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Clinical Study

Rates and risk factors associated with unplanned hospital readmission after fusion for pediatric spinal deformity

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Abstract

BACKGROUND CONTEXT: Short-term readmission rates are becoming widely used as a quality and performance metric for hospitals. Data on unplanned short-term readmission after spine fusion for deformity in pediatric patients are limited.
PURPOSE: To characterize the rate and risk factors for short-term readmission after spine fusion for deformity in pediatric patients.
STUDY DESIGN: This is a retrospective cohort study.
PATIENT SAMPLE: Data were obtained from the State Inpatient Database from New York, Utah, Nebraska, Florida, North Carolina (years 2006–2010), and California (years 2006–2011).
OUTCOME MEASURES: Outcome measures included 30- and 90-day readmission rates.
MATERIALS AND METHODS: Inclusion criteria were patients aged 0–21 years, a primary diagnosis of spine deformity, and a primary 3+-level lumbar or thoracic fusion. Exclusion criteria included revision surgery at index admission and cervical fusion. Readmission rates were calculated and logistic analyses were used to identify independent predictors of readmission.
RESULTS: There were a total of 13,287 patients with a median age of 14 years. Sixty-seven percent were girls. The overall 30- and 90-day readmission rates were 4.7% and 6.1%. The most common reasons for readmission were infection (38% at 30 days and 33% at 90 days), wound dehiscence (19% and 17%), and pulmonary complications (12% and 13%). On multivariate analysis, predictors of 30-day readmission included male sex (p=.008), neuromuscular (p<.0001) or congenital scoliosis (p=.006), Scheuermann kyphosis (p=.003), Medicaid insurance (p<.0001), length of stay of ≤3 days or ≥6 days (p<.0001), and surgery at a teaching hospital (p=.011). Surgery at a hospital performing >80 operations/year was associated with a 34% reduced risk of 30-day readmission (95% confidence interval 12%-50%, p=.005) compared with hospitals performing <20 operations/year.
CONCLUSIONS: The short-term readmission rate for pediatric spine deformity surgery is driven by patient-related factors, as well as several risk factors that may be modified to reduce this rate.

Keywords: Hospital readmission; Pediatric spine deformity; Scoliosis; Spine fusion; Spine surgery; Unplanned readmissions

Introduction

Unplanned short-term readmission rates have been targeted as a quality and performance metric in both surgical and non-surgical fields [1]. Unplanned readmissions were associated with $41.3 billion in hospital costs in 2011 for adult patients, and in 2012 the Affordable Care Act laid out strict guidelines by which underperforming hospitals will be financially penalized [2,3]. Arthroplasty is the first orthopedic subspecialty to have its 30-day readmission rates publicized (beginning fiscal year 2015), and other fields are likely to follow [3].

FDA device/drug status: Not applicable.

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EVIDENCE & METHODS

Context

In the era of health reform, acute postsurgical readmissions are widely seen as a viable measure of hospital quality and performance. The authors sought to evaluate hospital readmissions following pediatric spinal deformity surgery using a number of statewide inpatient datasets (SID).

Contribution

The study included more than 13,000 cases from a number of states. The overall 30- and 90-day readmission rates were 4.7% and 6.1% at 30 and 90 days, respectively. The authors postulate a number of risk factors that may influence readmission including hospital volume, insurance status and biologic sex.

Implications

This report should be viewed in light of its limitations, including a convenience sample of SIDs that may not be reflective of surgical experience nationwide. Given the number of states and years included, a relatively small sample of patients from any single center received surgery at any particular time-point. The relatively low number of readmissions and statistical testing approach combine to put this study at risk of being overfit, meaning that the results are not necessarily generalizable to all patients but rather limited to the sample of patients treated in their particular place and time. These facts should be considered when attempting to translate these findings to direct patient care. Given the design of this study and associated limitations, this work presents Level IV evidence.

—The Editors

The literature on unplanned readmissions after surgery shows that readmission rates vary widely depending on hospital type, hospital volume, and patient-related factors [4–8]. Between 8% and 70% of readmissions have been reported as preventable, with most preventable readmissions occurring within 30 days of discharge [9]. Preventable causes of readmission include hospital-acquired infections; premature discharge; inadequate communication between providers, patients, and caregivers; and poor planning for future care transitions. In adults, a recent meta-analysis reported that interventions including increased patient education and improved predischarge assessment and postdischarge follow-up are successful in preventing approximately 20% of readmissions [10]. Knowledge of common risk factors associated with readmission may help surgeons identify higher-risk patients before operation and develop strategies to decrease their risk for readmission. There are only three such studies on pediatric patients, two of which use the same National Surgical Quality Improvement Program (NSQIP) 2012 database and one of which is a single-institution study [11–13].

The purpose of the present study was to determine rates and identify risk factors for 30- and 90-day readmissions in children undergoing fusion for spine deformity in the largest nationwide cohort of patients to date.

Materials and methods

Data source

Data were obtained from the State Inpatient Database (SID), a collection of databases maintained by the Agency for Healthcare Research and Quality. The SID contains all of an individual state's hospital inpatient discharge records and comprises more than 97% of all US community hospital discharges. The SID is the largest all-payer inpatient care database in the United States. The collected data are de-identified, and no site-specific or surgeon-specific data may be reported per the data use agreement. Individual patients have unique identifier codes that can be used to track patients across different time points and hospitals and to link readmissions to the original index surgical admission.

A total of five states had comprehensive data available for the period 2006–2010: New York, Florida, Nebraska, North Carolina, and Utah. One state (California) had comprehensive data from 2006 to 2011. These states are geographically and socially diverse, and represent approximately one-third of the US population [14]. These six states contributed the data for the present study.

Inclusion criteria

All patients <21 years of age who underwent spine fusion surgery for a diagnosis of deformity were identified using *International Classification of Diseases, Ninth Revision* (ICD-9) procedural codes (Figure and Supplementary Appendix). We excluded cervical as well as degenerative diseases and procedures, revision operation, and diagnosis other than spine deformity.

Patient and hospital characteristics

Patient-, surgical-, and hospital-related variables were abstracted from the combined SID database. Variables were selected on the basis of theoretical contribution to risk for readmission as well as common predictors of readmission in orthopedic surgery patients [11,13,15–19]. Baseline demographic data were also collected. Patient-related factors included age, sex, insurance type, race, comorbidities, year of treatment, and discharge disposition. Comorbidities were identified using ICD-9 codes and classified as the total number of comorbidities (Supplementary Appendix). All comorbidities that comprise the Charlson comorbidity index were included. The Charlson comorbidity index was originally validated in adult patients but has been used in pediatric populations as well [20,21]. Surgical factors included surgical approaches (anterior, posterior, and combined), spine levels fused (lumbar and thoracic), number of levels fused (3–7 vs.