Too Frail for Surgery? Initial Results of a Large Multidisciplinary Prospective Study Examining Preoperative Variables Predictive of Poor Surgical Outcomes

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BACKGROUND: The decision as to whether a patient can tolerate surgery is often subjective and can misjudge a patient's true physiologic state. The concept of frailty is an important assessment tool in the geriatric medical population, but has only recently gained attention in surgical patients. Frailty potentially represents a measureable phenotype, which, if quantified with a standardized protocol, could reliably estimate the risk of adverse surgical outcomes.

STUDY DESIGN: Frailty was prospectively evaluated in the clinic setting in patients consenting for major general, oncologic, and urologic procedures. Evaluation included an established assessment tool (Hopkins Frailty Score), self-administered questionnaires, clinical assessment of performance status, and biochemical measures. Primary outcome was 30-day postoperative complications.

RESULTS: There were189 patients evaluated: 117 from urology, 52 from surgical oncology, and 20 from general surgery clinics. Mean age was 62 years, 59.8% were male, and 71.4% were Caucasian. Patients who scored intermediately frail or frail on the Hopkins Frailty Score were more likely to experience postoperative complications (odds ratio [OR] 2.07, 95% CI 1.05 to 4.08, $p = 0.036$). Of all other preoperative assessment tools, only higher hemoglobin ($p = 0.033$) had a significant association and was protective for 30-day complications.

CONCLUSIONS: The aggregate score of patients as "intermediately frail or frail" on the Hopkins Frailty Score was predictive of a patient experiencing a postoperative complication. This preoperative assessment tool may prove beneficial when weighing the risks and benefits of surgery, allowing objective data to guide surgical decision-making and patient counseling. (J Am Coll Surg 2013;217:665–670. © 2013 by the American College of Surgeons)

The decision of whether or not a patient will tolerate a surgical procedure is overly subjective, especially in the elderly and/or comorbid population due to the paucity of standardized, easily reproducible tools to predict postoperative outcomes.[1] This subjectivity is highlighted by the observation that there is significant discordance between different perceptions of 10-year life expectancy between physicans.[2] Many of the commonly used instruments to assess preoperative risk do not take into account a patient's physiologic reserve, and instead account only for existing deficits of discrete organ systems.[3] Additionally, cognitive impairments have been linked by geriatricians to poor outcomes in the elderly, and are not components of the traditional surgical risk indices.[4,5] A standardized, verified, preoperative risk assessment tool accounting for these considerations would aid surgeons' preoperative decision-making in hopes of limiting postsurgical complications and improving health outcomes.

In order to better understand the functional and physiologic heterogeneity among the elderly, the concept of

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Abbreviations and Acronyms

ASA = American Society of Anesthesiologists
BMI = body mass index
CCI = Charlson Comorbidity Index
CES-D = Center for Epidemiologic Studies Depression Scale
ECOG = Eastern Cooperative Oncology Group

frailty has been introduced and defined as a global phenotype of decreased physiologic reserve introducing vulnerability and limiting a person's ability to respond to stressors.[6,7] Over the past 2 decades, the medical community that specializes in geriatrics has come to recognize frailty as an important clinical entity, and its presence can identify patients at risk for poor outcomes, such as the development of disabilities, dementia, falls, hospitalization or institutionalization, or increased mortality.[8] To date, the application of frailty as a surgical risk assessment tool to predict postoperative outcomes has only recently been examined.[9,10] Most notably, Makary and colleagues[9] published their findings in 2010 that established the Hopkins Frailty Score in a large heterogeneous cohort of patients undergoing major and minor operations. The finding of preoperative frailty of any degree was predictive of postoperative complications, length of stay, and discharge to a skilled or assisted nursing facility.[9]

In this study, we sought to further characterize preoperative measurements of frailty and their ability to reliably predict postoperative outcomes. In addition to the Hopkins Frailty Score,[9] we hypothesized that other measurements of frailty such as self-assessment tools and biochemical markers may provide independent additive value to the existing frailty index.

METHODS

Study design and participants

The Emory University Institutional Review Board approved this prospective study of patients undergoing major surgical intervention for a urologic, general surgical, or surgical oncology illness, not including endoscopic procedures such as transurethral resection of the bladder or prostate and ureteral stone retrieval. Inclusion criteria were age 18 years or older and being evaluated for a surgical procedure requiring hospital admission. Exclusion criteria consisted of an inability to ambulate, poor manual dexterity or inability to grip, and inability to read or verbally understand the questionnaires. There were 214 patients enrolled consecutively after surgical consultation who consented to proceed with surgery.

Preoperative assessment of frailty included the 5 components of the Hopkins Frailty Score (shrinking, weakness, exhaustion, low activity, and slowed walking speed, Appendix 1),[9] traditional risk indices assigned by surgeons and anesthesiologists (American Society of Anesthesiologists [ASA] scale,[11] Eastern Cooperative Oncology Group [ECOG] Performance Status,[12] and Charlson Comorbidity Index [CCI][13]), patient-answered questionnaires (Center for Epidemiologic Studies Depression Scale [CES-D],[14] Mini Nutritional Assessment,[15] and Katz Activities of Daily Living[16]), and serum biochemical measurements commonly obtained preoperatively (albumin, C-reactive protein, estimated glomerular filtration rate, and hemoglobin). For each patient, we collected the following clinical and demographic variables: age, race, sex, height, weight, body mass index (BMI), medical comorbidities, and surgical procedure.

Outcomes measures and statistical analysis

The primary outcomes measure was postoperative complications within 30 days of surgery of any grade using the Clavien-Dindo Classification.[17] Meticulous review of the medical record with particular attention to the patient's hospital course and postoperative follow-up visits was conducted to obtain data on postoperative surgical complications.

All analyses were conducted using SPSS Statistics 20 software. Results with $p < 0.05$ were considered significant. For univariate analysis we used the chi-square test or Fisher's exact test for categorical variables and 1-way ANOVA for continuous variables. In our analysis, each component of frailty as well as the composite of all frailty measurements were tested individually. Multivariate regression models were constructed to account for potential confounders by adjusting frailty status and other variables significant on univariate analysis for ASA, ECOG scores, and age because these variables represented traditional risk assessment tools and known prognostic factors and we wished to account for their effect on the relationship of frailty and outcomes.

RESULTS

At the end of recruitment, 214 patients were enrolled. Twenty-five patients did not undergo surgery because they sought care elsewhere or had metastatic disease on staging after their office visit, leaving 189 evaluable patients at the time of this analysis. Patient clinical and demographic data are presented in Table 1. Mean patient age and BMI were 62 years (range 19 to 86 years) and 28.6 kg/m^2 (range 16.7 to 54.6 kg/m^2), respectively. The majority of patients were male (59.8%) and Caucasian (71.4%). Figure 1 demonstrates the relationship between age and the prevalence of frailty in our study