CHAPTER – 7

Frailty and perioperative outcomes

Background:

Improved healthcare facilities have increased the life expectancy of humans and thus an increase in the number of elderly population. However, this growing number of elderly patients has also witnessed a hike in patients undergoing surgery due to various compromising medical comorbidities.This older patient population has an increased risk ofpostoperative complications compared to younger patients. Various frailty tests have been demonstrated to predict whether a patient's health may deteriorate as a result of medical or surgical stress. Despite this, the numerous definitions and scoring systems for frailty have made it difficult for healthcare providers to implement a uniform assessment pattern into clinical therapy.

In all sickness contexts, frail people have poor prognosisand are unlikely to cope well with a severe stressor like surgery when compared to healthy older patients. It has long been established that advanced age is a risk factor for poor surgical results. [1, 2] The fact that frailty is linked to both age and reduction in physiological reserve has led to the belief that frailty can be assessed before surgery in order to anticipate the probability of adverse outcomes. Frailty is a systemic measure of general health and physiological status, whereas current preoperative examinations tend to focus on end-organ dysfunction. [1] This could make assessing frailty a helpful tool for predicting mortality and functional outcomes after surgery.[3]

Prevalence of frailty before surgery:

For a variety of reasons, risk factors may be considered significant for prognostication and care planning. [4] Typically, a risk factor is considered to be of significant importance if

1) There is presence of a risk factor,

2) It is substantially predictive of outcome (e.g., >50% increase in relative risk), and/or

3) It is potentially modifiable.

The projected prevalence of frailty in surgical patients is discussed below, followed by sections on the strength of the link and probable modifiability of frailty.

Frailty in surgical patients: [5]

According to predictions, one-fifth of surgical procedures will be performed on patients over the age of 75 by 2030.[6] The surgical population is ageing due to the nature of surgical pathology, which is often degenerative (eg, osteoarthritis), neoplastic (eg, bladder cancer), or metabolic (eg, vascular illness). While frailty is linked to ageing, it is not just seen in the elderly, nor are all elderly persons feeble. The frequency of frailty has been shown in numerous research, with rates varying between surgical specialties. In elective orthopaedic surgery, 23% of patients were fragile, compared to 53% in emergency hip fracture surgery. [7, 8] When it comes to cancer surgery, studies show that 25% of patients receiving elective cystectomy are frail, with a similar high prevalence rate of frailty in emergency general surgical patients (39%), where the underlying pathology is frequently neoplastic. [9, 10, 11]

Identifying frailty in the perioperative setting:

Because frailty is frequent and has important perioperative implications, but it is not specific to or universal in older persons, it is critical to correctly identify frailty in the

context of other overlapping illnesses and syndromes. While comprehensive geriatric assessment (CGA) and optimization are considered as the gold standard methods for screening, diagnosing, and managing frailty, it is time consuming and requires specialised knowledge. As a result, a number of frailty instruments have been developed that can be used in a variety of clinical settings and delivered by non-specialists. Few such examples of these tools are: [12-17]

- Single surrogate markers of frailty (e.g., gait velocity),
- Simple infographic tools (e/g., clinical frailty scale (CFS)),
- Scales or scores such as Edmonton frailty scale
- Electronic frailty index,
- Biomarkers like interleukin 6,
- Disease specific scores such as comprehensive assessment of frailty,
- surgery specific scores (e.g., comprehensive assessment of frailty)

Furthermore, the use of cross-sectional imaging for the opportunistic examination of associated diseases, such as sarcopenia, has grown in prominence, with claims that it could serve as a surrogate marker for frailty.[18] Surrogate markers' brevity and ease of use are appealing, but their use risks losing authenticity to the multidomain nature of frailty definition and models.

Accurately quantifying frailty in the perioperative context is difficult, especially in case of emergency surgeries. It can be difficult to separate acute pathology from underlying frailty status, and it may require a detailed history and adequate primary care. Because there is no consensus on which frailty instrument should be used to screen for or diagnose frailty in the perioperative context, many doctors

have chosen CFS as a pragmatic approach.[19]

In both elective and emergency surgical settings, CFS can be employed even by non-specialists. The assessments made using this tool has been linked to 30- and 90-day mortality, risk of complications, length of stay in the critical care unit, and overall hospital stay after emergency laparotomy. Even patients who are categorised as vulnerable or pre-frail rather than frail have outcomes that indicate they are at high risk while utilising CFS. The National Emergency Laparotomy Audit has now included the CFS. [20]

Table 1: Frailty Instrument Composition Commonly Studied in the Perioperative Setting[4]

