REVIEW

OPEN

Preoperative frailty screening, assessment and management

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Purpose of review
To highlight the importance of frailty assessment in thoracic surgery patients.

Recent findings
Frailty results from an accelerated loss of functional reserve associated with ageing and leads to increased vulnerability following surgery. It is a complex and multidimensional syndrome involving physiological and psychosocial systems. Frailty is a separate entity from comorbidities and disabilities. Frailty is associated with an increased risk of complications and a higher mortality rate after thoracic surgery. Patients can easily be screened for frailty and frail patients can benefit from further assessment of all areas of frailty secondarily. Prehabilitation and rehabilitation can help limit frailty-related complications after thoracic surgery.

Summary
Frailty should be part of the routine preoperative evaluation for thoracic surgery. Frailty must be considered in assessing eligibility for surgery and in planning prehabilitation and rehabilitation if necessary.

Keywords
frailty, preoperative assessment, thoracic surgery

INTRODUCTION

Most patients undergoing major thoracic surgery are adults over 60 years of age. It is therefore relevant to look at the management of elderly patient as these patients are at higher risk of complications [1]. Frailty has a great impact on the prognosis of patients but its assessment outside geriatric medicine remains insufficient. As a result, the evidence on the impact and management of frailty in thoracic surgery is limited but growing. We will discuss the overall concept of frailty with its different components, the impact of frailty on the outcome of thoracic surgery patients, the importance of frailty assessment in providing holistic management and finally an effective way to assess and manage frailty in the pre and postoperative setting.

WHAT IS FRAILTY?

Frailty is a state of increased vulnerability to a stressful event, such as trauma or illness, which leads to poor resolution of homeostasis and increases the risk of complications and sequelae. Frailty results from an accelerated loss of functional reserve associated with ageing. It is a complex and multidimensional syndrome involving multiple physiological systems and leading to multiple frailty phenotypes. Frailty should be distinguished from comorbidities or disabilities, although all three entities may be related [2,3].

Patients' health status is conditioned by their biological, physical and psychosocial reserves and the pathophysiology of frailty is the result of an accumulation of deficits in one of these domains. Physical decline, malnutrition, chronic disease, disability, mental disorders, cognitive dysfunction, social difficulties or poor social support can combine to accelerate physiological ageing leading to sarcopenia, loss of muscle strength, oxidative stress, chronic inflammation and hormonal or metabolic

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KEY POINTS

- Frailty is a complex, multidimensional syndrome associated with an increased risk of complications and higher mortality after thoracic surgery.
- Preoperative frailty screening is easy to perform and should be assessed routinely.
- Frail patients need to be assessed in more details to better document the causes of their frailty.
- Diagnosis of frailty allows determination for patients eligibility for thoracic surgery, prehabilitation and rehabilitation programmes to be proposed to limit postoperative complications, hospital length-of-stay and improve outcomes.

disorders. As a result of the former conditions, frailty progressively develops, the typical phenotype being a patient with weakness, low energy, slowness and involuntary weight loss [4▪▪,5▪▪].

Frailty can occur at any age, but its prevalence increases significantly with ageing. Typically, in the general population, frailty affects less than 10% of people under 65 years old, while its prevalence increases to more than 30% in people over 80 years old [6,7]. Frailty is associated with increased healthcare use and costs [6].

Frailty is a concept that originated in geriatric medicine but there is growing evidence of its impact in many other medical fields. Surgical and oncological patients are even more frail compared with a population of the same age without comorbidity [8]. Although frailty in thoracic surgery has not been widely studied, it is concerned with frailty because it involves high-risk procedures, a high proportion of elderly patients and patients with significant comorbidities [6]. The prevalence of frailty in thoracic surgery patients has been estimated to be as high as 70% [9].

WHAT IMPACT HAS FRAILTY ON THORACIC SURGERY PATIENT OUTCOME?

It is accepted in thoracic surgery that the perioperative risk is better correlated with biological age rather than chronological age [10,11]. In line with this, frailty assessment can be assimilated to evaluating biological age.

After a stressor event such as surgery, the nonfrail patient will have temporarily reduced autonomy or increased dependence but will probably be able to return to a state of health comparable with the one present before the operation. Conversely, the frail patient will have a slower or incomplete recovery from surgery, especially when a complication occurs or a surgical revision is required [12]. Several studies have shown that a frail patient will have serious postoperative complications, poor postoperative outcomes, prolonged hospital stay, hospital readmissions, increased 30-day and long-term mortality [13,14]. An increase in mortality has been shown for frail patients in both elective [15] and emergency procedures [16].

