Frailty

Frailty is often the final stage of life and needs to be recognised and managed appropriately.

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Clinicians recognise frailty as a state of 'weakness' where there is an increased vulnerability to adverse outcomes and where minor physiological stressors can lead to progressive deterioration. In the frail elderly, each insult results in functional decline which does not recover to prior levels (Fig.1).

Frailty may be primary or secondary to medical conditions and the challenge in assessing and managing frail persons is to understand the complex relationships between frailty, disability and co-morbidity; and in so doing, to improve function, overcome environmental and morbidity challenges and keep elderly people in their communities by preventing institutionalisation. There are many definitions of frailty, of which that described by Freid *et al*. from data collected in the Women's Health and Aging Studies is possibly the most useful clinically (Fig. 2).[1] Frailty is associated with cognitive impairment, depression, social isolation, incontinence, osteoporosis, osteoarthritis and atherosclerosis and multiple contributing factors such as malnutrition, reduced physical activity and medication side-effects, which interact to result in falls, hospital admissions, functional decline and institutionalisation and perpetuate the spiral of increasing frailty.

According to Freid *et al*. frailty is at least 3 of the following:

- loss of weight (> 5% body weight or 4.5 kg over 1 year)
- slow walking speed (>7 seconds over 5 m)
- exhaustion CESD-D depression scale
- reduced physical activity (<383 kcal/week)
- Reduced grip strength.

The prevalence of frailty increases with age from 7% in those aged 65 years to over 20% in those over 80 years of age.[2] The loss of reserve capacity, as well as unstable homeostasis, and then function in multiple physiological systems such as muscle (sarcopaenia), neurological (increased postural sway and impaired postural reflexes), cardiovascular (postural hypotension) and water and electrolyte balance, lead to a state of 'weakness', which results in an increased risk of falls, incontinence, delirium, hospitalisation, institutionalisation and death.

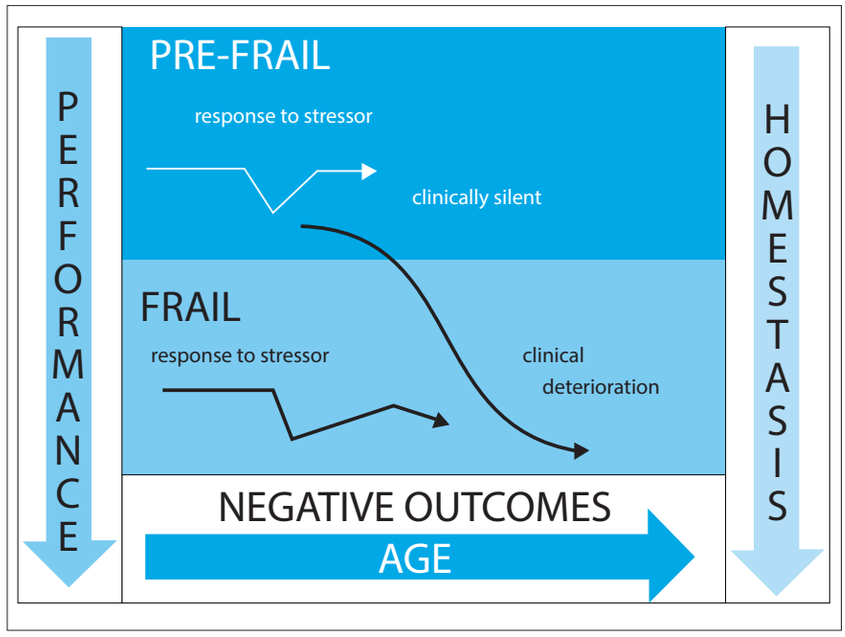

Fig. 1. The progression of frailty.

