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Frailty and Sarcopenia: Low Utilization of Frailty Scales in Thoracic Surgery and the Potential Impact of Prehabilitation

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Keywords

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Introduction

Frailty is a syndrome characterized by physical deconditioning and sarcopenia. It is associated with increased perioperative complications, delayed recovery, and increased mortality. However, the Society of Thoracic Surgeons (STS) Risk Calculator [1], perhaps the only routinely utilized tool to assess surgical candidacy and outcomes in cardiac surgery, is rarely used in thoracic surgery. The STS Risk Calculator utilizes a patient's medical history and current patient data including daily alcohol and tobacco use, severity of carotid artery stenosis, New York Heart Association (NYHA) classification, days since myocardial infarction, ejection fraction, and most recent laboratory values to predict short-term outcomes [1]. Ultimately the question remains: How applicable is the STS calculator to lung and esophageal cancer patients or do we need to re-define risk stratification for patients undergoing such thoracic surgery, which are distinct from cardiac bypass and valvular surgeries? Can clinicians unanimously agree to use a single risk calculator to reproducibly identify frail patients across all disciplines in order to timely intervene and provide tailored prehabilitation to optimize their outcomes?

Frailty and Sarcopenia

A growing body of surgical literature across multiple surgical specialties, including thoracic oncology, has demonstrated the impact of frailty and sarcopenia. Frailty clinically manifests as a decrease in the capacity to perform activities of daily living. It is essentially a physiological decline in multiple organ systems, resulting in decreased capacity to withstand stress, including surgery and disease. Sarcopenia parallels frailty. Defined as loss of skeletal muscle mass, strength, and function, sarcopenia may be diagnosed by the presence of low gait speed, low grip strength, or low muscle mass. It can be quantified by the skeletal mass index and has been independently correlated with worse postoperative complications [2]. There is a great deal of overlap between sarcopenia and frailty, as both are objective measures of physical functioning. Both frailty and sarcopenia appear more pronounced in oncological patients and may predict the patient's ability to tolerate surgery, complications, and recovery. In oncology, frailty and sarcopenia have also been linked to higher chance of tumor recurrence and poor progression-free survival. If indeed a frailty scale could be employed routinely, it may be able to identify "at-risk" patients so that they may be optimized prior to undergoing an elective procedure or not offered a resection. Indeed, it is not the procedure itself that places frail patients at risk for poor outcome, but it is the individual's capacity to recover from a postoperative morbidity such as a prolonged air leak, aspiration pneumonia, bronchopleural fistula, or anastomotic leak. It is well known that esophagectomy is an extremely morbid operation with almost 50% morbidity and up to 3% mortality [3]. A recent study on the pancreaticoduodenectomy procedure, which is a comparable procedure to esophagectomy with similar complication profiles, validated frail patients to have poorer survival in both surgical and non-surgical cohorts when compared with non-frail counterparts [4], thus suggesting that frail patients can potentially be identified among those undergoing major lung or esophageal resections.