In a large retrospective cohort of 6373 patients admitted for thoracic surgery, the independent factors for postoperative morbidity and mortality were nonelective surgery and functional status. Compared with patients with good functional status, dependent patients had more pneumonia [10%, odds ratio (OR) 2.7], longer intubation duration (23%, OR 9.3), higher rates of severe postoperative complications (29.2%, OR 5.75) and a significantly higher overall mortality rate of 18.1% (OR 7.7) [17].

Discrimination between frail and nonfrail patients is therefore of paramount importance for postoperative risk assessment in thoracic surgery. To date, however, the impact of frailty management on patient outcomes after thoracic surgery remains insufficiently unexplored.

PREOPERATIVE FRAILTY ASSESSMENT

An accurate assessment of the multidimensional components of frailty requires a bio-physical, mental, nutritional and social approach. To date, there is no tool that can fully assess all these components at the same time and there is no consensus on how frailty should be assessed. There are over 20 validated tools for screening and measuring frailty, with important similarities, but there is no defined standard assessment tool. In addition, there is no validated tool for frailty assessment in thoracic surgery. However, this wide range of scores and scales allows physicians to find the one that fits their needs according to the type of surgery, their local population and their resources.

Basically, some scores can be used for frailty screening, whereas other scores can be used to assess one frailty domain more accurately. Table 1 provides a list of the main frailty scales, the frailty domain explored, workload and their respective specific requirements.

Among the scores used for frailty screening, some are designed to assess the frailty phenotype, in particular walking speed, weakness, unintentional weight loss, frequency of falls and physical activity, such as the Fried phenotype score [18], the FRAIL scale [19] or the Gérontopôle Frailty Screening Tool [20]. On the other hand, there are scores that screen cumulative deficits in nutrition,

Table 1. Frailty scoring systems and domain assessment

Test	Screening frailty	Frailty domain assessment	Easy to perform	Specific requirements
Fried phenotype score [17]	x		x	Handgrip dynamometer
FRAIL scale [18]	x		x	
GFST [19]	x		x	
CFS [21]	x		x	
EFS [20]	x	Screens all domains	x	Clock drawing and walking tests
DAI [24]		Assesses all domains		40 items to assess Handgrip dynamometer
CNST [25]		Nutrition	x	
Mini-Cog Score [26]		Cognitive function	x	Included in EFS
MMSE [27]		Cognitive function	x	
PHQ-2 [28]		Mental health	x	
Time up & go test [29]		Physical status	x	

CFS, clinical frail scale; CNST, Canadian Nutrition Screening Tool; DAI, Deficit Accumulation Index; EFS, Edmonton frail scale; GFST, GÕrontopole Frailty Screening Tool; MMSE, Mini-mental State Examination; PHQ-2, Patient Health Questionnaire-2.

cognition, comorbidities, declining physical fitness, mental health and socioeconomic problems, such as the Edmonton Frail Scale (EFS) [21] and the Clinical frailty scale [22]. All these scores classify the patient as nonfrail, vulnerable (at risk) or frail. Significantly, the 'initial clinical impression' has been correlated with the prognosis of patients admitted for elective cardiac surgery. This assessment consists of the anaesthetist answering the basic question 'Is the patient in front of me fit for the proposed operation?' even before consulting the patient's medical record [23].

Once prefrailty or frailty has been diagnosed, a more precise frailty evaluation is done by using scales evaluating each frailty domain such as nutrition, physical health, mental health, social support or cognition and are rather well correlated with poor surgical outcome. However, the heterogeneity of the scores used does not allow us to determine the most predictive factor of a poor surgical outcome [4▪▪,24]. This more in-depth assessment of frailty would be intended to better define the specific needs of the patient pre and postoperatively [4▪▪].

The Deficit Accumulation Index is able to partially evaluate all frailty components [25], while nutrition can be assessed by the Canadian Nutrition Screening Toll (CNST) [26], cognition by a Mini-Cog score [27] or Mini-mental state evaluation [28], Mental health by a Patient Health Questionnaire-2 [29] and finally physical health can be a Timed Up & Go test [30].

Since frailty can be observed in young patients [6], frailty screening should not be reserved to elderly and performed for all patients during the preoperative anesthesia consultation.