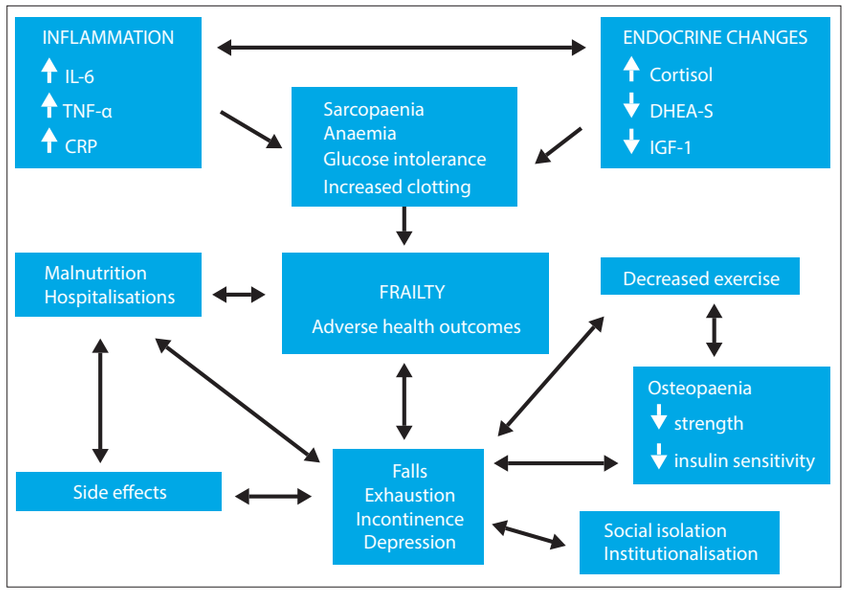

Fig. 2. Age-associated changes in physiology and their consequences.

Physiological changes in the very old, which include hormonal, hypothalamic-pituitary

axis and inflammatory changes, predispose them to progressive frailty. Oestrogen in women and testosterone, to a lesser extent, in men decline with age. Oestrogen suppresses IL-6 which, together with C-reactive protein and TNFα are raised in the frail elderly and contribute to activation of the clotting cascade with increased factor VII, fibrinogen and D-dimers leading to adverse vascular outcomes.[3] Endocrine changes also contribute to the accelerated loss of muscle mass seen in frailty. Lower levels of growth hormone, dehydroepiandrosterone sulphate, insulin-like growth factor-1 (IGF-1) and increased cortisol are seen.[4] These age-associated changes in physiology lead to primary frailty and increasing vulnerability to physical and functional decline as a result of minor physical or psychosocial stressors (Fig. 2).

Assessing and managing frailty requires a multidisciplinary approach involving medical, rehabilitation, social and dietary interventions. The task of the physician is:

1. to prevent frailty in community-dwelling elderly
2. to intervene after an acute insult to restore function
3. to assess and manage as soon as frailty is recognised
4. to optimise function and quality of life with increasing frailty.

Preventing frailty in the community-dwelling elderly

Medical care of functional community-dwelling older persons should focus on optimising management of vascular risk factors and chronic diseases while critically reviewing medication to prevent iatrogenesis from side-effects, which increase with the number of prescribed and over-the-counter medications taken. Side-effects such as postural hypotension from anti-hypertensives, dizziness, myopathy from statins and poor appetite should be screened for. Drugs which increase the risk of falls, such as psychotropics, especially benzodiazepines and those with anticholinergic side-effects, should be avoided. Assessment for emerging physical impairments, such as loss of hearing and vision, postural instability (get-up-and-go test) and incontinence, should form part of routine follow-up. Atrophic vaginitis contributes to urinary urgency and management with topical oestrogen is effective. In order to maintain an active lifestyle, management of osteoporosis and pain from osteoarthritis should be optimised.

Lifestyle advice should include exercise and dietary advice. Exercise should include both aerobic exercise and activities that maintain strength and postural control. Practical advice is brisk walking at least 30 minutes 4 times a week and an exercise where static balance and strength is improved such as calinetics, Thai Chi or Rekei. Increasing energy expenditure also improves appetite. The diet should be adequate in protein, vitamins and minerals and overly restrictive diets should be avoided. Care should be taken to avoid medication which suppresses appetite, saliva or taste, and good dental care prevents oral problems.