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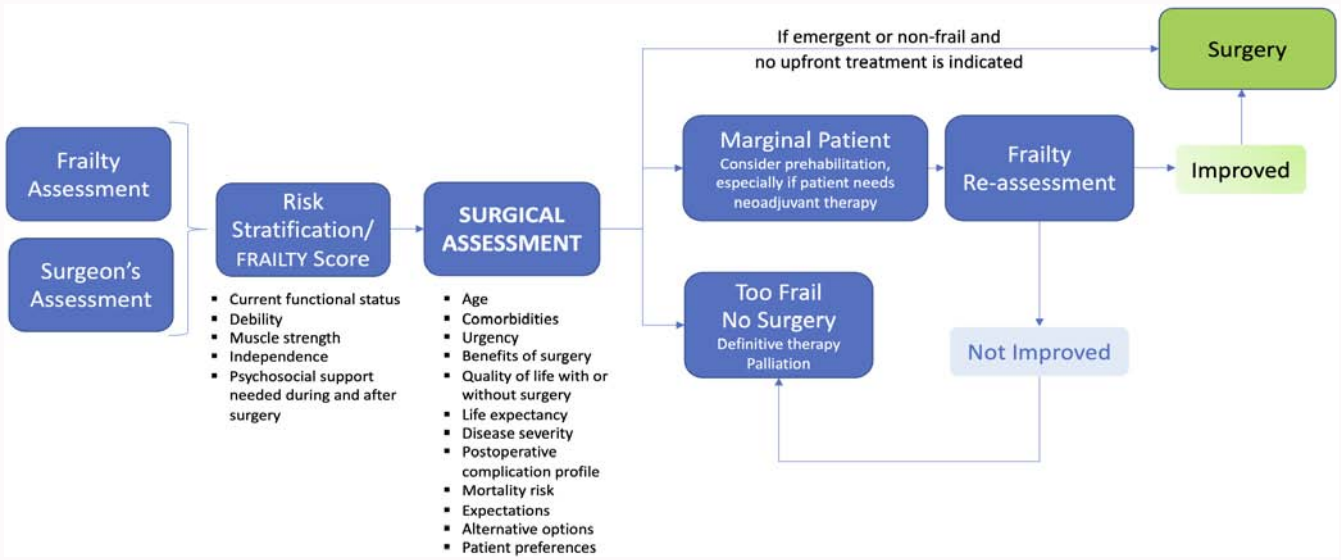

Figure 1: Standard assessment of frail patients being considered for surgery and proposed algorithm for their management.

Frailty Scales

Some examples of frailty assessments include the Fried Frailty Phenotype (FFP), Clinical Frailty Score (CSF), Groningen Frailty Indicator (GFI), Clinical Global Impression of Change in Physical Frailty (CGIS-PF), Geriatric Functional Evaluation (GFE), and Frailty Index-Comprehensive Geriatric Assessment (FI-CGA). While there is an abundance of measurement tools and methodologies to evaluate frailty that are still being created, there is no universally accepted best form of assessment in the thoracic field. The modified Frailty Index (mFI), one of the most widely used tools, evaluates frailty based on clinical history, physical examination, and presence of comorbidities. It is available in 11-item and 5-item forms. Each item is a binary function that receives either 0 or 1 point for an additive score. The mFI has been aptly applied in cardiac, general, gynecologic, neurosurgical, orthopedic, otolaryngologic, plastic, general thoracic, urologic, and vascular surgery with a stepwise increase in the risk of morbidity and mortality with higher mFI score [5-7]. These results have also been reproduced in oncologic literature, suggesting that a high mFI score is an independent predictor of postoperative morbidity and mortality and is a better predictor than age and American Society of Anesthesiologists grade.

Despite the availability of these assessment tools and evidence of their predictive value for surgical outcomes, the field of thoracic surgery has been slow to adopt the use of either of these scores in preoperative planning. Two recent studies formalized frailty testing in thoracic surgery candidates using functional physiological metrics. Tang et al. developed a novel composite measure consisting of grip strength, 30-sec chair sit-stands, 6-min walk distance, and normalized psoas muscle area to predict outcomes after esophagectomy [8]. Hanada et al. evaluated the association between a Short Physical Performance Battery (SPPB), including walking speed, chair stands, and standing balance, to evaluate postoperative pulmonary complications after lung resection [9]. Both of these studies provided complementary data validating the use of frailty scales to predict surgical outcomes in both lung and esophageal patients. The current functional status should be included in the objective frailty assessment of every thoracic oncology patient prior to resection. Although further validation and refinement are necessary, these two studies offer the possibility of capturing changes in functional status over time.

