MAYO CLINIC

ORIGINAL ARTICLE

Depression After Spinal Surgery: A Comparative Analysis of the California Outcomes Database

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Abstract

Objective: To examine the relative incidence of newly recorded diagnosis of depression after spinal surgery as a proxy for the risk of post–spinal surgery depression.

Patients and Methods: We used the longitudinal California Office of Statewide Health Planning and Development database (January 1, 2000, through December 31, 2010) to identify patients who underwent spinal surgery during these years. Patients with documented depression before surgery were excluded. Risk of new postoperative depression was determined via the incidence of newly recorded depression on any hospitalization subsequent to surgery. For comparison, this risk was also determined for patients hospitalized during the same time period for coronary artery bypass grafting, hysterectomy, cholecystectomy, chronic obstructive pulmonary disease, congestive heart failure exacerbation, or uncomplicated vaginal delivery.

Results: Our review identified 1,078,639 patients. Relative to the uncomplicated vaginal delivery cohort, the adjusted hazard ratios (HRs) for newly recorded depression within 5 years after the admission of interest were 5.05 for spinal surgery (95% CI, 4.79-5.33), 2.33 for coronary artery bypass grafting (95% CI, 2.15-2.54), 3.04 for hysterectomy (95% CI, 2.88-3.21), 2.51 for cholecystectomy (95% CI, 2.35-2.69), 2.44 for congestive heart failure exacerbation (95% CI, 2.28-2.61), and 3.04 for chronic obstructive pulmonary disease (95% CI, 2.83-3.26). Among patients who underwent spinal surgery, this risk of postoperative depression was highest for patients who underwent fusion surgery (HR, 1.28; 95% CI, 1.22-1.36) or had undergone multiple spinal operations (HR, 1.22; 95% CI, 1.16-1.29) during the analyzed period.

Conclusion: Patients who undergo spinal surgery have a higher risk for postoperative depression than patients treated for other surgical or medical conditions known to be associated with depression.

 ■ Mayo Clin Proc. 2016;■■(■):1-10

The psychosocial effects imposed on patients who undergo major surgery[1] or have debilitating chronic disease[2,3] cannot be overstated. Many patients experience postoperative depression after major surgical interventions, including coronary artery bypass grafting (CABG),[4,5] hysterectomy,[6] and cholecystectomy.[7] Similarly, the risk of depression in patients who have incapacitating chronic diseases (eg, congestive heart failure [CHF] and chronic obstructive pulmonary disease [COPD]), is striking.[2,3] Despite our understanding of depression risks in these diseases, the risk of newly diagnosed depression after spinal surgery remains poorly studied. We used the California Office of Statewide Health Planning and Development (OSHPD) database (January 1, 2000, through December 31, 2010) to explore the risk of newly diagnosed depression after spinal surgery.

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PATIENTS AND METHODS

Data Source

This study used the California OSHPD longitudinal inpatient-discharge administrative database from January 1, 1995, through December 31, 2010.[8] In California, each time a patient is treated in a licensed acute care hospital, a record is submitted to the OSHPD database. The reported data include patient demographic information such as age, sex, race/ethnicity, diagnostic information, treatment information, disposition, total

charges, and expected source of payment. Diagnostic and treatment information is based on the *International Classification of Diseases, Ninth Revision, Clinical Modification* (*ICD-9-CM*) codes. Each patient in the database is assigned a unique masked identifier, which allows tracking of patients throughout multiple inpatient hospital stays and over multiple years in the state of California.

Study Design

We applied a novel study design that we have termed an *in silico prospective cohort design*. In this design, we first identified a population of patients who underwent spinal surgery without a previous or concurrent diagnosis of depression. We then longitudinally followed this cohort to identify newly recorded depression diagnoses on subsequent hospitalizations as a proxy for risk of postoperative depression. Parallel analyses were performed for patients who underwent CABG,[4,5] hysterectomy,[6] or cholecystectomy[7] and for patients who were hospitalized with medical conditions known to be associated with depression including CHF[2] and COPD.[3] A cohort of patients who underwent uncomplicated vaginal deliveries was also identified and studied as a reference population because it represented a hospitalized patient population with relatively low comorbidity burden.

Inclusion and Exclusion Criteria

Patient selection criteria for this study are detailed in the Figure. All included patients were assigned an "index admission" corresponding to their first hospitalization on record related to a particular surgical procedure or medical diagnosis (eg, spinal surgery, CABG, hysterectomy). We examined index admissions beginning on January 1, 2000, in order to ensure a minimum of 5 years of prior hospitalization information (dating back to January 1, 1995, the start of the OSHPD data set) with which to determine hospitalization history. Our primary patients of interest to be considered for analysis—collectively referred to as our *spinal surgery cohort*—consisted of all adult patients younger than age 65 years who were hospitalized primarily for spinal surgery between January 1, 2000, and December 31, 2010. Patients with a history of depression (dating as far back as January 1, 1995) or with depression recorded on their index admission were excluded. Patients were also excluded if they had a history of spinal surgery, CABG, hysterectomy, cholecystectomy, normal delivery, CHF exacerbation, or COPD exacerbation. A comparison set of patients was identified—collectively referred to as our *comparative cohort*—that included adult patients younger than age 65 years who were hospitalized for a variety of common medical conditions and surgical procedures: CABG, hysterectomy, cholecystectomy, vaginal delivery, admission for CHF exacerbation, or admission for exacerbation of COPD (for relevant *ICD-9-CM* codes, see Supplemental Appendix, available online at http://www.mayoclinicproceedings.org). Patients were excluded from the comparison cohort if they had a history of depression, had a diagnosis of depression on arrival for the index admission for their respective diagnosis/surgery, had previously been admitted for spinal surgery, or had any previous admission for CABG, hysterectomy, cholecystectomy, normal delivery, CHF, or COPD.

Patients who underwent spinal stimulator placement surgery during their index admission were also excluded because spinal stimulators are typically placed after failure of multiple operations.[9] This patient cohort likely underwent their index spinal surgery in another state. Finally, patients from both cohorts were excluded from the entire analysis if they had a history of diagnosis of trauma to the head, spine, liver, gallbladder, heart, lungs, or pelvic organs at the time of their index admission or if they received any combination of the aforementioned surgical or medical diagnoses during the years of our analysis. The risk of postoperative depression (see "Outcomes" section) was analyzed and compared between these patient cohorts.

After our initial comparative analysis, our spinal surgery cohort was split into 3 categories: (1) patients who underwent a spinal fusion operation during their index admission and this admission was the only one during the study period related to spinal operations, (2) patients who underwent a nonfusion spinal operation during the index admission and this admission was the only one during the study period related to spinal operations, and (3) patients who underwent more than one spinal surgery (of any kind, including