Preventing frailty
- optimise management of chronic diseases
- control vascular risk factors
- review medications for side-effects/interactions
- screen for physical impairments
- exercise
- adequate diet.

Intervene after an acute insult to restore function

When an acute illness or insult such as a fall, infection or surgery occurs, physical inactivity and under-nutrition combined with a catabolic state can result in rapid deconditioning and loss of muscle mass and strength. Poor nutrition is common in hospitalised patients and supplements of protein and calories (such as shakes) can prevent this. Patients should be mobilised as soon as possible and exercised in bed until then. Physiotherapy should be initiated as soon as the patient is admitted and rehabilitation continued until baseline function has been achieved. An occupational therapy assessment should be performed before discharge. Care needs to be taken to prevent factors which contribute to delirium, such as dehydration, faecal impaction, uncontrolled pain and drugs. Functional incontinence is common and can be avoided by timed toileting and the use of bulking agents and suppositories to prevent constipation. Urinary catheters should be avoided if possible and, if not, clamping and releasing can prevent the onset of urge incontinence when the catheter is removed.[5]

Acute insult: Preventing functional decline
- protein supplements
- physiotherapy
- prevent delirium
- bladder and bowel management.

Assess and manage as soon as frailty is recognised

Once frailty has led to significant physical and functional decline it is difficult to reverse. For that reason persons at risk of becoming frail or where the onset of frailty is recognised should have a comprehensive geriatric assessment, which includes assessment and optimising management of chronic and degenerative diseases, looking for the onset of new diseases, which may be precipitating frailty, screening for cognitive decline and depression, nutritional assessment, screening for sensory impairments, gait and balance assessment, environmental assessment and assessing the adequacy of social support. [6]

Comprehensive geriatric assessment
- Medical
  - review and optimise chronic and degenerative disease
  - identify new diseases
  - vision and hearing
  - medication review for iatrogenesis
- Psychogeriatric
  - cognitive screen (MMSE, MOCHA)
  - depression screen
- Nutritional
  - dietary intake
  - oral problems
  - dysphagia
  - medication side-effects
- Mobility and balance
  - get-up-and-go
  - 5 m walk time
  - Romberg test
- Functional assessment
  - IADL and ADL scale
  - occupational therapy
- Social
  - social participation
  - physical and social support
  - financial resources.

The medical assessment

Systemic enquiry needs to be comprehensive, covering cognitive function, symptoms of depression, impairments in balance, falls or fear of falling, bladder and bowel function and sensory impairments in addition to the major physiological systems. The examination includes supine and erect blood pressure at 1 and 3 minutes to identify postural hypotension and an ECG and chest X-ray to identify cardiorespiratory pathologies contributing to 'exhaustion'. Thorough neurological and musculoskeletal examination, including foot problems, is indicated if abnormal gait or postural control if observed on the gait and balance assessment.

Gait and balance assessment

The value of assessing gait and balance is that not only can one identify and assess the severity of age-related impairment in postural control, but when there are pathologies, often multiple, a functional assessment can be conducted in a few minutes to identify which pathology is implicated. More detailed assessment can be conducted by a physiotherapist if required.

Get-up-and-go test

The person sits in a chair without arms where the knees are at 90° and gets up without using their arms, walks 3 m, turns 180° walks back and sits down. The test can be timed to achieve better predictive results and rated as follows:

- <10 seconds: freely mobile
- <20 seconds: mostly independent
- 20 - 30 seconds: variable mobility
- >30 seconds: impaired mobility.

Difficulty on sit-to-stand indicates hip and thigh weakness, which is common with sarcopaenia and deconditioning as well as myopathies. Swaying and using arms to steady indicates poor postural control. The gait of frailty and fear of falling is small steps, poor foot clearance, mildly wide base and forward flexed posture. One could also identify common pathologies affecting gait in the elderly such as Parkinson's, spastic gait from cervical myelopathies, hemiparetic gait or antalgic gait from lower extremity osteoarthritis, gout or foot problems. Milder impairments in postural control or fear of falling will result in the taking of more than 3 steps, shuffling or staggering when executing a 180° turn.

