

# Frailty

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## Abstract

Frailty is a geriatric syndrome that is accompanied by a greater degree of influence by varied stressors. It increases the speed of deterioration, morbidity and mortality. Frailty is generated by numerous factors that co-exist to generate a combined effect. Various instruments have been used to screen frailty in both the office setting and in the community. History taking and examination provide a time-tested way of evaluating the causes. A comprehensive geriatric assessment with a multidisciplinary approach has been shown to facilitate this. Individualised physical and nutritional therapy with correction of causative conditions are important management strategies.

**Key words:** frailty, ageing, geriatrics, elderly care medicine

## Introduction

Frailty is a syndrome associated with older adults that flags red, signifying unfavourable health outcomes.<sup>1,2,3</sup> Although frailty does not have a set definition, it is a syndrome that influences the decline in health, vitality, physical abilities, and longevity of individuals by increasing their vulnerability to stressors. Early detection of frailty and addressing the causative processes will improve the outcome for patients. Frailty syndrome is directly associated with an overall increased risk of falls, disability, hospitalization, institutionalization and death. Studies have demonstrated that being frail or pre-frail carries up to 2.5 times the worsening of all of these consequences along with limitations in mobility and activities of daily living. It is noteworthy that women are frequently diagnosed as frail while frail men have a higher degree of mortality.<sup>4,5</sup>

## Key points

1. Frailty is a common geriatric syndrome that increases vulnerability to stressors, accelerating decline, deleterious effects, and even death.
2. Frailty is caused by multiple factors occurring in concert rather than singularly.
3. Clinicians need to actively screen older adults for frailty. Tools such as Fried Frailty Phenotype and Clinical Frailty Scale are useful.
4. Focused history-taking, thorough examination, conscientious use of investigations, and a comprehensive geriatric assessment are advocated.
5. Frailty is addressed by physical therapy, nutrition, and correction of medical conditions in an individualised and goal-directed manner.

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**Pathophysiology and risk factors**

The normal ageing process results in the accumulation of molecular and cellular defects that influences the decline of physiological and psychological reserves (Figure 1). These reserves are important resilience agents to maintain homeostasis and pathological changes in ageing. Cumulative effects rather than singular organ dysfunction lead to a decline in multiple systems.<sup>6</sup> Mitochondrial and protein processing, accumulation of free radicals and increased tendency to apoptosis contribute to phenotypic changes.<sup>7</sup> Important age-related changes such as hormonal dysfunction, sarcopenia and immune dysfunction are notably encountered. Numerous epidemiological studies have shown that altered stress response and energy response systems, as well as endocrine and hormonal changes that affect skeletal muscle, are all strongly associated with physical frailty. These changes are characterized by dysregulated immune responses characterized by chronic inflammatory pathway activation.<sup>8</sup>

The prevalence of frailty varies in the literature from 5-15%. It is multifactorial and associated with advanced age, females, unhealthy lifestyles, and low economic status. Furthermore, frailty increases the number of health deficits and multimorbidity. Studies show that patients with diabetes, respiratory disease, strokes, dementia, connective tissue disease and osteoarthritis are known to have higher rates. Polypharmacy is another noteworthy associated factor for frailty while it is a risk factor for polypharmacy as well.

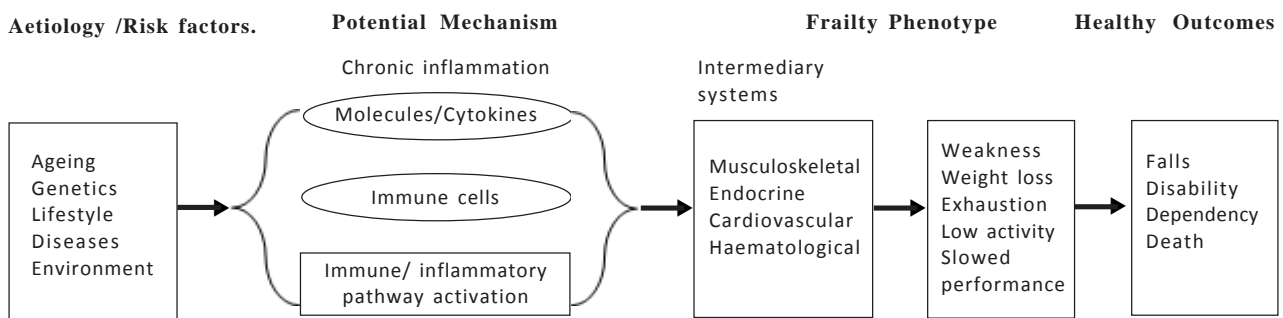
Those with frailty demonstrate many physical signs or symptoms (traits). However, there are no pathognomonic or hallmark features. At the onset, patients would have generalized weakness and would report exhaustion. Thereafter symptoms of slowing down, poor balance, reduced physical activity and strength and challenges in cognition will manifest. Extreme stages will manifest with weight loss. There exists a dynamicity of frailty with transitioning between the spectrum of robustness, pre-frailty and frailty in