Prehabilitation

The benefit of having an accurate assessment of frailty and sarcopenia that predicts postoperative outcomes is to help practitioners identify high risk patients who may benefit from "prehabilitation" programs to optimize their health prior to undergoing surgery. It is crucial to identify frail patients considered for thoracic surgery, as they are more likely to suffer postoperative morbidity, may not have the physiological reserve to receive adjuvant therapy, and may be at risk for early recurrence. The ultimate question then becomes how can one mitigate such risks of poorer quality of life after surgery and/or short disease-free interval and thus overall survival. Herein, a timely assessment of frailty with shared decision-making between a patient and their surgeon becomes critical in terms of setting expectations and discussing the role of prehabilitation, counseling, smoking cessation, and/or post-operative rehabilitation (Figure 1). The ideal length of prehabilitation (2 weeks *vs.* 6 weeks) typically depends on an individual's baseline functional status and should be decided by a team of trained prehab therapists working in conjunction with the surgeon. For frail patients proceeding directly to surgery, such as those presenting with hemoptysis or esophageal perforation, given the acuity and nature of the disease, will need aggressive postoperative rehabilitation. However, for those who can afford to 'buy' time – advanced stage lung or esophageal cancers - who could 'benefit' from neoadjuvant therapy, a management algorithm that incorporates aggressive preconditioning and nutritional optimization as a bridge to surgery (Figure 1). With the advent of novel neoadjuvant treatment strategies/regimens both in early-stage lung cancer and locally-advanced esophageal cancer, there is more role of delaying surgery and offering prehabilitation to frail and sarcopenic patient while undergoing upfront treatment (Figure 2). In the future, studies that quantify functionality may allow reassessment of patients after implementation of such optimization strategies to evaluate improvement in functional status and/or decrease in operative risk.

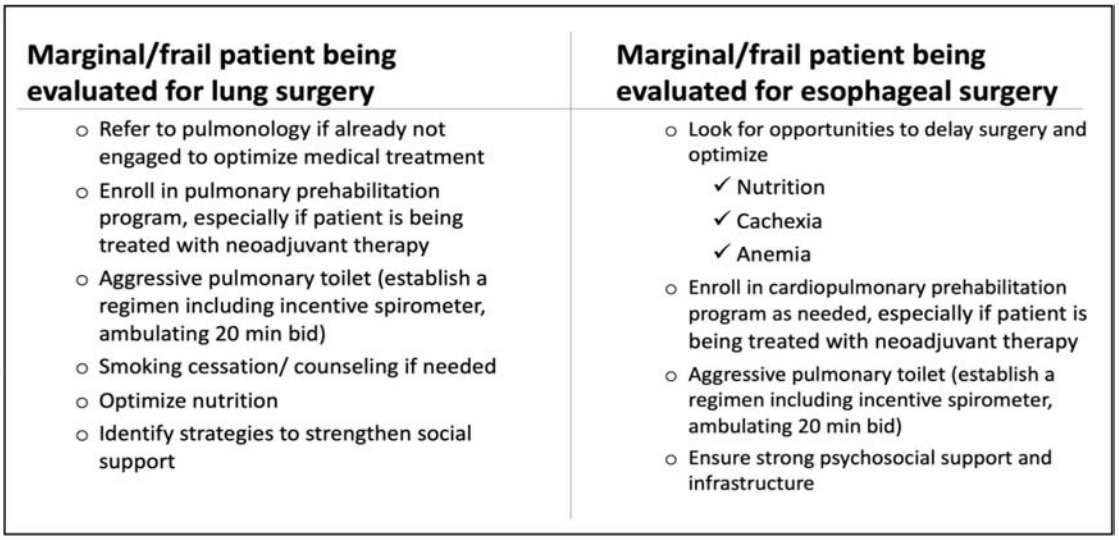

Figure 2: Proposed FRAILTY algorithms for lung and esophageal patients: Frail patients, in need of neoadjuvant therapy, benefit from integrated prehabilitation while awaiting surgery.

Looking into the Future

The assessment of preoperative risk should be informative for surgical decision-making and patient counseling. No single assessment tool can replace the surgeon's evaluation or patient autonomy. However, objective evidence to identify those who may benefit from preoperative rehabilitation and integrated geriatric management may be valuable tools for improving morbidity and mortality in vulnerable populations. While further implementation of these tools is necessary, a combination of current functional status and clinical history data may offer the best holistic picture to aid in the assessment of surgical candidacy. Routine adoption of assessment tools that allow robust assessment of patients preoperatively can help streamline decision-making among clinicians and minimize surgeon shopping. Additionally, such assessment tools can also be used to build an argument of developing more prehabilitation programs nationwide, which indeed will not only increase the likelihood of improved patient outcomes but will eventually increase the surgical pool of patients who may otherwise be deemed nonoperative.

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