Romberg's test

The person stands with feet together and then closes the eyes for at least 15 seconds. The person then has to rely on vestibular function and proprioreceptive sensation alone to maintain balance. If staggering or taking a step occurs to prevent falling there is sensory or vestibular impairment. Look also for for backward and forward swaying (postural sway), which indicates slow postural reflexes and increased risk of falls.

Sternal nudge

While standing with the feet together and the eyes open the examiner gently nudges the patient on the sternum with 2 fingers, hard enough for the patient to offer some resistance to keep their posture. The examiner should keep their other hand behind the patient's back to prevent them from falling should they lose their balance. Excessive swaying, losing balance or taking a step backwards indicates poor postural control.

Impaired postural control, along with reduced core and proximal muscle strength, are the primary causes of gait instability and fear of falling which leads to the person adopting the gait and posture common in frailty – slightly wide-based, small steps and shuffling with poor heal strike. The person

Table 1. Comprehensive assessment and intervention

Medical	Identify which conditions will improve, remain stable and progress
Chronic diseases	Optimise management
New pathologies identified	Rationalise medication to improve iatrogenesis
Physiotherapy	Rehabilitate to improve endurance and strength and postural control
Occupational therapy	Rehabilitate to restore function Adapt environment to maximise function and independence
Social	Support socially, physical and financial where necessary
Nutrition	Ensure adequate protein, energy, vitamin and mineral intake

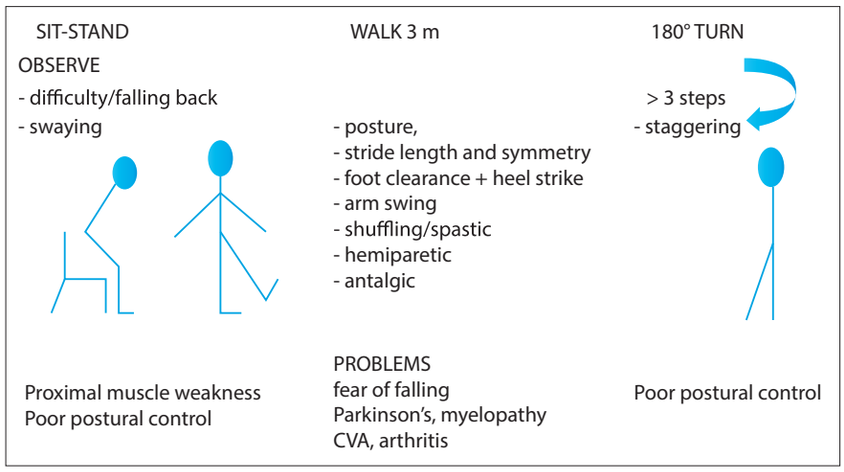

Fig. 3. The get-up-and-go test.

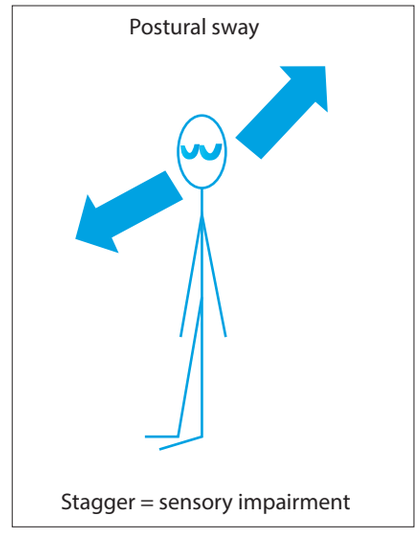

Fig. 4. The Romberg test.

