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Clinical Study

Frailty and postoperative outcomes in patients undergoing surgery for degenerative spine disease

Alana M. Flexman, MD[a,*], Raphaële Charest-Morin, MD[b], Liam Stobart, MD[a], John Street, MD PhD[c], Christopher J. Ryerson, MD MAS[d]

[a]*Department of Anesthesiology, Pharmacology and Therapeutics, Vancouver General Hospital, University of British Columbia, Room 2449 JPP 899 West 12th Avenue, Vancouver, BC, Canada, V5Z 1M9*

[b]*Department of Orthopedic Surgery, Centre Hospitalier Universitaire de Québec, 1401 18e rue, Local B-2408, Québec, QC, Canada, G1J 1Z4*

[c]*Combined Neurosurgical and Orthopedic Spine Program, Department of Orthopedic Surgery, University of British Columbia, 818 West 10th Avenue, Vancouver, BC, Canada, V5Z 1M9*

[d]*Division of Respirology, Department of Medicine, St. Paul's Hospital, University of British Columbia, Ward 8B, 1081 Burrard Street, Vancouver, BC, Canada, V6Z 1Y6*

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Abstract

BACKGROUND CONTEXT: Frailty is defined as a state of decreased reserve and susceptibility to stressors. The relationship between frailty and postoperative outcomes after degenerative spine surgery has not been studied.

PURPOSE: This study aimed to (1) determine prevalence of frailty in the degenerative spine population; (2) describe patient characteristics associated with frailty; and (3) determine the association between frailty and postoperative complications, mortality, length of stay, and discharge disposition.

STUDY DESIGN: This is a retrospective analysis on a prospectively collected cohort from the National Surgical Quality Improvement Program (NSQIP).

PATIENT SAMPLE: A total of 53,080 patients who underwent degenerative spine surgery between 2006 and 2012 were included in the study.

OUTCOME MEASURES: A modified frailty index (mFI) with 11 variables derived from the NSQIP dataset was used to determine prevalence of frailty and its correlation with a composite outcome of perioperative complications as well as hospital length of stay, mortality, and discharge disposition.

METHODS: After calculating the mFI for each patient, the prevalence and predictors of frailty were determined for our cohort. The association of frailty with postoperative outcomes was determined after adjusting for known and suspected confounders using multivariate logistic regression.

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* Corresponding author. Department of Anesthesiology, Pharmacology and Therapeutics, University of British Columbia, Vancouver General Hospital, Room 2449 JPP 899 West 12th Avenue, Vancouver, BC, Canada, V5Z 1M9. Fax +1 604 875 5209.

E-mail address: alana.flexman@vch.ca (A.M. Flexman).

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RESULTS: Frailty was present in 2,041 patients within the total population (4%) and in 8% of patients older than 65 years. Frailty severity increased with increasing age, male sex, African American race, higher body mass index, recent weight loss, paraplegia or quadriplegia, American Society of Anesthesiologists (ASA) score, and preadmission residence in a care facility. Frailty severity was an independent predictor of major complication (OR 1.15 for every 0.10 increase in mFI, 95%CI 1.09–1.21, p<.0005) and specifically predicted reoperation for postsurgical infection (OR 1.3, 95%CI 1.16–1.46, p<.0005). Prolonged length of stay and discharge to a new facility were also independently predicted by frailty severity (p<.0005). Frailty severity predicted 30-day mortality on unadjusted (OR 2.05, 95%CI 1.70–2.48, p<.0005) and adjusted analyses (OR 1.48, 95%CI 1.18–1.86, p<.0005).

CONCLUSIONS: Frailty is an important predictor of postoperative outcomes following degenerative spine surgery. Preoperative recognition of frailty may be useful for perioperative optimization, risk stratification, and patient counseling.

Keywords: Frailty; Degenerative spine disease; Morbidity; Outcomes; Risk stratification; Spine surgery

Introduction

Frailty is defined as a state of increased vulnerability to poor resolution of homoeostasis after a stressor event, which increases the risk of adverse outcomes [1]. Frailty represents a state of weakened reserve against even minor stressors and may occur independent of and out of proportion to chronological age [1,2]. The prevalence of frailty in the nonsurgical hospital population is approximately 10%, although this varies with the population and method of frailty measurement [3]. The prevalence of frailty in community dwelling individuals increases with age, and even mild frailty is associated with worsening disability, admission to hospital, and death in the community-dwelling elderly population [4].

Frailty is more prevalent in the surgical population (42%–50%) compared with the nonsurgical elderly population (4%–10%), and is likely to be an important predictor of outcome in patients undergoing spine surgery [1]. Preoperative frailty has been independently associated with increased morbidity and mortality in several surgical populations [5–9]. These studies showed that frail surgical patients experienced higher rates of postoperative complications, length of stay, and mortality, and were more likely to be discharged to a care facility rather than home [7,8,10]. As the rate of complications after spine surgery is high [11] and the mean age of patients undergoing spine surgery is also increasing [12,13], frailty is likely to be increasingly common and relevant to this population. Despite these potential implications, little is known about the prevalence of frailty in the spine surgery population or on the impact of frailty on postoperative outcomes in this vulnerable population.

Our study objectives were to (1) determine the prevalence of frailty in patients undergoing surgery for degenerative spine disease; (2) describe the patient characteristics associated with frailty; and (3) determine the relationship between frailty and postoperative complications, length of stay, discharge disposition, and mortality in this population.

Materials and methods

We performed a retrospective analysis of the prospectively collected American College of Surgeons National Surgical Quality Improvement Program (NSQIP) database.

Study population

Data were extracted from the American College of Surgeons NSQIP database following approval from our Institutional Clinical Research Ethics Board (H12-03433). The NSQIP database is a prospective multicenter database of adult patients that has been described previously [14]. High-quality data collection and entry are ensured through rigorous training of the clinical reviewer as well as inter-rater reliability audits to ensure accurate and consistent data entry. Cases are sampled using an 8-day cycle to ensure an even case mix, and operating room logs are audited to ensure representative sampling of cases. The most recent year included in this study (2012) includes 543,885 cases from 374 centers.

We identified patients undergoing spine surgery for degenerative spine conditions in the NSQIP database from 2006 to 2012. We first identified patients undergoing any type of spine surgery by selecting all common procedural terminology (CPT) codes related to the spine. We used International Classification of Diseases and CPT codes to further restrict our population to spine surgery patients with a primary diagnosis of degenerative disease (Supplementary Appendix, Table S1). We excluded patients who did not receive a general anesthetic.

Predictor variables

We calculated a modified frailty score and modified frailty index (mFI) for each patient using a previously described method [9,15]. The mFI is a simplified form of the Canadian Study of Health and Aging Frailty Index [16,17]. The Canadian Study of Health and Aging Frailty Index is based on the theory of "accumulating deficits" and strongly correlates with overall mortality in community-dwelling adults