Screening for Frailty in Thoracic Surgical Patients

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Background. **The presence of frailty or prefrailty in older adults is a risk factor for postsurgical complications. The frailty phenotype can be improved through long-term resistance and aerobic training. It is unknown whether short-term preoperative interventions targeting frailty will help to mitigate surgical risk. The purpose of this study was to determine the proportion of frail and prefrail patients presenting to a thoracic surgical clinic who could benefit from a frailty reduction intervention.**

Methods. **A prospective cohort study was performed at a single-site thoracic surgical clinic. Starting October 1, 2014, surgical candidates 60 years of age or older who consented to be screened were included. Patients were screened using an adapted version of Fried's phenotypic frailty criteria: weakness (grip strength), slow gait (15-foot walk), unintentional weight loss, self-reported exhaustion, and low self-reported physical activity (Physical Activity Scale for the Elderly). Prefrailty was identified when participants demonstrated one to two frailty characteristics; frailty was identified when participants demonstrated three to five frailty characteristics.**

Results. **Of 180 eligible patients, 126 consented, and 125 completed screening. Thirty-nine participants (31%) were not frail, 71 (57%) were prefrail, and 15 (12%) were frail. Exhaustion was the most common frailty symptom (34%). Frailty prevalence did not significantly differ among men and women (men: 10%, women: 14%; $p = 0.75$).**

Conclusions. **We found a high proportion of prefrail and frail patients among patients deemed candidates for thoracic surgical procedures. This finding indicates that frailty may be underrecognized. Substantial numbers of patients may be considered for a presurgical frailty reduction intervention.**

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Frailty is defined as a state of increased vulnerability to physiologic stressors [1, 2]. Although no single operational definition exists [3], phenotypic frailty has been shown to predict falls, disability, hospitalization, and death [4]. As more patients of advanced age present for surgical treatment, there has been growing interest in assessing frailty as a surgical risk factor [5–11]. Phenotypic frailty has been shown to predict surgical complications, increased hospital length of stay, and postdischarge institutionalization [5, 6]. Research has begun to focus on interventions to mitigate the risks of frailty [12]. Some frailty activity interventions were able to improve frailty measures in as little time as 6 weeks [13, 14], thus indicating that a presurgical frailty intervention may also be feasible.

The prevalence of frailty in thoracic surgical candidates is not known. In the study originally defining the phenotypic frailty criteria, the prevalence of frailty and prefrailty in a community dwelling sample was 7% and 47%, respectively [4]. A systematic review showed frailty prevalence ranging from 4.0% to 59.1%, with the overall weighted prevalence of frailty at 10.7%, or 9.9% when focusing on physical frailty [15]. Frailty is more prevalent in the presence of acute and chronic disease, a finding suggesting that frailty prevalence may be higher in surgical groups [4]. In a study of 594 patients presenting for elective surgical procedures, 10.4% were frail and 31.3% were prefrail using Fried's frailty index [5]. Thoracic surgical candidates may represent a group with increased comorbidity and frailty, and they may be an ideal group to target for an intervention.

The objective of this study was to determine the proportion of frail and prefrail patients presenting to a thoracic surgical clinic as potential surgical candidates who could benefit from a preoperative frailty intervention. Results from this study will inform an intervention designed to reduce frailty and frailty-related surgical complications in this population.

Patients and Methods

Participants

Patients seen in the University of Chicago Thoracic Surgery Clinic in Chicago were actively recruited to

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participate in frailty screening from October 1, 2014 through January 6, 2016. These patients were recruited and consented to participate in screening during their first or second clinic visit if they were deemed to be candidates for major thoracic surgical procedures. Inclusion criteria were age 60 years or older, ability to consent, willingness to participate in frailty screening, no obvious contraindication to surgical intervention, and thoracic disease that could require major operation (major lung resection, esophagectomy, repair of giant paraesophageal hernia, chest wall resection, extended pleurectomy or decortication, or sternotomy for thymectomy or other mediastinal process). Contraindications to surgical treatment were assessed by participating surgeons based on an overview of the patients' condition, which included their physical status, comorbidities, and cancer stage, as appropriate.