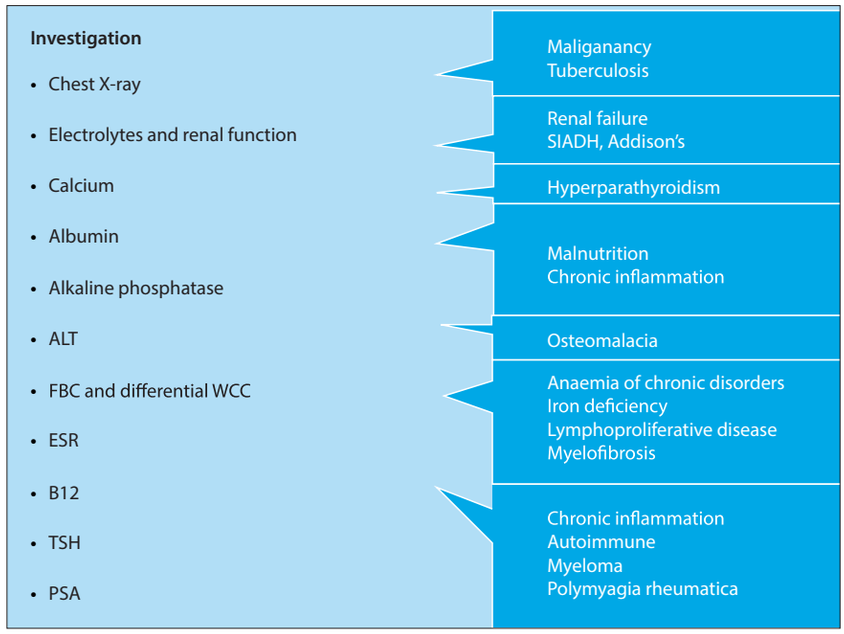

Fig. 5. Suggested baseline investigations.

leans forward with the head extended, thus altering the center of gravity and further increasing the risk of falls.[7]

Screening for malignancy is part of the routine clinical examination that should include examination of the thyroid, breast, prostate, rectum and gynecological examination as well as an occult blood. The medical assessment may find that existing pathologies, such as advanced cardiac, respiratory, neurodegenerative or malignant conditions may be sufficient to explain the progression of frailty. If this is not the case, symptoms or signs may be identified that point to a new pathology, which should be investigated in its own right. The problem is that pathologies common in the elderly may present with few specific signs and symptoms to guide the clinician, and exhaustive investigation is expensive and rarely rewarding. The difficulty in the very old is that increasing frailty may be the only manifestation of a new pathology. Choosing an appropriate spectrum of investigations which will identify pathologies common in the elderly or which, if abnormal, will identify the need for further investigation, depends on the resources available.[8, 9]

Once the medical assessment is completed, the clinician should have excluded or identified new pathologies, optimised management of chronic diseases and decided if impairments leading to disability can be improved, are stable or will continue to deteriorate. When there is physical frailty, even in the presence of progressive degenerative disease, physical rehabilitation can improve both endurance and strength and postural control. Good communication between the physician and rehabilitation teams are needed to define realistic goals for functional outcomes and their impact on the patients' independence in ADLs and IADLs. Impairments and subsequent disability in the frail may be improved, but seldom reversed, and functional limitations need to be addressed to improve independence. Altering the frail person's physical environment in order to improve independence is the domain of the occupational therapist, who needs to work closely with the physiotherapist in order to identify functional goals and adapt the environment where physical impairments that limit independence are likely to remain.

With frailty, physical and functional impairments are likely to remain and, depending on the co-morbidities present, deteriorate with time, resulting in increasing care needs. Assessing the social, physical and financial support available to the frail person is important in deciding if it is adequate and sustainable, and if not, engaging social services and planning for long-term care needs. Caregiver burden and stress should be assessed to identify where support is needed. Institutionalisation may be the only option where support is inadequate or not sustainable. In this case the kind of institution and the level of care provided should be adequate for the person's functional limitations, but provide scope for independence in domains where they can function.

