis	1 (~0%)	0 (0%)	
SIRS	59 (2.8%)	39 (6.8%)	
Admission status			<0.001
Inpatient	1227 (60.9%)	535 (92.9%)	
Outpatient	821 (39.1%)	41 (7.1%)	
ASA class			<0.001
I–II	1132 (54.0%)	110 (19.1%)	
>II	966 (46.0%)	466 (80.9%)	
Transferred from			<0.001
Home	2020 (96.3%)	477 (82.8%)	
Acute care hospital—inpatient	19 (0.9%)	19 (3.3%)	
Nursing home/chronic care facility	3 (0.1%)	51 (8.9%)	

(continued)

Table 1. Continued

Clinical characteristics	Home	Nonhome	P-value
Outside ED	51 (2.4%)	26 (4.5%)	
Other	4 (0.2%)	2 (0.3%)	
Unknown	1 (∼0%)	1 (0.2%)	
Time to operation			<0.001
≤1 day	1905 (90.8%)	377 (65.5%)	
>1 day	193 (2.9%)	199 (34.5%)	
Intraoperative data			
Procedure			<0.001
TSA	323 (15.4%)	196 (34.0%)	
HA	134 (6.4%)	72 (12.5%)	
ORIF	1641 (78.2%)	308 (53.5%)	
Type of anesthesia			0.881
General (GA)	2015 (96.0%)	554 (96.2%)	
Regional/Other	83 (4.0%)	22 (3.8%)	
Total operative time (min)			0.253
0–90	747 (35.6%)	192 (33.3%)	
91–120	548 (26.1%)	170 (29.5%)	
>120	803 (38.3%)	214 (37.2%)	
Postoperative data			
Length of stay(days)			<0.001
0–2 days	1607 (76.6%)	92 (16.0%)	
>2 days	491 (23.4%)	484 (84.0%)	
Any predischarge complication	109 (5.2%)	154 (26.7%)	<0.001

ASA: American Society of Anesthesiologists; CHF: congestive heart failure; COPD: chronic obstructive pulmonary disease; ED: emergency department; IDDM: Insulin dependent diabetes mellitus; NIDDM: non-insulin dependent diabetes mellitus; ORIF: open reduction internal fixation; RBCS: red blood cells; SIRS: systemic inflammatory response syndrome; TSA: total shoulder arthroplasty.

analysis were then entered into multivariate regression models while adjusting for all-baseline clinical characteristics of the study population.

All significant predictors, for both models (1, predictors of discharge destination and 2, impact of non-home discharge on postdischarge outcomes), have been reported as odds ratios (OR) with confidence intervals (CIs). Additionally, for all multivariate regression analyses, the area under curve (AUC) along with CIs was used to report the predictive probability of the models. All statistical analysis was carried out using SPSSv22 (IBM, Armonk, NY).

Results

Baseline clinical characteristics

Following application of inclusion/exclusion criteria, a total of 2674 patients undergoing surgical fixation for an isolated proximal humerus fracture were included in the final cohort. The majority of the patients being operated on were between 18 and 65 years of age (N = 1217; 45.5%), followed by 66–80 years of age (N = 1055; 39.5%) and were females (N = 2002; 74.9%). The most common type of procedure being performed was ORIF (N = 1949; 72.9%) followed by TSA (N = 519; 19.4%) and HA (N = 206; 7.7%). A total of 2098 (78.5%) had a home discharge and 576 (21.5%) were discharged to a nonhome destination. Within nonhome discharges, most patients were sent to skilled-care facilities (N = 407; 70.7%) and inpatient rehabilitation units (N = 121; 21.0%), with the remainder distributed between unskilled facilities, assisted living facilities, and separate acute care units (N = 48; 8.3%).

Predictors for nonhome discharge

Following adjusted multivariate analysis of all variables with p-value < 0.1 from Table 1, age > 65 years ($p < 0.001$), partially dependent functional health status prior to surgery (OR 1.80 (95% CI 1.07–3.04); $p = 0.027$), inpatient admission status (OR 1.83 (95% CI 1.16–2.90); $p = 0.010$), ASA grade > II (OR 2.01 (95% CI 1.47–2.74); $p < 0.001$), transfer from nursing home/chronic care facility (OR 85.7 (95% CI 23.2–316.8); $p < 0.001$), undergoing a TSA versus ORIF (OR 1.47 (95% CI 1.09–1.99); $p = 0.012$), a length of stay > 2 days (OR 9.72 (95% CI 6.89–13.70); $p < 0.001$), and the occurrence of any predischarge complication (OR 1.85 (95% CI 1.31–2.62); $p < 0.001$) were significant predictors associated with a nonhome discharge disposition (Table 2). The model had excellent predictive probability with an AUC = 0.917 (95% CI 0.91–0.93).

