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Drivers of 30-Day Readmission in Elderly Patients (>65 Years Old) After Spine Surgery: An Analysis of 500 Consecutive Spine Surgery Patients

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■ BACKGROUND: Early readmission after spine surgery is being used as a proxy for quality of care. One-fifth of patients are rehospitalized within 30 days after spine surgery, and more than one-third within 90 days; however, there is a paucity of data about the cause of early readmissions in elderly patients after elective spine surgery.

■ METHODS: A total of 500 elderly patients (>65 years old) undergoing elective spine surgery at a major academic hospital were included in the study. We identified all unplanned readmissions within 30 days of discharge. Unplanned readmissions were defined to have occurred as a result of either a surgical or a nonsurgical complication. Patient records were reviewed to determine the cause of readmission and the length of hospital stay.

■ RESULTS: A total of 50 (10%) unplanned early readmissions were identified. The mean ± SD age was 72.54 ± 5.84 years. The mean ± SD number of days from discharge to readmission was 11.02 ± 7.25 days, and the average length of hospital stay for the readmissions was 7.7 days. The majority of patients that were readmitted presented to the emergency department from home (46%), whereas 38% were readmitted from a skilled nursing facility. The most common causes for readmission were infection or a concern for infection (42%) and pain (14%), with 32% of readmissions requiring a return to the operating room.

■ CONCLUSION: Our study suggests that in elderly patients undergoing elective spine surgery, infection or a concern for infection, pain, and altered mental status were the most common primary reasons for unplanned readmission.

INTRODUCTION

National health care costs have surged over the last quarter century at a concerning rate, with unplanned readmissions accounting for a significant amount of total health care expenditure.[1] Accordingly, reducing hospital readmission rates has captured the interest of policymakers because they believe that reducing readmission rates represents a unique opportunity to simultaneously improve care while lowering total health care expenditure.[2] In fact, as part of the Affordable Care Act, the U.S. Congress directed the Centers for Medicare and Medicaid services to reward physicians with the lowest readmission rates and penalize hospitals with "worse than expected" 30-day readmission rates.[2]

In recent decades, the fastest growth in complex spine surgery occurred in elderly patients (≥65 years old). These patients often present with poor baseline functional reserve, as well as other coexisting chronic medical conditions that contribute to high 30-day hospital readmissions rates.[2] Although 30-day readmission rates are being used as a proxy for quality, as well as a tool used to compare health care quality across institutions, little is known about the reasons for unplanned readmissions in elderly patients undergoing complex spine surgery. The aim of this retrospective study is to assess and identify the drivers of unplanned 30-day readmissions in elderly patients undergoing complex spine surgery.

METHODS

A total of 500 consecutive elderly patients (>65 years old) undergoing elective spine surgery at Duke University Hospital from 2008 to 2010 were included in this study. Institutional review board approval was obtained before the initiation of the study. We identified 50 patients who had unplanned readmissions to a major academic medical center within 30 days of discharge. We reviewed the hospital chart of each readmission to determine the cause of readmission and the length of stay. Unplanned readmissions were defined as either surgical or nonsurgical complications. Surgical complications were defined as complications as a direct result of the surgery. These complications included hardware failure requiring a revision procedure, uncontrolled pain, new-onset sensory/motor deficits, deep-vein thrombosis, pulmonary embolism, or other surgical complications. Nonsurgical complications were defined as complications as a result of medical conditions not directly related to surgery. These complications included myocardial infarction, chest pain, fever, and other medical complications. The definition of deep and superficial surgical-site infections is based on the criteria of the Centers for Disease Control and Prevention for surgical-site infections.

Planned readmissions were defined as either staged or rescheduled procedure. For the staged procedure, patients were discharged with the expectation that he or she would be readmitted for the subsequent stage of the procedure. A rescheduled procedure occurred when a patient was admitted on day of surgery, was cancelled before surgery, discharged, and rescheduled within a month. Planned readmissions were not included in the final data analysis and not calculated into surgical readmission rates.