Managing chronic frailty

When frailty is established and functional limitations cannot be regained or are likely to progress the goal of management is to retain function and independence as long as possible, and to minimise the person's vulnerability to further decline. The physician's role is to optimise management of chronic diseases, paying particular attention to conditions impairing cognition, mobility and continence, and to ensure that medication side-effects and interactions are not contributing to impairments or impairing quality of life. Symptoms such as confusion, dizziness, postural hypotension, constipation and urinary urgency are commonly drug-related. Constipation is a common problem in frail persons who are physically inactive and faecal impaction leads not only to faecal and urinary overflow incontinence, but also to poor nutritional intake and delirium.

Nutrition is often poor for a variety of reasons, such as reduced taste, cognitive impairment, depression, dental problems, inability to cook or financial constraints.

Ensuring good protein and vitamin intake is essential to minimise the progression of sarcopaenia. Exercise is important, not only in maintaining muscle strength and balance, but increased energy expenditure improves appetite and well-being. Even in the very frail, exercise and nutritional interventions have shown benefit.[10] In frail patients with co-morbidities, which may include cardiorespiratory, neurological and musculoskeletal diseases, individualised exercise programmes may be needed. Vitamin D is necessary to prevent osteoporosis and for muscle function. Routine supplementation is controversial, but given that frail persons often have limited sun exposure and are at risk of deficiency, this is a common practice.[11, 12]

Occupational therapists have an ongoing role in optimising function and independence of the person and by adapting the environment. As dependency and care needs increase, the adequacy of social, physical and financial support should be monitored.

References

1. Freid LP, Tangen CM, Watson J, et al. Frailty in older adults: Evidence for a phenotype. J Gerontol 2001;56A:M146-M156.
2. Wilson F. Frailty-and its dangerous effects-might be preventable. Ann Intern Med 2004;141:489-492.
3. Waltson J, Mc Burnie MA, Newman A, et al. Frailty and the activation of inflammation and coagulation systems with and without clinical morbidities: Results from the Cardiovascular Health Study. Arch Intern Med 2002;162:2333-2341.
4. Leng SX, Cappola AR, Andersen RE, et al. Serum levels of insulin-like growth factor-1 (IGF-1), and dehydroepiandrosterone sulphate (DHEA-S), and their erelationships with serum interleukin-1, in the geriatric syndrome of frailty. Aging Clin Res 2004;16:153-157.
5. McMillan GJ, Hubbard RE. Frailty in older inpaients: What physicians need to know. Q J Med 2012;105:1059-1065.
6. Fairhall N, Langron C, Sherrington C, et al. Treating frailty – a practical guideline. BMC Medicine 2011;9:83.
7. Prince F, Corriveau H, Hébert R, Winter DA. Gait in the elderly. Gait and Posture 1997;5:128-135.
8. Rockwood K. Medical management of frailty: Confessions of a gnostic. Can Med Assoc J 1997;157:1080-1084.
9. Morley JE. Frailty: Diagnosis and management. Journal of Nutrition, Health and Aging 2011;15(8):667-670.
10. Fiaterone MA, O'Neil EF, Ryan ND, et al. Exercise training and nutritional supplementation for physical frailty in very elderly people. N Engl J Med 1994;330:1769-1775.
11. Latham NK, Anderson GS, Lee A, Bennet DA, Moseley A, Cameron ID. A randomized, controlled trial of quadriceps resistance exercise and vitamin D in frail older people: The Frailty Intervention Trial in Elderly Subjects (FITNESS). JAGS 2003;51:291-299.
12. Janssen HCJP, Samson MM, Verhaar HH. Vitamin D deficiency, muscle function, and falls in elderly people. Am J Clin Nutr 2002;75:611-615.

Summary

- Frailty is associated with cognitive impairment, depression, social isolation, incontinence, osteoporosis, osteoarthritis and atherosclerosis
- Multiple factors contribute, such as malnutrition, reduced physical activity and medication side effects, which interact to result in falls, hospital admissions, functional decline and institutionalisation and perpetuate the spiral of increasing frailty
- Assessing and managing frailty requires a multidisciplinary approach involving medical, rehabilitation, social and dietary interventions
- When frailty is established and functional limitations cannot be regained or are likely to progress, the goal of management is to retain function and independence as long as possible and to minimise the person's vulnerability to further decline