The preoperative anaesthesia consultation provides an opportunity to screen and possibly further assess frailty, in addition to the usual preoperative tests. Given the enormous impact of frailty on postoperative prognosis, the routine implementation of a rapid and user-friendly screening test is of paramount importance. Indeed, the assessment of frailty is necessary not only to inform the physician and the patient of the postoperative risk but also to allow possible perioperative measures to improve the patient's prognosis.

In practice, we suggest screening for frailty using the FRAIL scale and the EFS as these scores do not require additional equipment and a well-conducted preoperative assessment can already complete a large part of these scores.

NUTRITIONAL SCREENING

A poor nutritional status, defined by energy intake and/or nutrient quality, appeared to be correlated with higher frailty scores [31–33]. In line, patients with a good nutritional status and high levels of nutritional biomarkers (total protein, albumin, retinol binding-protein etc.) have lower frailty scores [34]. However, there have been conflicting results since a more recent meta-analysis showed no correlation between protein intake and frailty [35].

Primary sarcopenia is an age-related reduction in muscle mass and strength. As with the link between nutrition and frailty, the link between

sarcopenia and frailty is not clear [36]. Some authors suggest that sarcopenia is a risk factor for frailty [35,37]. Furthermore, sarcopenia and malnutrition are also linked as nutritional supplementation has been shown to improve the latter, in addition to physical activity which is the basis of sarcopenia management [38].

In summary, malnutrition, sarcopenia and frailty are interrelated but remain distinct entities. The EFS screens for frailty by evaluating weight loss and physical performance, but nutrition and sarcopenia can be independently evaluated, as already mentioned. Malnutrition can be screened using the CNST [26] and then more deeply evaluated by the mini nutritional assessment [39]. Sarcopenia assessment can be performed independently either by estimating muscle mass or muscle strength but the assessment of the subsequent functional performance is the most common, using gait speed measurement such as the Timed Up & Go test [4▪▪], the Short Physical Performance Battery [40,41], and the five times sit-to-stand test [42].