Frailty Index Variable	Fried Phenotype	Clinical Frailty Scale	Edmonton Frail Scale
Anemia Albumin Sodium Low body mass index Obstructive sleep apnea Cerebrovascular disease Cancer Diabetes mellitus Cognitive impairment	Weight loss: >10 lbs unintentionally in the previous year Grip strength: lowest 20% (by sex and body mass index) Exhaustion: self-report	1. Very fit: People who are robust, very active, and motivated. These people commonly exercise regularly. They are among the fittest of their age 2. Well: People who have no active disease symptoms but are less fit than category 1. Often, they exercise or are very active occasionally 3. Managing well: People whose medical problems are well controlled, but they are rarely active beyond walking.	Cognition: Clock draw test General health: Number of hospital admissions in the past year Functional independence: Number of activities of daily living requiring assistance
Alcohol abuse Falls history Heart failure Insulin use Liver disease Coronary artery disease	Slowness: 15-foot walking speed (by sex and height) Low activity: Kilocalories per week (males <383, females <270)	4. Vulnerable: While not dependent on others for daily help, often symptoms limit activities. A common complaint is being "slowed up," and/or being tired during the day 5. Mildly frail: These people often have more evident slowing and need help in high order IADLs. Typically, this impairs shopping and walking outside alone, meal preparation, and housework	Social support: Availability of reliable help Medication use: Presence of polypharmacy
Peptic ulcer disease Peripheral vascular disease Renal disease Rheumatic disease Smoker Visual impairment Hearing impairment		6. Moderately frail: People need help with all outside activities and with keeping house. Inside, they often have problems with stairs and need help with bathing and might need minimal help with dressing 7. Severely frail: Completely dependent for all personal care from whatever cause (physical or cognitive). Even so, they seem stable and not at high risk of dying (within ~6 mo) 9. Terminally ill: Approaching the end of life. This category applies to people with a life expectancy <6 mo, who are not evidently frail	Medication use: Forgetting to take prescribed medications Nutrition: Unintentional weight loss Mood: Feelings of sadness or depression Continence: Presence of urinary incontinence Functional performance: Timed up and go test
Assistance needed dressing Assistance needed meals Assistance needed shopping Weight loss Multimorbidity Depression Possibly inappropriate medication Polypharmacy			

AD8-Alzheimer's Disease in 8 questions questionnaire[17]; PHQ-2-Patient Health Questionnaire[16]; CAGE[18]; The Frailty Index is calculated as a number from 0 to 1 by dividing the number of deficits present by the number of deficits measured (ie, 30) as recommended by Searle et al.[20] One point is assigned for the presence of each feature of the phenotype, resulting in a score from 0 to 5. Following assessment, an individual is assigned a score on the scale. Zero to 2 points are assigned to each question, creating a score that ranges from 0 to 17.

Abbreviations: CAGE, cut down, annoyed, guilty, eye-opener; IADL, instrumental activities of daily living; PHQ-2, 2 question Personal Health Questionnaire.

Adopted from: McIsaac DI, MacDonald DB, Aucoin SD. Frailty for perioperative clinicians: a narrative review. Anesthesia & Analgesia. 2019; 130(6): 1450-60.

The impact of frailty on perioperative outcomes:

Even in healthy people, surgery causes significant physiologic stress. As a result, it's not surprising that the existence of frailty prior to surgery is closely linked to a higher risk of negative outcomes and a higher use of resources. Frailty is consistently associated with at least a 2-fold increase in the risk of major morbidity, mortality, and readmissions, according to an ever-growing epidemiologic literature that now includes large studies using administrative data, prospective registries, primary prospective observational studies, and systematic reviews. [21, 22, 23]

Furthermore, given the growing emphasis on patient-reported outcomes and the importance of functional measures for older surgical patients, it's critical to remember that frailty doubles the risk of new patient-reported disability, lowers quality of life, and fivefold increases the risk of non-home discharge among older people who previously lived in the community. Furthermore, duration of stay, expenses, and other indicators of resource consumption are consistently greater for older adults with frailty, ranging from 15% to 60% in various studies. [24, 25]

Whilst relative increases in risk, as well as risk estimates attuned for imperative confounders such as type of surgery, relative importance, urgency and indication of the surgery, are useful to clinicians in communicating expected outcomes to patients and their families, absolute risk estimates are particularly easier to understand and more evocative when delivering prognostic information prior to surgery. [26, 27] Fortunately, even for weak patients, the absolute risk of death in the month following surgery

is modest (usually 5% after major, elective non-cardiac surgery). [28] However, 1-year mortality rates after major elective cancer surgery are frequently high, exceeding 40% (which presumably reflects the interaction of surgery, frailty, and the underlying oncologic process). [29] A similar dose-response connection exists, with higher frailty scores (independent of instrument) associated with a higher chance of mortality.

