

Thirty-Day Readmission Risk Factors Following Single-Level Transforaminal Lumbar Interbody Fusion (TLIF) for 4992 Patients From the ACS-NSQIP Database

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Abstract

Study Design: Retrospective cohort study.

Objective: To describe the readmission rate and identify risk factors associated with 30-day readmission after transforaminal lumbar interbody fusion (TLIF) surgery.

Methods: Patients who underwent elective single level TLIF surgery from 2011 to 2013 were identified in the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) database. Emergency or trauma cases were excluded. Preoperative, intraoperative, and postoperative variables were extracted. A multivariate binary regression identified predictors correlated with 30-day readmission.

Results: A total of 4992 patients were included in the analysis. The overall 30-day readmission rate was 5.51% (275/4992) for readmissions reported between 2011 to 2013. The mean age of patients readmitted was 62.40 years (standard error [SE] = 0.78) and 60.92 years (SE = 0.20) among those whom were not readmitted ($P = .05$). The top three causes for readmission included postoperative pain control, deep or superficial surgical site infections. Predictors associated with 30-day readmission in a multivariate analysis included female gender (odds ratio [OR] = 1.27, 95% CI = 0.97-1.65), history of severe chronic obstructive pulmonary disease (OR = 1.81, 95% CI = 1.11-2.96), and in the postoperative period, American Society of Anesthesiologists class (OR = 1.30, 95% CI = 1.04-1.63), presence of superficial surgical site infection (OR = 18.23, 95% CI = 10.36-32.08), or urinary tract infection (OR = 4.93, 95% CI = 2.84-8.58).

Conclusions: The readmission rate, risk factors, and causes following TLIF surgery are comparable to other lumbar spinal procedures reported from the ACS-NSQIP database.

Keywords

readmission, risk factors, TLIF, spine surgery, ACS-NSQIP

Introduction

The Agency for Healthcare Research and Quality (AHRQ) estimates that approximately 3.3 million adult 30-day all-cause readmissions resulted in hospital costs approaching \$41.3 billion dollars. Medicare patients accounted for the largest share of total readmissions and associated costs.¹ In response, the Centers for Medicare and Medicaid Services (CMS) implemented the Hospital Readmissions Reduction Program through the Patient Protection and Affordable Care Act (PPACA) in 2013. This program penalizes Medicare

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payments to hospitals with a high 30-day readmission rate for several common medical conditions.² Predictors associated with hospital readmission in spinal surgery have been studied, including examination of lumbar decompression, lumbar discectomy/microdiscectomy, cervical spine surgery, and posterior spinal fusion procedures.³⁻¹¹

Transforaminal lumbar interbody fusion (TLIF) represents one of the most common procedures for lumbar interbody fusion. In the 2001-2010 Nationwide Inpatient Sample databases, there were an estimated 153 939 TLIF/posterior lumbar interbody fusion (PLIF) cases identified among 923 038 patients, accounting for 79% to 86% of all lumbar interbody fusions.¹² Interbody fusion procedures, especially the TLIF surgery, have become more widespread in the past decade for common spinal conditions such lumbar spondylosis, and spondylolisthesis. However, few studies have addressed predictors for hospital readmission or readmission rates following these surgeries. Buerba et al⁵ identified 6.3% of 10 387 patients in American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) database had undergone TLIF/PLIF from 2005-2010 but the authors did not investigate the risk of readmission. In this study, we used the national validated multicenter ACS-NSQIP database to examine the percentage of 30-day readmission and risk factors associated with 30-day readmission for patients undergoing elective single level TLIF spine surgery.

Methods

Data Source and Population

The ACS-NSQIP database is a prospective, multi-institutional outcome database that collects data on over 300 variables for patients undergoing major surgical procedures in both the inpatient and outpatient setting.¹³ Data is collected through a prospective systematic sampling system. Details of the systematic sampling process have been described elsewhere.¹⁴ Trained surgical clinical reviewers extract information from chart review and follow-up. Data from national participant use files from 2006 to 2013 was obtained. Readmission information was collected from 2011 onward in the database, which defined our study cohort time frame from 2011-2013. The ACS-NSQIP data is a public database and did not require institutional review board approval.