Clinical impact of nonhome discharge on postdischarge outcomes

Unadjusted analysis showed that patients discharged to a nonhome destination versus home were more likely to experience any postdischarge complication (6.4% versus 1.3%; $p < 0.001$), respiratory complication (1.2% versus 0.3%; $p = 0.009$), thromboembolic complications (1.6% versus 0.6%; $p = 0.026$), renal complications (1.2% versus 0.2%; $p = 0.001$), 30-day readmissions (8.3% versus 3.1%; $p < 0.001$), 30-day reoperations (3.6% versus 2.0%; $p = 0.026$), and mortality (1.7% versus 0%; $p < 0.001$) (Table 3). Following adjustment for all baseline preoperative, intraoperative, and postoperative data from Table 1, patients having a nonhome discharge had higher odds of developing any postdischarge complication (OR 4.25 (95% CI 2.08–8.67); $p < 0.001$), postdischarge thromboembolic complications (OR 12.51 (95% CI 3.05–51.29); $p < 0.001$), and postdischarge renal complications (OR 9.06 (1.18–73.49); $p = 0.039$) (Table 4).

Discussion

Based on our thorough search of literature, the current study is the first of its kind that utilizes a large, well-audited national surgical database to identify the incidence, risk factors, and assess the postdischarge clinical impact associated with a nonhome discharge. Broadly summarizing the results, we found that elderly and functionally dependent patients, transferred from chronic-care/nursing facilities, undergoing inpatient TSAs, and experiencing predischarge complications were more likely to be discharged to a destination other than home. Furthermore, more postdischarge complications are noted to occur in patients undergoing a nonhome discharge.

With the cost of each additional day spent in the hospital estimated to be over $1000 USD,[13] identification of patients who can be discharged early to postacute care facilities would not only serve as an effective way of curbing unnecessary healthcare costs but also positively reduce the risk of patients experiencing potential and nonreimbursable hospital-acquired events during a prolonged hospital stay. Furthermore, risk stratification of patients preoperatively can also allow providers to appropriately tailor a discharge plan, which not only optimizes necessary healthcare utilization, but also is appropriate to a patient's needs and requirements.

We found that an age > 65 years, ASA > II, and a dependent functional health status prior to surgery were associated with discharge to a location other than home. A plausible explanation could be that all these factors significantly contribute to the overall baseline function of the patient and play an important role in determining frailty. Given that past literature has extensively shown that poor frailty levels are associated with higher risks of postoperative morbidity and mortality,[17–19] surgeons are more likely to be cautious and stress the need for continued care, in the form of rehabilitation units or skilled-care facilities, rather than having them discharged to a home. Furthermore, due to low preoperative functional levels, patients may require a prolonged and intensive inpatient rehabilitation course to ensure adequate mobility prior to discharge to home. Higher ASA grades have also been known to impact the postoperative course of care in surgical patients.[20] With regards to shoulder literature, Shields et al.[21] conducted a ACS-NSQIP database analysis to assess postoperative morbidity following various shoulder surgical procedures, and concluded that in addition to other procedural factors, ASA class was a significant predictor associated with experiencing major complications.

Table 2. Significant factors associated with a nonhome discharge. Adjusted for age, gender, race, BMI, comorbidities, admission status, ASA grade, transfer status, time to operation, type of procedure, length of stay (LOS), and occurrence of any predischarge complication. AUC = 0.917 (95% CI 0.91–0.93).