Frailty is associated with a high rate of complications, which can reach 50%. [30] As a result, frailty was identified as the highest risk factor for the development of postoperative morbidity in older patients in a recent comprehensive study. Delirium is particularly prevalent in elderly surgical patients, with rates ranging from 10% to 50% depending on the type and urgency of the procedure. [31] Frailty is a high risk factor for developing delirium following major surgery (odds ratio = 4.1), and in a recent comprehensive review, it was only surpassed by a history of delirium in terms of its intensity of connection with delirium incidence.[32, 33]

While survival is important to older individuals, expected function and quality of life outcomes may be even more important in the event of an acute illness. [34] Unfortunately, perioperative frailty studies seldom investigate these patient-centered and patient-reported outcomes, and even fewer give clinically useful information. Evidence suggests that frailty is a powerful predictor of poor functional outcomes when these data are available. It was discovered that 3 months following major elective non-cardiac surgery, 1 in 5 older persons with frailty were having a new or markedly increased handicap in a multicenter cohort research with over 700 participants. It was also found that that 15%–50% of fragile elderly adults who lived independently in the community prior to surgery were unable to return home following elective treatments. [35]

In the 90 days following major, elective non-cardiac surgery, 29% of patients with frailty die, are institutionalised, or return home with a new handicap, according to a prospective research. These findings are consistent with the cardiac literature, which shows that older adults with frailty had a 20% higher absolute risk of dying or having a lower quality of life a year following surgery (when compared to people without frailty). [36]

Finally, while most research examining the link between frailty and poor surgical outcomes focus on major inpatient surgery, it's also crucial to note that frailty predicts poor outcomes even in low-risk procedures. These procedures include urgent and emergent appendectomy and cholecystectomy, where frailty has a greater influence on mortality than laparotomy or bowel resection. Frailty is also linked to a higher than 3-fold increase in the risk of complications following ambulatory hernia, breast, thyroid, or parathyroid surgery. [37]

Frailty management in the perioperative setting:

The intensity of the presentation, whether elective or emergency, influences how frailty is identified and managed in the perioperative setting. Early screening and identification of frailty is recommended in the elective situation. Frailty assessment at the outset of the process has several advantages such as: [5]

- Informing risk assessment
- Collaborative decision making
- Potential syndrome modification well before surgery.

An accurate diagnosis of frailty, together with understanding of the effects of frailty on morbidity and mortality during surgery, can lead to an informed

discussion of the potential benefits, risks, alternatives to surgery, and choices if nothing is done. In this case, some patients and healthcare professionals may decide not to pursue surgical treatment, and instead opting for conservative methods. In other circumstances, individuals who appear to be at high risk may engage with healthcare teams to modify their frailty syndrome, so changing their perioperative risk profile, allowing surgery to take place, and improving their postoperative results.

Furthermore, there are typically multiple surgical options available. For example, a patient with rectal cancer may have the option of undergoing local resection, radical resection with a stoma, or radical resection with bowel continuity restoration. Oncological benefits, perioperative risks, and quality-of-life outcomes are all varied. Frailty screening, preoperative optimization, multidisciplinary shared decision making, and targeted perioperative therapies mean that some fragile patients who would normally be regarded too high-risk for surgery can nonetheless benefit.

The same ideas apply in an emergency room, but the focus changes away from altering the patient's risk profile and toward customising the care pathway. High-risk frail patients undergoing emergency laparotomies, for example, will be treated by consultant level clinicians with planned level 3 care. The observation that the patient is weak with known unfavourable outcomes may also drive early discussions with patients and their families about care limits, avoiding the futility of surgery in certain cases and the futility of escalating therapies following difficulties in others. [38]

While frailty screening has gained popularity in perioperative pathways, interpreting the outcomes of frailty tools necessitates a qualified team. This necessitates a collaborative approach involving surgeons, anaesthesiologists, and those trained in the management

of frailty and multimorbidity, in keeping with the perioperative agenda. Such an approach should first focus on individual patient-level potential modifiers of the frailty syndrome, and then change the perioperative pathway to obtain optimal clinician-reported, patient-reported, and process-related outcomes. [5]

Comprehensive geriatric assessment (CGA) and optimization:

In a variety of therapeutic contexts, CGA and optimization is a well-established strategy for evaluating and managing older people. It entails a multidomain, interdisciplinary evaluation with the goal of describing recognised disease as well as previously undiscovered illnesses, as well as assessing functional, psychological, and social status. For all issues highlighted, this multidomain assessment encourages the design of a short- and long-term inquiry and management strategy (Table 2). Addressing a multisystem condition with a multidomain intervention has face validity and is increasingly supported by the perioperative literature in the context of frailty in the perioperative situation. [39, 40] These studies show that using preoperative CGA can improve postoperative outcomes in older surgical populations such as hip fracture, orthopaedic elective surgery, elective vascular surgery, and colorectal surgery. However, none of these trials particularly looked at the effect of CGA on the frailty syndrome during the perioperative period.[5]