Study Variables

Patients who underwent lumbar arthrodesis through a TLIF approach alone were included (Current Procedural Terminology [CPT] code 22612). There is no CPT code to distinguish between patients undergoing open versus minimally invasive surgery (MIS) technique. In 2012, 2 CPT codes, 22612 (lumbar arthrodesis with lateral transverse technique) and 22630 (arthrodesis, posterior interbody technique), were merged into a single CPT code (22633). Cases with CPT codes 22630 and 22633 were excluded to focus the analysis on patients

exclusively undergoing TLIF surgery. Only elective single level surgical cases were included. Exclusion criteria were emergency, urgent unplanned cases, and 2-level or multilevel fusion (secondary CPT codes: +22632, +22634, or +22614).

Variables were chosen with 2 general time categories: (1) preoperative period including patient characteristics and (2) operative and postoperative period. Body mass index (BMI) in kg/m² was calculated. Variables were identified through literature search and clinical knowledge of known predictors associated with readmission following elective lumbar spine surgery. The causes for admission were identified through 2 variables, using (1) the variable for the reason for readmission or (2) the International Classification of Diseases Version 9 (ICD-9). Grafting material was also explored (CPT codes: 20930, 20931, and 20936 to 20938).

Two variables in the database captured first time 30-day readmission: "readmission" and "readmission1." These variables were combined to capture all 30-day readmission.

Statistical Analysis

Stata Intercooled, Version 12 (Stata Corporation, College Station, TX) was used for statistical analysis. Descriptive statistics comparing patients with and without 30-day readmission was analyzed by 2-sided Student's *t* tests and χ^2 tests for continuous and categorical variables, respectively. When necessary, the Fischer exact test and Wilcoxon-Mann-Whitney rank sum test were used for small cell counts with fewer than 10 observations. Multivariable parametric binary logistic regression models were constructed to test the association of combined predictors with readmission within 30 days. Risk factors from the univariate analysis with $P < .1$ and cell counts greater than 20 observations each were included into the multivariate regression model. Variables that would result in absolute readmission (ie, reoperation, sepsis, pulmonary embolism, etc) were excluded from final multivariable analysis. A forward and backward stepwise regression analysis was conducted to identify risk factors associated with 30-day readmission. Odds ratios (ORs) are presented with 95% confidence intervals (CIs). The likelihood ratio (LR) test was implemented to compare the goodness of fit between final logistic regression models.

Results

From January 1, 2011 to December 31, 2013, 4992 patients met inclusion and exclusion criteria.

Thirty-Day Readmission Percentages

A total of 275 (5.51%) patients were readmitted within 30 days of discharge after elective single level TLIF. The greatest percentage of readmission was in 2012 (5.85%). Figure 1 shows the percentages of single level elective TLIF cases since ACS-NSQIP began collecting data and the number of readmissions by admission year. A total of 275 cases were identified as reoperation. There was no statistically significant difference in 30-day readmission rate between those undergoing revision

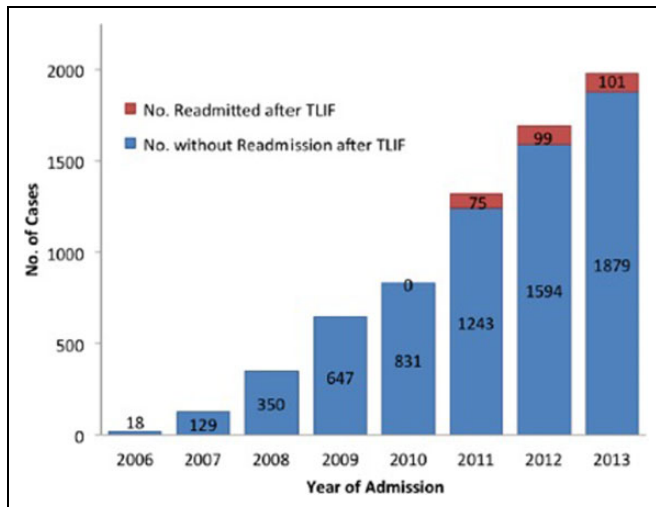


Figure 1. Single-level elective TLIF cases (CPT code: 22612) with number of 30-day readmissions reported since 2006. CPT, Current Procedural Terminology; TLIF, transforaminal lumbar interbody fusion.

compared with patients undergoing first-time surgery ($P = .47$). These patients were included in the final analysis.

Of 275 readmissions, 156 (56.72%) had a reported diagnosis for 30-day readmission. More than 45 ICD-9 codes for readmission were listed. Reasons for readmission for the remaining cases are unknown and represent missing data. The top reasons for readmission among the 156 patients were deep (10%) and superficial (8.5%) surgical site infections and uncontrolled postoperative pain control (8.5%) followed by postoperative seroma (6%) or hematoma formation (2%). Other common medical admission diagnoses included acute cardiac disease, progressive renal disease, gastrointestinal disease (ie, postoperative ileus), pulmonary embolism (PE), urinary tract infection (UTI), and deep venous thrombosis (DVT).

