The Impact of a Frailty Education Module on Surgical Resident Estimates of Lobectomy Risk

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Background. **Frailty is a risk factor for adverse events after surgery. Residents' ability to recognize frailty is underdeveloped. We assessed the influence of a frailty education module on surgical residents' estimates of lobectomy risk.**

Methods. **Traditional track cardiothoracic surgery residents were randomly allocated to take an online short course on frailty (experimental group) or to receive no training (control group). Residents read a clinical vignette, made an initial risk estimate of major complications for lobectomy, and rated clinical factors on their importance to their estimates. They viewed a video of a standardized patient portraying the patient in the vignette, randomly selected to exhibit either vigorous or frail behavior, and provided a final risk estimate. After rating five vignettes, they completed a test on their frailty knowledge.**

Results. **Forty-one residents participated (20 in the experimental group). Initial risk estimates were similar between the groups. The experimental group rated clinical factors as "very important" in their initial risk estimates more often than did the control group (47.6% versus 38.5%; $p < 0.001$). Viewing videos resulted in a significant change from initial to final risk estimates (frail 50% ± 75% increase, $p = 0.008$; vigorous 14% ± 32% decrease, $p = 0.043$). The magnitude of change in risk estimates was greater for the experimental group (10.0 ± 8.1 versus 5.1 ± 7.7; $p < 0.001$). The experimental group answered more frailty test questions correctly (93.7% versus 75.2%; $p < 0.001$).**

Conclusions. **A frailty education module improved resident knowledge of frailty and influenced surgical risk estimates. Training in frailty may help educate residents in frailty recognition and surgical risk assessment.**

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Accurate assessment of operative risk is essential to the appropriate selection of patients for surgery, patient and family counseling, and before, during, and after surgery management. Most conventionally used risk factors for lung resection are related to respiratory and cardiac function and comorbidities [1]. Knowledge of these factors alone does not result in accurate prediction of lobectomy outcomes [2]. Instead, risk estimation is a complex cognitive process that relies on learned patterns, specific knowledge, and unconscious processing of information that cannot occur without direct interaction between the surgeon and the patient [3].

There is growing interest in frailty as a risk factor for surgical complications. Frailty is defined as low physiologic reserve with increased susceptibility to complications and reduced ability to recover from such complications. It has been associated with an increased risk of complications in cardiothoracic surgery [4, 5] and general surgery [6–8] and has been demonstrated to predict complications in a manner that is complementary and additive to standard risk scores. Frailty can be recognized in part by slow gait, reduced strength, fatigue, low levels of physical activity, and weight loss [9]. Experienced thoracic surgeons, on visual inspection, have an ability similar to that of geriatricians to recognize frail characteristics [10]. Surgeons in practice are better than surgical residents at recognizing frailty and at incorporating factors associated with frailty in their surgical risk estimates [11]. Whether frailty recognition and incorporation into surgical risk estimation can be taught to residents, or whether that ability only arises as a result of accumulated experience, is not known.

The current study was designed to assess whether frailty recognition can be taught to surgical residents, and how knowledge of frailty influences their estimates of surgical risk.

Material and Methods

Subjects participating in this study were cardiothoracic residents in traditional 2-year or 3-year training programs. They were contacted through e-mail using addresses provided by the Thoracic Surgery Directors' Association, and were provided $50 in remuneration

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when they completed the study. Subjects provided their contact information, age, sex, year of cardiothoracic training, and comfort level with performing a lobectomy (novice, learner, competent, expert). The study was approved by the University of Chicago Institutional Review Board, and written consent was waived; implicit consent from each subject was assumed as reflected in their decision to "opt in" for participation.

Clinical vignettes were abstracted from histories of patients who underwent lobectomy for management of lung cancer, as previously described [2, 11]. Patient vignettes were assigned risk scores based on the Charlson comorbidity index [12] and EVAD [13] values. Based on their combined risk scores (range, 2 to 15), they were classified as low risk (two vignettes; score 4 or 5), average risk (one vignette; score 8), and high risk (two vignettes; score 11) for major complications after lobectomy. The risk scores were not shared with the subjects.