Conclusion:

The surgical population is growing older, and fragility is becoming more common. New approaches to perioperative care are required now that it is recognised that this syndrome has a negative impact on postoperative outcome. Future research and implementation science should concentrate

on three areas. First and foremost, rather than inventing new frailty tests, reaching consensus on which frailty tool to employ for screening and diagnosis in emergency and elective surgical settings is critical. Second, the case for frailty as a predictor of poor postoperative outcomes has been made and no further research is required. In the perioperative environment, research should focus on both multicomponent therapies and single pharmacological modifiers of the frailty syndrome. Third, the outcomes of this research should be transferred into ordinary clinical care by creating collaborative perioperative pathways and evaluating them using implementation of scientific techniques.

Table 2: A multidomain approach to modifying the frailty syndrome in the

Domain	Issue	History/examination	Screening or diagnostic tools	Investigation	Optimisation
Medical	Postural hypotension with visual hallucinations	History of falls. Reports of slowing, falls, tremor, rigidity etc. Proactive assessment for non-motor symptoms if Parkinson's disease likely. Physical examination.	Unified Parkinson's disease rating scale.	DaTSCAN. Cerebral imaging with computed tomography or magnetic resonance imaging (does not necessarily need to be preoperative).	In established cases, proactive plan around medications including timings and alternative drugs or routes of administration when nil by mouth. Pre-emptive advice to ward teams about non-motor complications likely at time of surgery (constipation, delirium or falls). In newly identified cases, consider starting medications preoperatively versus outpatient follow-up based on symptoms and urgency of surgery.
	Exertional dyspnoea and daily cough	Smoking history but no prior known chronic lung disease. History of symptoms of chronic obstructive pulmonary disease.	Medical research council breathlessness scale. 6-minute walk test.	Spirometry. CXR.	Smoking cessation advice. Flu vaccination. Inhaled therapy according to NICE / British Thoracic Society guidelines. Pulmonary rehabilitation according to local guidelines.
Geriatric syndromes	Falls	Previous history. History of 'near misses', suggestive underlying causes and injuries sustained. Bone health screening.	Gait speed. Timed up and go. Fracture risk assessment tool.	Bone profile and vitamin D. Suggestion to GP about DEXA and follow-up.	Medical management of bone health (eg bisphosphate and calcium-vitamin D supplementation). Medical falls review. Strength and balance training.
	Cognitive impairment	Self-reported history of cognitive issues. Collateral history from relative/carer.	4AT. MoCA.	Cerebral imaging or recommendation to GP for this.	Delirium risk assessment and optimisation eg cessation of anticholinergic medications, ensuring normal electrolytes and treating constipation. Signposting to standardised postoperative management of delirium. Communication with patient and relatives. Long-term vascular risk factor management. Referral to memory services for long-term follow-up.
Psychological	Anxiety and depression	Self-reported history. Collateral from family/carer. Symptoms.	Hospital anxiety and depression score.	Thyroid function tests. Exclusion of cognitive impairment.	Referral for psychological support (talking services). Consider pharmacological treatment. Explanation or counselling regarding surgery if this is prominent trigger for symptoms.

Table 2: A multidomain approach to modifying the frailty syndrome in the perioperative setting (Contiues)

Domain	Issue	History/examination	Screening or diagnostic tools	Investigation	Optimisation
Functional and social	Functional dependency	Self-reported concerns. Collateral from family/ carer. Assessment of underlying cause.	Barthel. Nottingham extended activities of daily living.	Physical examination and investigation of pathology causing disability eg proximal myopathy secondary to vitamin D deficiency. Prescribe analgesia for osteoarthritis.	Preoperative physiotherapy. Occupational therapy intervention (eg home adaptations). Social worker intervention to proactively identify barriers to discharge. Proactive communication regarding anticipated length of stay and access to rehabilitation or care at discharge.
	Non-adherence to prescribed medications	Self or family reported concerns. Clinical evidence of non-adherence. Assessment of understanding of medications.	STOPP/START.	Assessment of cognition and understanding of medications.	Liaising with community pharmacist to assist with dosette box and with care services or telecare to prompt medication.

4AT = four 'A's test; CXR = chest X-ray; DaTscan = dopamine transporter single photon emission computed tomography; DEXA = dual-energy X-ray absorptiometry; GP = general practitioner; MoCA = Montreal cognitive assessment; NICE = National Institute for Health and Care Excellence; START = screening tool to alert doctors to right treatments; STOPP = screening tool of older people's potentially inappropriate prescriptions.

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