Logistic Regression Analysis

The preoperative risk factors associated with 30-day readmission on univariate analysis (Table 1) included age in years ($P = .06$), American Society of Anesthesiology physical status (ASA) class ($P < .001$), gender ($P = .03$), preoperative hematocrit percentage ($P < .01$), and history of severe chronic obstructive pulmonary disease (COPD) ($P = .01$).

Operative and postoperative risk factors associated with 30-day readmission are shown in Table 2. The following risk factors were significantly associated with readmission: length of total surgical stay ($P < .01$), total operation time in minutes, superficial surgical site infection identified after index surgery, urinary tract infection, occurrence of DVT/thrombophlebitis, occurrences of sepsis and pneumonia after surgery (all P s $< .001$). Patients requiring readmission spent 26.37 minutes (standard error [SE] = 8.04, $P < .001$) more time in the operating room than patients not requiring readmission. Functional

status was not found to be associated with 30-day readmission ($P = .48$); approximately 97% of patients were functionally independent in both patient populations. Use of morselized allograft was found to be used less in patients whom were readmitted ($P = .07$) but was not an important predictor in the multivariable analysis. We found other risk factors that were significantly associated with 30-day readmission, but these were not included in multivariable logistic regression model due to collinearity with the primary outcome variable. These variables included occurrence of wound disruption/dehiscence, sepsis, DVT/thrombophlebitis, reoperation, deep surgical site infection, pulmonary embolism, and presence of pneumonia (all P s $< .001$).

The final multivariate regression analysis identified female gender, presence of severe COPD, ASA class, presence of urinary tract infection, total operative time in minutes, superficial surgical site infection to have an increased odds of 30-day readmission (Table 3). The risk factors most strongly associated with increased odds of 30-day readmission included presence of superficial surgical site infection (OR = 18.23, 95% CI = 10.36-32.08), and urinary tract infection (OR = 4.93, 95% CI = 2.84-8.58). Total operative time in minutes was correlated with 30-day readmission in both univariable and multivariable analysis. However, given the null estimate of the OR, this variable is likely not clinically significant.

Forty-three percent (119 of 275) of cases in the readmission group returned to the operating room for a second surgery within 30-days of primary TLIF procedure compared with 1.3% (60 of 4715, $P < .001$) in the group that did not require a readmission. The operative indications for repeat surgery were not reported. The time for return to the operating room after primary TLIF surgery was 5.11 days (SE = 0.70, $n = 45$) among patients not readmitted compared to 16.51 days (SE = 0.81, $n = 83$) among patients readmitted within 30 days; this difference was significant ($P < .001$).

Discussion

This study represents the first review of 30-day readmission cause and risk factors for readmission for patients undergoing single level elective TLIF surgery from 2011 to 2013 using the ACS-NSQIP database. The 30-day readmission rate was 5.51%. This rate is higher than that reported for patients undergoing lumbar decompression (3.7% to 4.4%) and anterior cervical discectomy and fusion (2.9%) from the same ACS-NSQIP database.^{3,7,8} Top causes included postoperative pain management and surgical site infections.

Female gender, ASA class, and history of severe COPD were preoperative risk factors statistically associated with odds of 30-day readmission (Tables 1 and 3). Higher ASA class has been described as an important risk factor for readmission following other spine procedures^{7,10} and was found to increase the odds of readmission in our present analysis as well. COPD is a marker of increased patient-specific medical comorbidity and was not significantly associated with superficial surgical site infections ($P = .32$), but was statistically associated with deep

Table 1. Preoperative Risk Factors Associated With 30-day Readmission for Patients Undergoing Single Level-Selective TLIF According to CPT Code 22612.^a