Frailty Assessment

Once consent was obtained, subjects were screened using an adapted version of Fried's phenotypic frailty criteria: (1) unintentional weight loss, (2) weakness, (3) exhaustion, (4) low physical activity, and (5) slowness [4]. Unintentional weight loss was assessed using measured weight loss (if available) or self-reported unintentional weight loss over the previous year. A frailty point was assigned if the participant reported a decline of 10 pounds or more or 5% body weight in the past year. Weakness was assessed by measuring the grip strength of the dominant hand by using a dynamometer (JAMAR Plus+ Hand Dynamometer, Instrument M3-200, Patterson Medical, Warrenville, IL). The average of three measurements was recorded. A frailty point was assigned if strength was in the lowest quintile for sex and body mass index category by using previously established cutpoints [4].

Exhaustion was assessed using two self-reported questions: In the last week, "I felt that everything I did was an effort;" and "I could not get going." Answer options included: rarely or none of the time (<1 day), some or a little of the time (1 to 2 days), a moderate amount of the time (3 to 4 days), or most of the time (5 to 7 days). Exhaustion was identified if either answer was a moderate amount of time (3 to 4 days per week) or most of the time (5 to 7 days per week). Low physical activity level was assessed using the Physical Activity Scale for the Elderly score. A point was assigned if the participant scored in lowest quartile by sex by using previously established cutpoints [16].

Slowness was assessed by measuring gait speed over a distance of 15 feet at a normal pace, averaged over three trials. A frailty point was assigned if the participant scored in lowest quintile by sex and height by using previously established cut-points [4]. The presence of one to two criteria indicated prefrailty; three or more criteria indicated frailty.

Covariates

Data were also collected on subjects' age, body mass index (kg/m^2), sex, race, and referral diagnosis.

Statistical Analysis

The primary outcome studied was the proportion of prefrail and frail patients in the study sample. Means (continuous) and frequencies (categorical) were generated for baseline characteristics and frailty status. Frailty status and Eastern Cooperative Oncology Group (ECOG) performance status were compared [17]. ECOG status was dichotomized as 0 to 1 (normal) and 2 to 3 (low performance status). Frequencies were also assessed across sex subgroups. χ^2 tests were used to identify correlation between frailty status and ECOG status and to identify significant differences among sex subgroups.

Results

Of the 180 eligible patients, 126 consented, 21 deferred, 13 declined, 10 did not follow up in clinic, and 10 were not approached. The average age of the participants was 70.4 years. In this sample there was a slightly higher proportion of female patients (51.2%), and most patients were white (72.8%). The most common referral diagnosis was for a lung lesion (including lung mass and lung nodule; 68.8%). Complete demographic data are presented in Table 1. Age breakdown by sex is shown in Figure 1.

In this sample, 68.8% of patients were prefrail or frail (Fig 2). Of the five phenotypic frailty characteristics, the most commonly identified characteristic was exhaustion. The least commonly identified characteristic was slowness (Fig 3). Frailty status and ECOG status were not significantly correlated ($p = 0.080$; Table 2). Frailty prevalence was not significantly different across sex subgroups (men: 9.8%, women: 14.1%; $p = 0.75$). Women

Table 1. Demographic Characteristics of Screened Patients

Characteristic	Value
Age (mean [range])	70.4 (60–88)
BMI (mean [range])	27.6 (14–48)
Sex (n [%])	
Women	64 (51.2%)
Men	61 (48.8%)
Race (n [%])	
White	91 (72.8%)
Black	27 (21.6%)
Asian	6 (4.0%)
Referral diagnosis (n [%])	
Lung nodule	46 (36.8%)
Lung cancer	40 (32.0%)
Mediastinal mass	9 (7.2%)
Paraesophageal hernia	7 (5.6%)
Esophageal cancer	7 (5.6%)
Mesothelioma	6 (4.8%)
Metastatic, nonlung primary tumor	3 (2.4%)
Chest wall tumor	2 (1.6%)
Pleural effusion	2 (1.6%)
Emphysema	2 (1.6%)
Pneumothorax	1 (0.8%)

BMI = body mass index.