Variable	Odds ratio (95% CI)	P-value
Age(years)		
≤65	Ref.	–
66–80	2.68 (1.91–3.76)	<0.001
81–89	6.85 (4.52–10.37)	<0.001
≥90	25.08 (8.56–73.47)	<0.001
Race		
White	Ref.	–
Black or African-American	1.01 (0.44–2.34)	0.976
Asian	0.74 (0.25–2.20)	0.583
American Indian or Alaska Native	0.76 (0.18–3.34)	0.725
Native Hawaiian or Pacific	0.00	0.999
Unknown/not reported	0.24 (0.15–0.39)	<0.001
BMI (kg/m^2)		
≤24.99	Ref.	–
25.0–29.99	0.69 (0.49–0.97)	0.035
30.0–34.99	0.72 (0.49–1.06)	0.095
≥35.00	1.01 (0.68–1.50)	0.971
Functional health status prior to surgery		
Independent	Ref.	–
Partially dependent	1.80 (1.07–3.04)	0.027
Totally dependent	4.30 (0.63–29.2)	0.136
Unknown	2.71 (0.69–10.61)	0.152
Admission status		
Inpatient	1.83 (1.16–2.90)	0.010
Outpatient	Ref.	–
ASA class		
I–II	Ref.	–
>II	2.01 (1.47–2.74)	<0.001
Transferred from		
Home	Ref.	–
Acute care hospital—inpatient	1.43 (0.64–3.27)	0.383
Nursing home/ chronic care	85.7 (23.2–316.8)	<0.001
Outside ED	0.88 (0.44–1.57)	0.566
Other	1.21 (0.09–15.62)	0.882
Unknown	1.88 (0.0–961.1)	0.843
Procedure		
TSA	1.47 (1.09–1.99)	0.012
HA	1.21 (0.78–1.87)	0.389
ORIF	Ref.	–
Length of stay (days)		
0–2 days	Ref.	–
>2 days	9.72 (6.89–13.7)	<0.001
Any predischarge complication	1.85 (1.31–2.62)	0.001

ASA: American Society of Anesthesiologists; AUC: area under curve; BMI: body mass index; CI: confidence interval; ED: emergency department; HA: hemiarthroplasty; ORIF: open reduction internal fixation; TSA: total shoulder arthroplasty.

Patients being admitted from chronic-care/nursing facilities had higher odds of being discharged to a destination other than home. This may be partially explained by the fact that these patients are probably being discharged back to the facility from whence they came. A secondary reason may be that surgical management was necessary after failed nonoperative management. However, given that the ACS-NSQIP does not provider preadmission data it is difficult to derive a more affirmative conclusion about this. Future studies revolving on studying the impact of different transfer status, using more granular clinical data, may yield answers to this interesting observation. Contrary to previous literature,[22] a hospital-to-hospital transfer was not significantly associated with nonhome discharge.

Finally, we noted that experiencing a predischarge complication was significantly associated with a nonhome discharge. While this is understandable given that these patients may require extended care in post-acute care facilities depending on the severity of the adverse event, it is pertinent to stress that complications

Table 3. Unadjusted analysis of postdischarge outcomes between the two groups. All variables with p-value<0.1 were further analyzed using multivariate regression analyses to assess the clinical impact of nonhome discharge while adjusting for all variables from Table 1.

Postdischarge outcomes	Home	Nonhome	P-value
Any postdischarge complication	37 (1.3%)	37 (6.4%)	<0.001
Postdischarge wound complications	9 (0.4%)	3 (0.5%)	0.770
Postdischarge respiratory complications	7 (0.3%)	7 (1.2%)	0.009
Postdischarge cardiac complications	2 (0.1%)	2 (0.3%)	0.166
Postdischarge thromboembolic complications	13 (0.6%)	9 (1.6%)	0.026
Postdischarge renal complications	4 (0.2%)	7 (1.2%)	0.001
Postdischarge septic complications	3 (0.1%)	3 (0.5%)	0.090
Postdischarge stroke	3 (0.1%)	1 (0.2%)	0.866
Postdischarge bleeding requiring transfusions	1 (0%)	2 (0.3%)	0.057
30-day readmissions	66 (3.1%)	48 (8.3%)	<0.001
30-day reoperations	43 (2.0%)	21 (3.6%)	0.026
Mortality	1 (~0%)	10 (1.7%)	<0.001

Table 4. Multivariate analysis assessing the clinical impact of nonhome discharge on postdischarge clinical outcomes.