Risk Factor	ACS-NSQIP Variable	Readmission Within 30 Days "Yes"	Readmission Within 30 Days "No"	P
Surgery performed by neurosurgeon	surgspec	141/275 (51)	2430/4717 (52)	.94
Age, y (mean ± SE)	age	62.40 ± 0.78 (n = 275)	60.92 ± 0.20 (n = 4717)	.06
Female gender	sex	171/275 (62)	2614/4716 (55)	.03
Race	race_new			.19
American/Alaskan Indian		1/275 (<1)	20/4717 (<1)	
Asian		6/275 (2)	65/4717 (1)	
Black		25/275 (9)	296/4717 (6)	
White		234/275 (85)	4004/4717 (85)	
Native Hawaiian or Pacific Islander		0	13/4717 (<1)	
Unknown		0	82/4717 (2)	
ASA Class (mean ± SE)	asaclas	2.62 ± 0.03 (n = 275)	2.50 ± 0.58 (n = 4715)	<.001
Class 1		1/275 (<1)	97/4715 (2)	<.01
Class 2		111/275 (40)	2287/4715 (49)	
Class 3		154/275 (56)	2226/4715 (47)	
Class 4		9/275 (3)	105/4715 (2)	
Body mass index, kg/m ² (mean ± SE)	—	31.16 ± 0.40 (n = 273)	30.52 ± 0.09 (n = 4708)	.12
Underweight <18.5		2/273 (<1)	47/4708 (1)	.34
Normal 18.5 to <25		48/273 (18)	802/4708 (17)	
Overweight 25 to <30		78/273 (29)	1617/4708 (34)	
Obese 30 to <35		83/273 (30)	1249/4708 (26)	
Morbidly obese >35		62/273 (23)	993/4708 (21)	
Preoperative serum BUN, md/dL (mean ± SE)	prbun	17.47 ± 9.06 (n = 240)	16.75 ± 0.12 (n = 3971)	.23
Preoperative serum creatinine, mg/dL (mean ± SE)	prcreat	0.96 ± 0.03 (n = 246)	0.93 ± 0.01 (n = 4166)	.38
Preoperative creatinine >1.2 mg/dL	—	35/275 (13)	511/4717 (11)	.19
Preoperative INR value (mean ± SE)	prinr	1.02 ± 0.03 (n = 174)	1.01 ± 0.00 (n = 1.01)	.92
Preoperative platelet count (mean ± SE)	prplate	251.37 ± 4.32 (n = 257)	246.82 ± 1.04 (n = 4400)	.31
Preoperative WBC count, per microliter (mean ± SE)	prwbc	7.41 ± 0.14 (n = 259)	7.23 ± 0.04 (n = 4405)	.22
Preoperative hematocrit, % (mean ± SE)	prhct	39.83 ± 0.26 (n = 265)	40.50 ± 0.06 (n = 4455)	.01
Current smoker within 1 year	smoke	54/275 (20)	992/4717 (21)	.58
History of diabetes mellitus	diabetes ^b	55/275 (20)	784/4717 (16)	.15
History of severe COPD	hxcopd	21/275 (8)	196/4717 (4)	.01
Occurrences of SIRS, sepsis, or septic shock	prsepsis ^c	1/275 (<1)	18/4699 (<1)	.72

Abbreviations: CPT, Current Procedural Terminology; TLIF, transforaminal lumbar interbody fusion; SE, standard error of the mean; ASA, American Society of Anesthesiologists class; COPD, chronic obstructive pulmonary disease; BMI, body mass index; BUN, blood urea nitrogen; WBC, white blood cells; INR, international normalized ratio; SIRS, systemic inflammatory response system.

^aShown in the table are means or percentages for each variable. The variable name from the ACS-NSQIP database is shown, when appropriate.

^bDiabetes mellitus was treated as a binary variable representing the presence (insulin-dependent and non-insulin-dependent) or absence of the disease.

^cThis variable was made into a binary variable representing the presence (SIRS, sepsis, or septic shock) or absence of disease.

wound infections ($P < .01$). This finding may reflect the ACS-NSQIP definition of COPD, which is functional disability from COPD, chronic bronchodilator therapy with oral or inhaled agents, hospitalization in the past for treatment of COPD, or an FEV₁ of <75% of predicted on a pulmonary function test. The presence of COPD has been also identified as a risk factor for readmission causes with other spinal surgeries.^{10,15} Some studies hypothesize that minimizing readmissions in patients specifically with COPD could include optimal anesthetic techniques and agents, and the utilization of MIS techniques.¹⁶ The latter remains a controversial topic and possibly untrue in the case of the TLIF approach due to the advanced technical skill and experience required to perform an uncomplicated MIS TLIF.^{17,18} Female gender is likely an important risk factor for 30-day readmission, as approximately 55.43% of the patients in this entire cohort were female. A recent nationwide health

system review of over 645 449 patients found that women had undergone more spinal surgery overall.¹⁹ Additionally, the patient utilization literature has well characterized the female gender bias in seeking more medical care compared to males, which could help explain this finding.^{20,21}