any direction dependent on the resilience of the individual and therapeutic interventions. However, those who are pre-frail will be at a higher advantage in improving their state than their frail counterparts. Cognitive challenges and malignancy limit resilience.<sup>4,5</sup>

**Screening and evaluation**

There is no consensus on routine screening of frailty. However, clinicians should actively identify their patients at risk and those who are already frail. This is efficiently done with the aid of a comprehensive geriatric assessment (CGA). Interprofessional assessment of an individual’s physical, psychological, social and environmental factors on a systematic and multidimensional level is carried out by a CGA. These include medical conditions, functional ability, fall risk, polypharmacy, special senses, and higher functions. Threats to any of these domains require further assessment for frailty. All persons over 70 years of age with chronic disease or loss of weight more than 5% annually should be screened using tools. There is sparse data that screening unselected older populations for frailty by age will be of benefit.

Frailty should not be described by a single symptom or limited examination. No battery of laboratory or radiological tests can establish the presence of frailty. The evaluation should be based on a conscientious medical history and a thorough physical examination. Frailty tools are also useful in this process. The Fried Frailty Phenotype (FFP) and the Clinical Frailty Scale (CS) are useful ones which are based on history and examination. The FFP employs defined variables of unintentional weight loss, weakness, slowness, poor endurance and low physical activities. The presence of three or more positive indicators points towards frailty while one or two elements reflect pre-frailty. Conceptually it describes frailty as physical or phenotypic nature (Table 1).<sup>1-9</sup> The Rockwood Frailty Index (RFI) employs a greater amount of health indices in those suspected of frailty. The level of dependence, medical conditions as well as the likelihood of survival are to be considered (Figure 2).<sup>10</sup> Thus, it is based on deficit accumulation.



**Figure 1. Pathophysiology of frailty and frailty outcomes.**

**Table 1. Fried frailty phenotype**

<i>Frailty phenotype variables</i>	<i>Diagnostic criteria</i>
Weight loss	Unintentional loss of > 4.5 kg in the past 12 months and/or BMI of <18.5 kg/m <sup>2</sup>
Weakness	Hand grip strength (Jamar Hand Dynamometer) for sex and BMI. A measurement < 25 kg is considered weak
Exhaustion	A little or none of the time responses for the Short Form 12 item Survey (SF-12) question, “how much of the time during the past 4 weeks did you have a lot of energy?”
Slowness	The average of 2 readings in 6m fast gait speed test and a gait speed <0.65 m/s; the lowest quintile values stratified for gender and height considered as ‘slow’
Low physical activity	A score of <73 on the Physical Activity Score for Elderly (PASE) Questionnaire

There are some conditions that may mislead detecting frailty in those with weight loss, weakness, and impaired functional abilities. These include depression, malignancy, rheumatological disease (e.g. polymyalgia rheumatica, vasculitis), endocrinological disease (thyroid dysfunction, diabetes), cardiovascular disease, renal disease, haematological disease (myelodysplasia, anaemia), nutritional and neurological disease. Initial investigations should include a full blood count, liver and renal functions and thyroid stimulating hormone. History and physical examination-based workup for conditions should be done thereafter.