Videos of standardized patients were created to portray "somewhat vigorous" and "somewhat frail" behavior, hereafter referred to as "vigorous" and "frail" videos, as previously described [10, 11]. The videos were silent, and depicted the standardized patient walking into an examination room, sitting in a chair, rising from the chair, walking to an examination table, and climbing onto the table. The standardized patients were middle-aged, Caucasian, and similarly dressed in wardrobe (dark pants, light colored long-sleeved shirts) purchased for the videos. They were trained to depict ranges of physical behaviors related to aspects of frailty, including gait speed, strength, fatigue, and weight loss. Each standardized patient's vigorous and frail video was paired with a single clinical vignette.

Subjects were informed they were participating in "a study evaluating surgical risk assessment" and were not aware that the study involved randomization. They were randomly assigned to take a short online course on frailty (experimental group) or not (control group; Fig 1). Subjects in the experimental group took a five-question pretest regarding their basic knowledge of frailty and its impact on surgical outcomes (Appendix) and then completed the short course. The online short course instructed subjects on frailty definitions, components, assessment, and relationship to surgical outcomes. After the experimental group completed the short course, they began reading the clinical vignettes. The control group did not take the pretest or short course and began by reading the clinical vignettes.

All subjects read a clinical vignette, estimated the risk of major postoperative complications on an anchored Likert-type scale (0% to 100%; initial risk estimate), and indicated on a 13-item list of factors the relative importance (five-category scale from "very important" to "not important at all") of each factor in assessing risk for that vignette. Subjects then viewed a video of the standardized patient paired with the vignette, randomly selected to either the vigorous or the frail video. Subjects then again estimated the surgical risk associated with the vignette and video (final risk estimate). The experimental group ranked the importance of the video and of each element

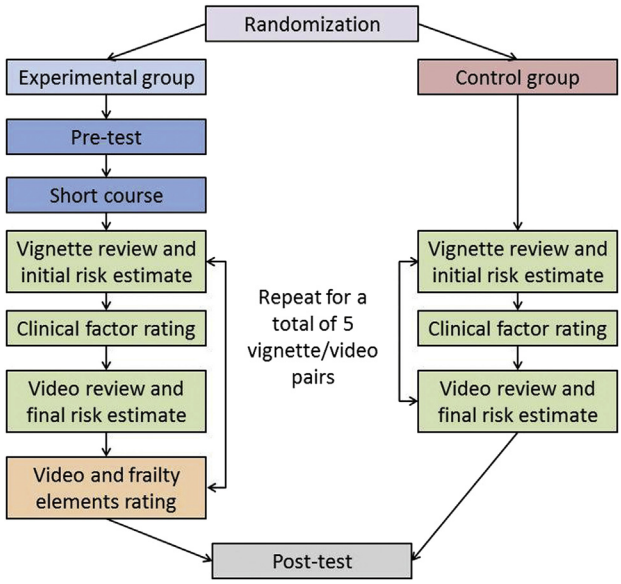

Fig 1. Schema for study design.

of frailty portrayed in the video (age, weight loss, gait speed, strength, fatigue) on a five-category scale ("very important" to "not important at all") to their final risk estimate. Five vignettes, each with a paired video, were evaluated by each subject. Control group subjects did not rate video or video element importance to avoid sensitizing them to the aspects of frailty being investigated. All subjects then completed a five-question posttest on their understanding of frailty and its impact on surgical outcomes that was identical to the pretest that the experimental group took at the beginning of the exercise (Appendix).

All data were collected and managed using Research Electronic Data Capture (REDCap) hosted at the University of Chicago [14]. Categorical variables were compared with χ^2 statistics. Continuous variables were compared using paired or unpaired t tests, as appropriate. Analysis of variance was used to compare means among groups. Effect size was assessed by calculating Cohen's d (medium effect = 0.5, large effect = 0.8). Means are expressed as ± SD. All analyses were performed using Minitab 16 (Minitab Inc, State College, PA).

Results

A total of 204 residents were invited by e-mail to participate, and 41 (20%) completed the study. Other than year of training, no data were collected regarding the residents who chose not to participate. The study subjects' mean year of training was 1.76 ± 0.70, compared with 1.73 ± 0.70 for the residents who elected not to participate ($p = 0.86$). Twenty subjects were randomly assigned to the experimental group, and 21 subjects were in the control group. There were no differences between the experimental and control groups other than a significantly