# The 5-Item Modified Frailty Index Is a Useful Tool to Predict Complications Following Revision Total Shoulder Arthroplasty

Theodore Quan[1], Matthew Joseph Best[2], Alex Gu[3], Brock Knapp, Rachel Ranson[4], Amil Raj Agarwal, Melina Recarey, Umasuthan Srikumaran, Zachary Richards Zimmer

[1]George Washington University, [2]Johns Hopkins University, [3]George Washington University School of Medicine An, [4]NYU Langone Orthopedic Hospital

INTRODUCTION: The modified 5-item frailty index (mFI-5) is a concise comorbidity-based risk stratification tool that has been used to predict the incidence of complications following various orthopedic surgeries. The purpose of this study is to evaluate the mFI-5 as a predictor of postoperative complications, readmission, length of stay, and discharge status in patients undergoing revision total shoulder arthroplasty (rTSA).

METHODS: Patients aged 50 years or older undergoing rTSA from 2013 to 2019 were queried in the National Surgical Quality Improvement Program database. The 5-item frailty index was calculated based on the sum of the presence of 5 conditions: diabetes, congestive heart failure, hypertension, chronic obstructive pulmonary disease, and dependent functional status. Chi-squared tests and multivariable analysis were used to evaluate the association of the mFI score with various postoperative complications.

RESULTS: This study included 1,393 patients with a mean age of 69 years. Baseline characteristics of the patients are shown in Table 1. Following adjustment on multivariable analysis to control for baseline differences between the groups, patients with a mFI score of 2 or greater were at increased risk of readmission (OR 2.58; p=0.019), bleeding requiring transfusion (OR 3.66; p=0.005), extended length of stay (OR 2.43; p=0.003), and be discharged to a non-home destination (OR 3.22; p<0.001) compared to patients with a mFI score of 0. Relative to patients with a score of 1, those with a mFI score of 2 or greater had an increased risk of postoperative transfusion (OR 2.46; p=0.008), extended length of stay (OR 2.16; p<0.001), and be discharged to a non-home location (OR 2.84; p<0.001) (Table 2).

DISCUSSION AND CONCLUSION: The mFI-5 predicts medical complications, increased length of stay, discharge to a facility, and readmission in patients undergoing rTSA. The variables within the mFI-5 are easily obtained through a patient history, allowing for a practical tool that clinicians can utilize to identify at-risk patients. This would allow providers to educate patients and their families and guide perioperative care in order to optimize patient outcomes.

Table 1. Baseline Patient Characteristics

| Variable | Overall |
|---|---|
| Total patients, n | 1,393 |
| **Gender, %** | |
| Female | 53.7 |
| Male | 46.3 |
| **Age, mean (SD), years** | 68.56 (8.96) |
| **BMI, mean (SD), kg/m²** | 31.13 (6.85) |
| **BMI Category, %** | |
| Underweight (<18.5) | 0.4 |
| Normal Weight (18.5-24.9) | 16.6 |
| Overweight (25.0-29.9) | 31.1 |
| Obese (30.0-34.9) | 26.2 |
| Severely Obese (35.0-39.9) | 13.8 |
| Morbidly Obese (≥40.0) | 9.9 |
| **Race, %** | |
| White | 87.1 |
| Black or African American | 7.1 |
| Hispanic | 4.4 |
| Native American or Alaska Native | 0.3 |
| Asian | 1.0 |
| Native Hawaiian or Pacific Islander | 0.1 |
| **ASA Class, %** | |
| I (normal healthy) | 0.8 |
| II (mild systemic disease) | 35.4 |
| III (severe systemic disease) | 60.0 |
| IV (severe systemic disease with threat to life) | 3.8 |
| **mFI Score, %** | |
| 0 | 27.4 |
| 1 | 47.1 |
| 2 | 22.5 |
| 3 | 2.9 |
| 4 | 0.1 |
| 5 | 0.0 |

SD, standard deviation; BMI, body mass index; ASA, American Society of Anesthesiologists; mFI, modified frailty index.

Table 2. Multivariable Regression Analysis of Postoperative Complications

| Complications | mFI score = 1 (reference group is mFI score = 0) | | mFI score ≥ 2 (reference group is mFI score = 0) | | mFI score ≥ 2 (reference group is mFI score = 1) | |
|---|---|---|---|---|---|---|
| | p-value | Odds ratio (95% CI) | p-value | Odds ratio (95% CI) | p-value | Odds ratio (95% CI) |
| Readmission | 0.234 | 1.531 (0.759 to 3.091) | **0.019** | 2.584 (1.168 to 5.717) | 0.287 | 1.354 (0.775 to 2.365) |
| Reoperation | **0.050** | 2.528 (1.001 to 6.385) | 0.104 | 2.505 (0.829 to 7.570) | 0.791 | 0.909 (0.448 to 1.843) |
| Postoperative transfusion | 0.590 | 1.256 (0.548 to 2.882) | **0.005** | 3.655 (1.466 to 9.112) | **0.008** | 2.461 (1.261 to 4.804) |
| Extended length of stay (> 3 days) | 0.195 | 1.427 (0.833 to 2.443) | **0.003** | 2.434 (1.366 to 4.337) | **<0.001** | 2.160 (1.410 to 3.307) |
| Non-home discharge | 0.881 | 0.960 (0.564 to 1.634) | **<0.001** | 3.215 (1.827 to 5.658) | **<0.001** | 2.837 (1.841 to 4.372) |

Bolding equals significance p<0.05
mFI, modified frailty index; CI, confidence interval.