**Management**

Setting of targets in collaboration with the patient, his family/caretakers and fellow healthcare team members is an important task to formulate priorities after looking at the benefits and risks of interventions. This decision of the ‘aggressiveness’ of care is based on a CGA. When an individual becomes older, the degree of frailty progresses while developing severe diseases and disability. The medical care for the needs of the vulnerable should be based on values and goals in an individualized manner for both prefrail and frail.<sup>11</sup> In those with moderate to severe frailty, an aggressive approach for non-life-threatening conditions may conflict with complications. Furthermore, redundant procedures as well as hospitalization will be accompanied by further burden and reduced quality of life.<sup>12</sup>

Physical training has demonstrated improvement in mobility and gait, reduction of falls, enhancement of activities of daily living and generalized well-being. These include yoga, tai chi or any other form of exercise.<sup>13</sup> Functionally challenged patients although may never reach minimum recommended activity levels, have been shown to improve their progression of limitation by even minor activities and endurance.

Systemic occupational therapy has also shown promising results.<sup>14</sup>

**Table 2. Frailty strength training prescription**

- Nonconsecutive 2-3 days/week
- Moderate intensity (5-6 on a 10-point scale)
- Target major muscle groups – 8-10 exercises/ session
- 8-15 repetitions per exercise
- Gradual increase of weight and repetitions on tolerability
- Strength training exercises
  - Sit to stand, heel and toe lifts, lunges, front and side arm raises, wall push-ups

**Table 3. Frailty balance training prescription**

- Two or more hours/week supervised
- Initially with less challenging positions to progress to advanced difficulty
- Maintain each exercise for 5-10 seconds with at least one repetition/exercise
- Flat surface exercise (initially)
  - Side-by-side stance, semi-tandem stance, tandem stance, single limb stance, heel stance and toes stance
- Uneven surface exercises
  - Step up and down without hand support, forward and backward walking, sidewise walking
- Complex task
  - Navigate obstacles/ pick up objects/ carry objects while walking, head turns in different directions, conversations/ simple mathematical calculation