Postoperative risk factors that were also statistically associated with the primary outcome of readmission on both univariate and multivariate regression were presence superficial surgical site infection, and presence of urinary tract infection (P s < .001). The presence of superficial surgical site infections in the postoperative period was the risk factor with the largest magnitude (OR = 18.23, 95% CI = 10.36-32.08). Overall, our findings support existing evidence in the scientific literature. A large primary analysis of the Kaiser Permanente health system since 2009 also identified the top 3 causes for readmission among instrumented spine cases as surgical site complications and sepsis.²²

Table 2. Operative and Postoperative Risk Factors Associated With 30-Day Readmission for Patients Undergoing Single-Level Elective TLIF According to CPT Code 22612.^a

Risk Factor	ACS-NSQIP	Readmission Within 30 Days "Yes"	Readmission Within 30 Days "No"	P
	Variable			
Duration of anesthesia, min (mean ± SE)	anetime	287.14 ± 20.96 (n = 50)	296.75 ± 4.21 (n = 945)	.66
Total operation time, min (mean ± SE)	optime	229.34 ± 7.90 (n = 275)	202.97 ± 1.51 (n = 4704)	<.001
Length of total surgical stay (mean ± SE)	totslos	4.34 ± 0.20 (n = 274)	3.82 ± 0.05 (n = 4674)	<.01
Morselized allograft	—	76/84 (90)	1598/1682 (95)	.07
Structural allograft	—	1/16 (6)	20/253 (8)	.81
Autograft from same incision	—	9/16 (56)	169/253 (67)	.39
Morselized autograft from separate incision	—	2/16 (13)	29/253 (12)	.90
Structural autograft from separate incision	—	0/16	5/253 (2)	.57
Superficial SSI	supinfec	28/275 (10)	31/4717 (<1)	<.001
Deep SSI	wndinf	34/275 (12)	7/4717 (<1)	<.001
Occurrences of wound disruption/dehiscence	dehis	10/275 (4)	5/4717 (<1)	<.001
Pulmonary embolism	pulembol	8/275 (3)	15/4717 (<1)	<.001
Occurrence of sepsis	othsysep	25/275 (9)	16/4717 (<1)	<.001
Urinary tract infection	urninfec	19/275 (7)	65/4717 (1)	<.001
Occurrence of DVT/thrombophlebitis	othdvt	18/275 (7)	24/4717 (<1)	<.001
Pneumonia diagnosed after surgery	oupneumo	8/275 (3)	25/4717 (<1)	<.001
Working RVU (mean ± SE ^a)	—	103.67 ± 4.76 (n = 22)	98.93 ± 0.92 (n = 380)	.34

Abbreviations: CPT, Current Procedural Terminology; TLIF, transforaminal lumbar interbody fusion; SE, standard error of the mean; SSI, surgical site infections; RVU, relative value units; DVT, deep venous thrombosis.

^aOperative and postoperative risk factors associated with hospital readmission within 30 days of elective single level TLIF surgery between 2011 and 2013. Shown in the table are means or percentages for each variable included in the analysis. The variable name from the ACS-NSQIP database is shown.

Table 3. Multivariable Logistic Regression Analysis of Risk Factors Associated With 30-Day Readmission Following Single-Level TLIF Surgery According to CPT Code 22612.

Risk Factor	Odds Ratio (95% CI ^a)	P
Preoperative		
Female gender	1.27 (0.97-1.65)	.08
History of severe COPD	1.81 (1.11-2.96)	.02
ASA class	1.30 (1.04-1.63)	.02
Operative/Postoperative		
Mean operative time in minutes	1.00 (1.00-1.00)	<.01
Superficial surgical site infection	18.23 (10.36-32.08)	<.001
Urinary tract infection	4.93 (2.84-8.58)	<.001

Abbreviations: CPT, Current Procedural Terminology; TLIF, transforaminal lumbar interbody fusion; ASA, American Society of Anesthesiologists; CI, confidence interval; COPD, chronic obstructive pulmonary disease.

^aTotal n observations included were 4667 unique cases. Stepwise forward and backward regression analysis was performed to identify risk factors.

We found that among the patients who remained in the hospital after the index surgery, return to the operating room occurred on average 11.00 days (SE = 1.07) sooner than patients who were discharged and required readmission later ($P < .001$). Patients readmitted for surgical site infections had superficial and deep infections identified at 2.08 days (SE = 1.79, n = 58) and 2.17 days (SE = 3.18, n = 41), respectively, later than patients who were not readmitted. Wound infections identified earlier in the postoperative period may have been managed medically or underwent second surgical revision before primary discharge. Basques et al²³ also identified surgical site infections to be significantly associated with 30-day

readmission following laminectomy for spinal stenosis among ACS-NSQIP patients.