Variable	Odds ratio (95% CI)	P-value	AUC (95% CI)
Any postdischarge complication	4.25 (2.08–8.67)	<0.001	0.73 (0.66–0.80)
Postdischarge respiratory complications	1.06 (0.18–6.18)	0.946	0.93 (0.86–1.00)
Postdischarge thromboembolic complications	12.51 (3.05–51.29)	<0.001	0.89 (0.83–0.96)
Postdischarge renal complications	9.06 (1.18–73.49)	0.039	0.94 (0.89–0.98)
30-day readmissions	1.42 (0.85–2.38)	0.186	0.74 (0.69–0.78)
30-day reoperations	1.56 (0.77–3.23)	0.214	0.67 (0.60–0.74)
Mortality	1.52 (0.08–31.02)	0.784	0.99 (0.98–1.0)

AUC: area under curve; CI: confidence interval.
Adjusted for age, gender, race, BMI, all-comorbidities (diabetes, smoking, dyspnea, functional health status, ventilator dependence, history of severe COPD, CHF in 30 days before surgery, hypertension, acute renal failure, currently on dialysis, disseminated cancer, open wound/wound infection, chronic steroid use, >10% bodyweight loss, bleeding disorders, transfusion≥1 unit of packed RBCs within 72 h of surgery, prior systemic sepsis), admission status, ASA class, transfer status, time to operation, procedure type, type of anesthesia, total operative time, length of stay (LOS), and occurrence of any predischarge complication.

are potentially avoidable instances that can be controlled through adequate medical optimization, early mobilization, and close in-hospital observation, when needed, to allow patients to be discharged home safely and early. It is also important to mention that contrary to previous literature by Menendez and Ring,[23] we were unable to establish a racial disparity with regards to discharge destinations. It is possible that racial disparities may not exist at quality improvement hospitals.[24] Finally, we also noticed that having a prolonged length of stay > 2 days was associated with higher odds of discharge to nonhome facilities. One possible reason for the latter finding could be that Medicare requires patients to complete a three-day hospital stay before being discharged to skilled-nursing facilities[25] Unfortunately, due to lack of insurance status data in the NSQIP, we were unable to confirm this hypothesis. Regardless, with studies showing that the three-day mandate unnecessarily increases hospital length of stay and costs, future study into healthcare policy may be able to modify this rule in an attempt to decrease overall expenditures.[26] Another explanation could be that experiencing a complication may complicate the postoperative care in these patients requiring them to stay in the hospital longer than usual to allow adequate medical optimization.

We found that a nonhome discharge was associated with higher odds of developing any postdischarge complication, thromboembolic complications, and renal complications. These findings reflect on the question of whether postdischarge care is being appropriately distributed among this cohort. For instance, patients who may have benefited from an assisted (home healthcare) home discharge may have been sent to a skilled-care facility instead. This may have predisposed them to developing complications secondary to continued exposure to an inpatient care environment. With complications following surgical procedures or medical care associated with high aggregate hospital costs for all payers,[27] early identification of patients who may be a risk of experiencing such adverse outcomes will allow providers to weigh-in this important factor during discharge planning. Counseling and resolving patient's concerns preoperatively with regards to the benefits and possible risks of nonhome discharges may also ultimately improve the quality of postacute care.

The major limitations are of the current study are primarily database related. First, the ACS-NSQIP database records surgical data up to 30 days following the primary procedure. It is possible that certain complications, such as SSIs, may be taking place well beyond this period.[28] Second, the database does not record the number of days spent at a postacute care location which may have been clinically useful. Third, the NSQIP does not contain insurance-specific data that would have been beneficial for assessing given that previous literature has denoted significant insurance disparities present with regard to postacute care resource utilization.[23] The NSQIP also does not contain hospital-specific data, such as hospital size, location (rural/urban), and teaching status which would have been useful in adjusting for in our analysis. The database also lacks preadmission data, and therefore we were unable to account for those patients who may have previously failed nonoperative management of proximal humerus fractures. Finally, the NSQIP records data from more than 500 participating hospitals, which largely consist of academic medical centers, and therefore the findings of the study may not be generalized to smaller community hospitals.

Conclusion

The study identifies numerous risk factors associated with a nonhome discharge, and also quantitatively assesses the clinical impact of nonhome discharge on postoperative outcomes. Surgeons can utilize these data to enhance knowledge with regards to nonhome discharge and preoperatively risk stratify patients to promote home discharge in patients when appropriate.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Disclosures

The American College of Surgeons National Surgical Quality Improvement Program and the hospitals participating in the ACS NSQIP are the source of the data used herein; they have not verified and are not responsible for the statistical validity of the data analysis or the conclusions derived by the authors. Since data were derived from a deidentified database, it was exempt from Institutional Review Board approval.

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Ethical Review and Patient Consent

This study uses de-identified patient information from a national database. No patient consent or Institutional Review Board approval were required.

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