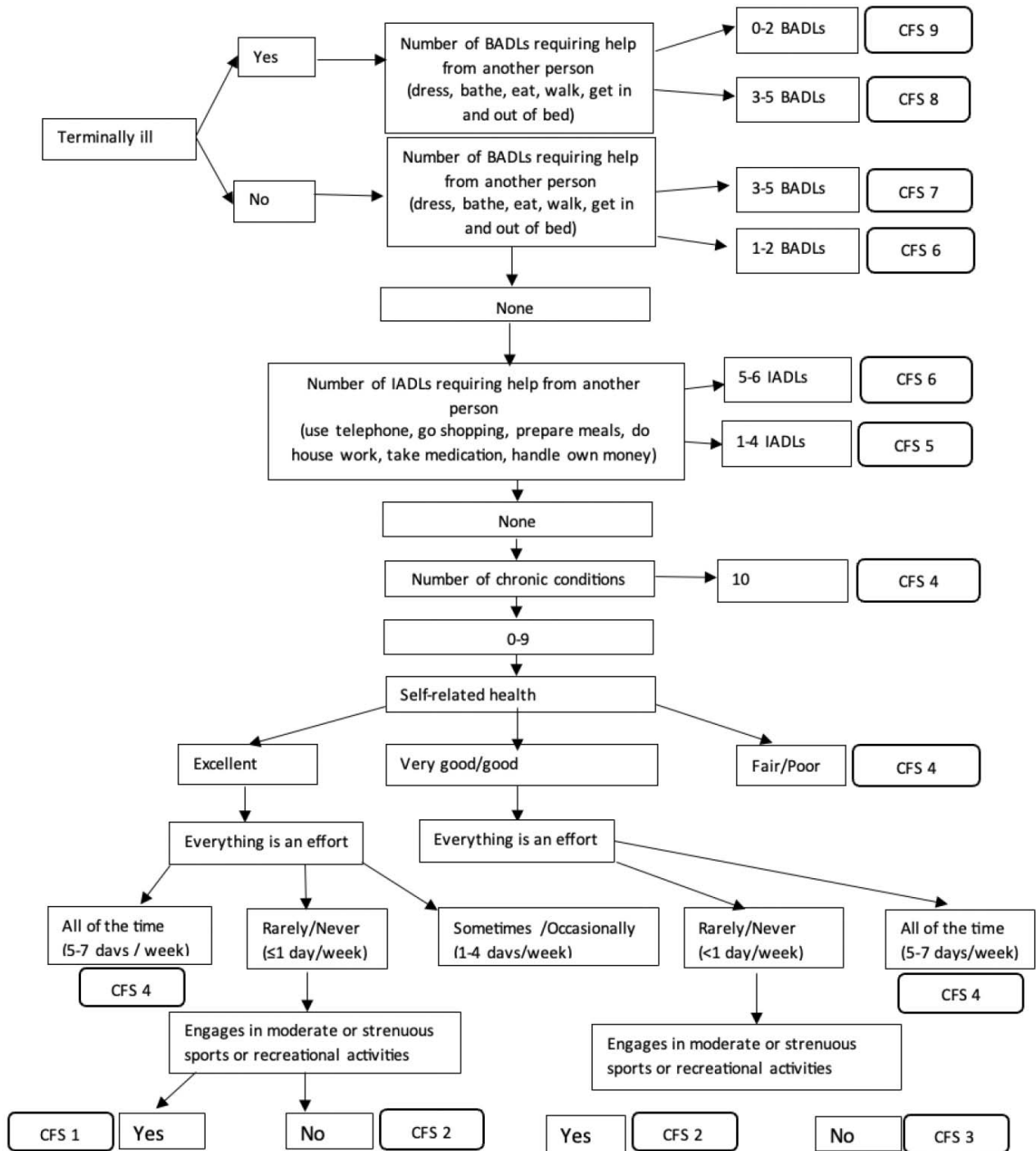


Figure 2. The Clinical Frailty Score Algorithm.

BADL – Basic Activities of Daily Living, CFS – Clinical Frailty Scale, IADL – Instrumental Activities of Daily Living










CFS 1 Very Fit		People who are robust, active, energetic and motivated. These people commonly exercise regularly. They are among the fittest for their age.
CFS 2 Well		People who have no active disease symptoms but are less fit than Category 1. Often, they exercise or are very active occasionally, e.g. seasonally
CFS 3 Managing Well		People whose medical problems are well controlled, but are not regularly active beyond routine walking.
CFS 4 Vulnerable		While not dependent on others for daily help, often symptoms limit activities. Common complaint is being 'slowed up', and/or being tired during the day.
CFS 5 Mildly Frail		These people often have more evident slowing, and need help in high order IADLs (finance, transportation, heavy housework, medications). Typically, mild frailty progressively impairs shopping and walking outside alone, meal preparation and house work.
CFS 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 assistance (cuing, standby) with dressing.
CFS 7 Severely Frail		Completely dependent for personal care, form whatever cause (physical or cognitive). Even so, they seem stable and not at high risk of dying (within ~ 6 months).
CFS 8 Very Severely Frail -		Completely dependent approaching the end of life. Typically they could not recover even from a minor illness.
CFS 9 Terminally Ill		Approaching the end of life. This category applies to people with a life expectancy <6 months, who are not otherwise evidently frail.

Figure 3. The Spectrum of Clinical Frailty Scale (CFS).



Weight loss is a key area that should be attended to. Factors such as adverse effects of medication, psychiatric conditions (e.g. depression), masticatory difficulties (e.g. edentulation, dental and gingival disease), dysgeusia, dyssomnia, and dysphagia should be addressed. Furthermore, dependency on caretakers at meal times and irrational dietary restrictions should be addressed. Nutritional supplementation in frail malnourished older adults is of limited use. However, oral supplementations between main meals as low volume high caloric snacks are helpful.<sup>15</sup> Data from metaanalysis have provided evidence that supplementation of vitamin D will improve balance and muscle strength and reduce falls in those who are deficient. An intake of 800-1000 units is advocated.<sup>16</sup>

There is limited data on the success of anti-inflammatory mediators and endocrinological intervention. These include replacement of growth hormone, dehydroepiandrosterone and testosterone. At present due to inadequate data, no pharmacological agent specifically to address frailty can be recommended. Another benefit of frailty detection is to screen those who have unfavourable health outcomes. Patients being contemplated for chemotherapy or major surgery can be assessed for the appropriateness of those interventions based on mortality and quality of life. Patients with progressive multiple diseases with advanced frailty and those who have failure to thrive will require palliative care approval with the identification of set goals.<sup>17</sup>

### Author declarations

### Competing interests

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### Authors' contribution

FHDSS, RMRHM and UR contributed in compiling this article.

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