The causes of readmission are likely multifactorial. We provide a descriptive analysis on 56% of readmission with a reportable cause, with the important caveat that these data are affected by confounding bias. This serves as an important area for improvement for the ACS-NSQIP database. In data collection, the database is only as valuable as the quality of the data collected. This is also true for CPT codes extracted to identify primary procedures. It is notable that over time reporting is improving, as no causes reported in 2011, 75% in 2012, and 81% in 2013. Additionally, this is demonstrated in Figure 1 as the case numbers increase gradually over time. While we are able to learn important insights, the incompleteness of the data limits representation of the entire cohort. Directions for future process improvement would be to request the ACS-NSQIP program to make hardstops at empty data fields, so that this vital information will not go uncollected. We found several common categories for readmission causes that have been identified in other reports from the spine literature.^{7,8,22} Even so, understanding that we are only able to look at a small majority of readmission reasons allows us to target areas of opportunity for process improvement in perioperative pain control. Coupled with these study findings, there appears to be a quality improvement opportunity for perioperative patient selection, medical optimization before and after surgery, and postoperative care coordination.

Additional limitations of this study include those inherent to the ACS-NSQIP data set and the nature of retrospective chart review. The variables collected are pre-determined and are not

necessarily constructed to identify risk factors for highly specialized surgeries such as the TLIF procedure. The database does provide general trends in outcomes such as postoperative medical complications, length of hospitalization, readmission percentages, and mortality. It should be mentioned that the CPT code for open versus the MIS approach is identical; making it impossible to stratify by subgroups. It is likely that these patients have different outcomes with some studies documenting reductions in length of hospitalizations, cost, and postoperative pain for those undergoing MIS approach.^{17,18} But this cannot be distinguished in the present analysis and is also likely driven by the technical expertise of the surgeon. Additionally, we are unable to discern severity of diabetes mellitus, nor to quantify the amount of postoperative pain as pain is not a variable that is not captured in the database. There is also the issue of missing data. For example, hematoma or seroma formation in the operative surgical site do not have their own variable fields, but were common causes for readmission. Bone density is also an important predictor that is not collected in the database. Another important study limitation relates to relatively rare incidence of a subset of postoperative medical diagnoses (ie, pulmonary embolism, pneumonia, wound dehiscence). It is likely that some of these postoperative medical diagnoses are independent predictors and causes of readmission, but the incidence is low in the current sample population. A larger sample size is needed for accurate estimation the statistical parameters. We are also unable to assess if readmissions were preventable from a medical standpoint. It is likely that some severe medical problems such as pulmonary embolism may sometimes be unavoidable even with the most optimized, most coordinated care.

Hospitals and administrative bodies have refocused attention on methodologies to quantify and improve quality measures in patient outcomes across all surgical specialties following the implementation of the PPACA. There are many metrics to assess patient outcomes. Here we investigated 30-day readmission and based on this study, we have identified several common categories resulting in readmission. Patients requiring additional procedures or pharmacotherapy should be the focus of future investigations to help guide measures that will potentially prevent 30-day readmissions. Special multidisciplinary teams for pain management and standardized protocols to ensure adequate pain control before patients are discharged from the hospital maybe implemented to reduce readmission. Interventions may encompass reevaluation of medication regimens, preoperative pain specialist consultation, early postdischarge communication and follow-up, or access to pain management care after discharge. Additionally, preventative measures focused on surgical site infections are relevant to all surgical specialties.^{24,25} Although surgical site infections are relatively rare, the cost of readmission is expensive and results in significant morbidity and mortality. Preventing adverse outcomes remains a challenge and indeed an opportunity for surgical teams to improve or create formal protocols that ensure improve patient outcomes and ultimately quality in care.

Conclusions

Among 4992 patients undergoing TLIF surgery since 2011, 275 (5.51%) patients were readmitted within 30 days of surgery. We identified important demographic, preoperative, operative, perioperative, and postoperative risk factors contributing to readmission within 30 days. Presence of urinary tract and superficial surgical site infections had the highest odds of predicting hospital readmission. The causes for readmission reported in 56.72% of readmitted patients were inadequate pain control and surgical site infections were the most common reported reasons for readmission. The present study builds on known risk factors and provides information to help direct clinical management with the goal of preventing common causes for readmission.

Declaration of Conflicting Interests

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