

Use of a 5-Item Modified Frailty Index for Risk Stratification in Patients Undergoing Surgical Management of Distal Radius Fractures

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Purpose Compared with cast treatment, surgery may expose patients with distal radius fractures to undue risk. Surgical intervention in this cohort may offer less benefit than previously thought and appropriate patient selection is imperative. The modified Frailty Index (mFI) predicts complications after other orthopedic surgeries. We hypothesized that this index would predict, and might ultimately prevent, complications in patients older than 50 years with distal radius fractures.

Methods We retrospectively reviewed the American College of Surgeons—National Surgery Quality Improvement Program (ACS-NSQIP) database, including patients older than 50 years who underwent open reduction and internal fixation of a distal radius fracture. A 5-item mFI score was then calculated for each patient. Postoperative complications, readmission and reoperation rates, as well as length of stay (LOS) were recorded. Bivariate and multivariable statistical analysis was then performed.

Results We identified 6,494 patients (mean age, 65 years). Compared with patients with mFI of 0, patients with mFI of 2 or greater were nearly 2.5 times as likely to incur a postoperative complication (1.7% vs 7.4%). Specifically, the rates of Clavien-Dindo IV, wound, cardiac, and renal complications were increased significantly in patients with mFI of 2 or greater. In addition, as mFI increased from 0 to 2 or greater, 30-day reoperation rate increased from 0.8% to 2.4%, 30-day readmission from 0.8% to 4.6%, and LOS from 0.5 days to 1.44 days. Frailty was associated with increased complications as well as rates of readmission and reoperation even when controlling for demographic data, LOS, and operative time. Age alone was not significantly associated with postoperative complications, readmission, reoperation, or LOS.

Conclusions A state of frailty is highly predictive of postoperative complications, readmission, reoperation, and increased LOS following open reduction and internal fixation of distal radius fractures. Our data suggest that a simple frailty evaluation can help inform surgical decision making in patients older than 50 years with distal radius fractures. (*J Hand Surg Am.* 2018; ■ (■): ■—■. Copyright © 2018 by the American Society for Surgery of the Hand. All rights reserved.)

Type of study/level of evidence Prognostic II.

Key words Complications, distal radius, frailty, length of stay, readmission.

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FRACTURES OF THE DISTAL RADIUS constitute one of the most common fractures encountered and treated by upper extremity surgeons, representing an estimated 17.5% to 22.2% of all fractures.^{1–4} In those older than 65 years, fractures of the distal radius are second only to fractures of the proximal femur in incidence.³ The need for distal radius fracture care is expected to grow as both the life expectancy and the activity level of the elderly population continues to increase.⁵

Distal radius fractures can be treated with immobilization or with surgical fixation.^{6–8} Cast immobilization has historically been reserved for extra-articular, stable fractures that maintain acceptable alignment after reduction.^{7–10} Surgical fixation is generally considered for unstable fractures with intra-articular stepoff or unacceptable alignment.^{7,8,11–16} Operative indications in patients 65 years or older are less definitively established.^{17–22}

Several studies have examined outcomes of both surgical and nonsurgical management of distal radius fractures in the elderly population.^{19,23–36} A recent randomized controlled trial comparing surgery to nonsurgical treatment found no difference in functional outcome, range of motion or pain scores at 6 and 12 months.²⁹ This study, in conjunction with several retrospective studies, reveals some benefits of open reduction and internal fixation (ORIF), such as earlier recovery of wrist function, improved radiographic alignment, and increased grip strength. However, these studies also demonstrate higher complication rates with surgical management, comparable long-term functional outcomes, and equivalent patient satisfaction with both surgery and cast treatment.^{19,23–36}

Therefore, at present, it remains unclear which elderly patients are likely to benefit from surgical fixation of unstable distal radius fractures.²⁰ As such, appropriate patient selection among elderly patients with distal radius fractures is imperative. Whereas studies have demonstrated higher rates of complications in older than in younger patients after surgical fixation of distal radius fractures,^{32,37} chronological age is likely a less important consideration than frailty. Frailty can be defined as a generalized decrease in multisystem physiological reserve and function.³⁸ Patients of the same age can have vastly different degrees of frailty and, therefore, very different risk profiles.^{39–43}

Several studies have used frailty, quantified as the modified Frailty Index (mFI), to effectively predict surgical outcomes and complications in both

orthopedics and other surgical specialties.^{39,42–49} The mFI is an 11-item, or abbreviated 5-item, index of functional status and comorbidities originally developed as a simplified version of the Canadian Study of Health and Aging Frailty Index, a comprehensive 70-item scale designed to quantify frailty.⁴¹ The mFI has compared favorably with other frailty indices, specifically the Charlson Comorbidity Index, in other areas of orthopedics and general surgery.^{50–52} We hypothesized that the 5-item mFI could predict several complications after surgical fixation of distal radius fractures.

METHODS

Data collection

Data for this study were collected from the American College of Surgeons—National Surgery Quality Improvement Program (ACS-NSQIP) database. The NSQIP database is an international, prospective database that collects preoperative and 30-day outcome data for patients undergoing surgical operations across multiple subspecialties. The number of cases contributed to the database per year has increased from 152,490 in 2006 to over 885,000 in 2015 across all specialties. The database captures 95% of 30-day outcomes by observing in hospital morbidity and mortality and then confirming 30-day outcomes by contacting patients via writing and phone call at the end of the period. In addition, surgical clinical reviewers and random audits ensure the accurate collection of data.

In the present study, the NSQIP database was queried for patients based on Current Procedural Terminology codes. The following codes were used: 25607 (open treatment of extra-articular distal radius fracture with internal or external fixation), 25608 (open treatment of intra-articular distal radius fracture with internal fixation of 2 fragments), and 25609 (open treatment of intra-articular distal radius fracture with internal fixation of 3 or more fragments). All patients from 2007 to 2015 were initially included in this study. Patients younger than 50 years and those with open injuries were excluded. In addition, in an attempt to capture only patients with an isolated injury, those who had another surgery unrelated to their distal radius were excluded. Lastly, patients meeting sepsis or presepsis criteria prior to surgery were excluded, and patients with incomplete data were also excluded from analysis.

Patient demographics

Patient demographic data were collected and included the following information: sex, age, race, American

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