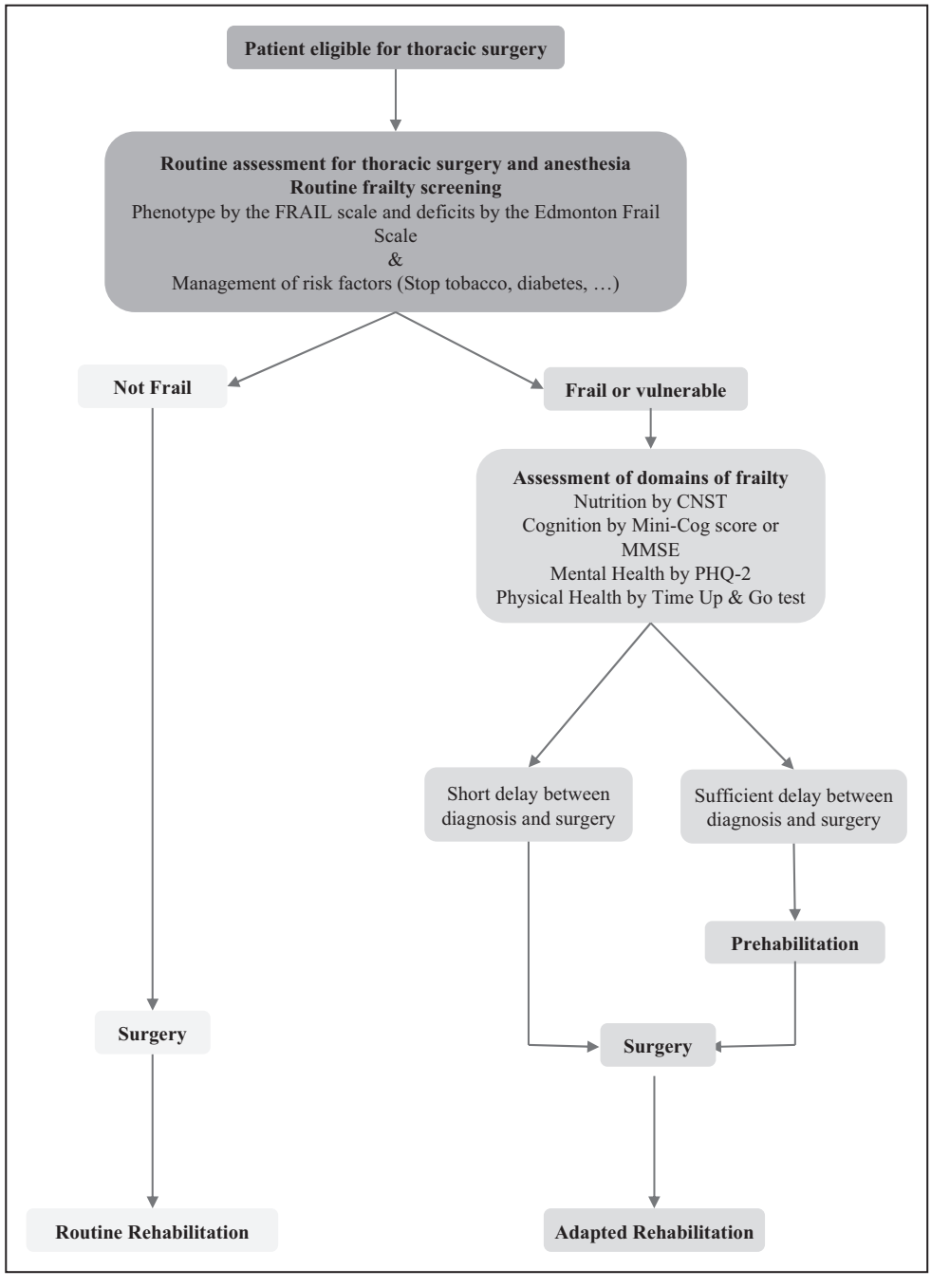

FIGURE 1. Frailty preoperative assessment and work-up.

Importantly, it must be noted that malnutrition and sarcopenia occur in obese patients, a condition that can easily hide frailty which is often associated in physician's mind with low BMI. There is a phenomenon called 'sarcopenic obesity' where obesity coexists with skeletal muscle depletion. The problem is not the excess of fat mass but the low skeletal muscle mass which is associated with a low metabolic reserve [43]. Obese patients should therefore also be assessed for nutrition and sarcopenia.

HOW FRAILTY ASSESSMENT HELPS AT MANAGING PATIENTS?

Once frailty has been identified, the medical team is aware of the increased perioperative risks of complication and mortality. Thus, the medical team has the option of refuting the surgery or surgical technique if the patient is too frail and the balance between benefit and risk is negative for the patient. It also has the possibility, in patients whose frailty seems reversible to a state of health allowing surgery, often prefragile patients, to improve their preoperative state by a prehabilitation programme. Yet, the duration of this programme prior to restoring an acceptable physical condition before surgery has been poorly evaluated in thoracic surgery. Finally, an adapted rehabilitation programme can be planned.

The current focus of prehabilitation therapies in thoracic surgery is the ability to recover proper cardiopulmonary function after surgery. Prehabilitation programmes already exist in thoracic surgery and have shown clinical outcome benefits in some patients. Conceptually, the preoperative management of these patients consists in reducing risk factors such as tobacco consumption, diabetes and cardiovascular risk factors but also to improve respiratory performance [44,45].

A frailty screening followed by a thorough assessment of the areas of frailty affecting the patient would allow planning of a frailty-related prehabilitation and rehabilitation in addition to the usual prehabilitation programme (Fig. 1).

Depending on the patient's needs, nutrition programme, physical exercise, cognitive stimulation, adapted social environment and support can be offered. There is a growing body of evidence demonstrating the beneficial effect of these interventions on the postoperative complication rate and outcome in frail patients undergoing elective major abdominal surgery [4▪▪,46,47]. However, even though similar benefits of prehabilitation are suggested in thoracic surgery, the limited number of studies and their variable quality indicate the need for additional studies in this specific condition [11,48▪▪].

The greatest limitation in prehabilitation for thoracic surgery lies in the short delay between the diagnosis, the operative indication and the surgery. Indeed, the oncological process very often at the basis of the operative indication leaves little time to perform prehabilitation [11]. In this context, efforts should be made to strengthen rehabilitation programmes.

CONCLUSION

Frailty is a multifactorial syndrome that significantly worsens the prognosis of patients after thoracic surgery. Systematic screening for frailty is therefore mandatory to accurately assess the perioperative risk of patients.

When frailty has been diagnosed and the patient remains eligible for surgery, a comprehensive assessment of the domains of frailty contributing to the patient's frailty should be performed to propose appropriate prehabilitation and rehabilitation programmes. Further studies should confirm the benefits of these interventions in thoracic surgery.

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Conflicts of interest

There are no conflicts of interest.

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- ▪ of special interest
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