We evaluated all pertinent patient and surgical variables. Surgical variables were categorized into 3 categories: anatomical location, surgical approach, and type of surgery. The anatomical locations included in this study were occipital-cervical, cervical, cervical-thoracic, thoracic, thoracic-lumbar, lumbar, and lumbar-sacral. The surgical approaches included anterior, posterior, and lateral approaches. The types of surgeries included were decompression with or without fusion.

Demographic variables evaluated included patient age, sex, race, and body mass index. Comorbidities included hypertension, diabetes, hyperlipidemia, coronary artery disease, and myocardial infarction. Surgical variables included number of vertebral levels involved, estimated blood loss, packed red blood cell transfusions, and length of stay in the intensive care unit. Primary treatment for readmission was categorized as observation, pain management, reoperation, intravenous antibiotics, and medical management.

Parametric data were expressed as means ± standard deviation (SD) and compared via the Student t test. Nonparametric data were expressed as median [interquartile range] and compared via the Mann-Whitney U test. Nominal data were compared with the χ^2 test. All tests were 2-sided and were statistically significant if the P-value was less than 0.05. We used SAS 9.3 (SAS Institute, Inc., Cary, North Carolina, USA) for all data preparation and analysis.

RESULTS

From 2008 to 2010, 50 (10%) of 500 elderly patients (>65 years old) who underwent an elective spinal surgery had an unplanned early readmission. The mean ± SD age was 72.54 ± 5.84 years (Table 1). The numbers of male and white patients were 15.9% and 28.78%, respectively (Table 1). The mean ± SD body mass index was 28.70 ± 8.0 (Table 1). The comorbidities of the readmitted patients included: diabetes (12.8%), coronary artery disease (2.0%), hyperlipidemia (66.0%), myocardial infarction (13.63%), and coagulopathy (12.0%) (Table 1). A total of 36.36% were smokers, 6% had a diagnosis of an anxiety disorder, and 14% had a diagnosis of depression (Table 1).

Decompression with fusion (92%) was the most common procedure (Table 2). A total of 28% of patients were readmitted after lumbar spine surgery, 16% after cervical spine surgery, and 15% after thoracic spine surgery (Table 2). The median [interquartile range] number of vertebral levels involved was 4 [3−6.75] (Table 2). The intraoperative mean ± SD estimated blood loss (milliliters) was 286.22 ± 129.42 mL (Table 2). Postoperative mean ± SD length of hospital stay was 8.28 ± 6.33 days (Table 2).

The more common reasons for unplanned readmissions due to surgical complications included surgical-site infection or a concern for infection (42%) and uncontrolled postoperative pain (14%) (Table 3 and Figure 1). Of the 42% of patients readmitted with SSI, 18% had a deep surgical-site infection and the remaining a superficial surgical-site infection. The more common reasons for unplanned readmissions due to nonsurgical complications included fever (18%), altered mental status (14%), deep venous thrombosis (4%), new sensory/motor deficits (4%), and less commonly, dysphagia, chest pain, and pulmonary

Table 1. Baseline Demographic and Comorbidity Data of Patients Readmitted within 30 Days of Discharge*

	($n = 50$)
Mean age, years	72.54 ± 5.84
Male (%)	15.90
Race, white, %	28.78
BMI, kg/m^2	28.70 ± 8.00
Diabetes, %	12.80
Smoker, %	36.36
Hypertension, %	0.00
CAD, %	2.00
CHF, %	3.78
A-Fib	12.00
MI, %	13.63
HLD, %	66.00
Coagulopathy, %	12.00
Depression, %	14.00
Anxiety, %	6.00

Data expressed as mean ± standard deviation or n (%).
BMI, body mass index; CAD, coronary artery disease; CHF, congestive heart failure; Afib, atrial fibrillation; MI, myocardial infarction; HLD, hyperlipidemia.
*Of the 500 patients enrolled in this study, 50 (10%) were readmitted within 30 days.