The frailty syndrome

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Abstract
Frailty is an important geriatric syndrome with a high prevalence in the community population. It can be seen as a state of extreme vulnerability and loss of resistance to external stressors resulting in an increased risk of several adverse outcomes. Although linked with ageing, disability and co-morbidity, many consider frailty as a distinct clinical and pathophysiological entity. A problem with this concept is the search for a suitable operational definition that can be used in clinical practice. Many exist in literature but there is no agreement on the best measure. The more popular of these definitions include Fried's model of frailty and the Frailty Index. Identification of frailty is recommended to target interventions and help improve outcomes.

Keywords
comprehensive geriatric assessment; frail older people; frailty; frailty-rating scale; frailty assessment; frailty syndrome; older people

Introduction
The older population in the world is increasing, with the global population of those aged 65 and over set to double by 2050 from 901 million to 2.1 billion. In the UK, with 18% of the total UK population currently aged 65 years and over, a proportion set to rise to 23% by 2035. Although this is a testament to the progress seen in society in general, and healthcare in particular, it creates additional challenges for health and social care systems. It is important that strategies can be put into place for the care of the older population, to ensure that those who are most at risk are able to receive the necessary help. However, the primary challenge to healthcare systems is not ageing per se but the association between ageing and frailty. Why are some very old people able to run marathons, whereas others, even without major co-morbidities, have marked functional decline? This article will tackle the issue of frailty and the problems that are faced within this growing area of geriatric medicine.

What is frailty?
Frailty is a multidimensional geriatric syndrome with important implications for the care of the older population. The exact reasons why some people develop frailty whilst others do not are unknown, but frailty can be thought of as: a dynamic state of increased vulnerability and loss of resistance to external stressors, resulting in an increased risk of adverse outcomes. Although it is associated with age, disability and co-morbidity, most would agree that frailty is a distinct entity, as they are not synonymous. Disability is concerned with the difficulty a patient faces in carrying out activities of daily living (ADL) whereas co-morbidity is the presence of two or more diseases in a patient. Not all of the oldest old are frail, and not all frail people are aged. There is a stereotypical image of an older person with frailty being of low weight, but frailty is associated with both low weight and obesity.

Frailty can play an important role in the planning of resources in the future, although there is still contention over the optimal way to assess and identify frailty.
Definitions of frailty
There are two general schools of thought on how best to define frailty: **rule-based definitions** and the **Frailty Index (FI)**.

**Rule-based definitions** include a pre-set list of components designed to assess an individual patient. The best known of these is the definition proposed by Fried et al., which consists of five criteria based on hypothesized signs and symptoms of frailty:
- shrinkage (loss of height or weight)
- weakness
- exhaustion
- slowness
- low activity.

The proposed measures to quantify each component are shown in Table 1. A person is graded frail if they score positive in three or more of these criteria, and frailty defined by this means has been shown to be associated with numerous long-term adverse outcomes (Table 4). **Pre-frail** is defined as scoring one or two out of five.

However, this is by no means a ‘gold-standard’ definition, and it has come under criticism as it may not reflect a fully multidimensional definition of frailty; for example, it excludes measures of cognition and mental health, which are putatively important additional markers in frailty. In addition, the complexity of the measurement criteria may also limit the suitability of the scale, as an understanding and definition of the baseline level for the local population are needed before the scale can be successfully used.

Subsequent research has improved the predictive validity of the scale by the addition of the domain of cognitive decline. In addition, another scale, developed from data obtained in the Study of Osteoporotic Fractures (SOF), has attempted to simplify the definition of frailty, and is more suited to the busy clinical setting. This is comparable to the Fried model of frailty in terms of its predictive properties, and the list of criteria and their measurement can be seen in Table 2.

The **Frailty Index** is a frailty-rating scale based on the principles of the accumulation of deficits and their association with frailty. The frailty status is constructed by counting the number of defined deficits per person – the more deficits a person has, the more likely that person is to be frail. In this operational definition, the level of frailty is reported as a ratio of deficits present to the total number of potential deficits. An advantage of this approach is the flexibility of the deficits that can be included, which can be signs and symptoms of disease, disability, or biochemical abnormalities. There are no set deficits or components that need to be measures in an FI, and scales can be constructed as long as they satisfy the criteria shown in Table 3.

However, despite this scale satisfying the concepts of what frailty is, its suitability in the clinical setting where time pressures may lead to less acceptability amongst clinicians and patients remains debatable. In addition, the weighting of a variable may also need to be considered, as certain deficits may be more associated with adverse outcomes than others.

Electronic forms of the frailty index have been developed which can be automatically populated from clinical data, reducing the resources required to complete the index.

Consequences of frailty
Frail people are at risk of numerous adverse outcomes, both in the short and long term, thought to be related to a lack of physiological reserve (or ‘allostatic’ load). With the onset of physical or emotional injury or challenge, a frail person is more likely to lack the ability to cope, leading to a decline in health and function, with implications for health services and the person’s welfare. Frailty, defined by either of the broad methods described above, is associated with poor outcomes, including mortality and worsening of dependence in activities of daily living (ADL). The impact of frailty on some common adverse outcomes is shown in Table 4. It is suggested that targeting frailty screening on those who suffer from such outcomes may be a clinically useful approach.
Attitudes and misconceptions
In 2015, a report was published into patient, public and health professionals' attitudes and perceptions towards frailty 1. Older people don’t tend to identify with being labelled as ‘frail' but can identify with aspects of ‘living with frailty.' Health professionals had some misconceptions that frailty is an end of life condition and irreversible, both of which are untrue. Frailty is a dynamic condition that can improve, and is not exclusively and end-of-life condition.

How to assess frailty
Frailty is a multidimensional syndrome, and an operational definition should reflect this. There is currently lack of consensus over which domains of frailty should be assessed and included, and frailty assessment scales developed in the past place different weighting on different domains. The most common domains assessed include physical function, gait speed or mobility, and cognition. In an attempt to clarify this issue, a Delphi-based consensus of experts recently agreed that a definition of frailty should include assessment of physical performance, including gait speed and mobility, nutritional status, mental health and cognition. The inclusion of biomarkers is under investigation. Ultimately, the scale used may remain dependent on the choice of the clinician as different measures of frailty may suit different purposes of the scale, and different scales may be developed specifically and be most appropriate for different contexts, such as surgery. The British Geriatrics Society recommends that the PRISMA-7, alongside a gait speed and timed-up-and-go test are carried out to identify frailty in the community setting. If a person’s health condition prevents them from being able to carry out a gait speed or timed-up-and-go test, a PRISMA-7 test based on their usual health status will suffice. The scoring criteria for PRISMA-7 can be found in Table 5 2. More recently, the electronic Frailty Index has been developed and validated in primary care 3; severe frailty identifies people 4x more likely to die, 5x more likely to admitted to long term care and 6x more likely to have an unplanned admission over 1 year. The electronic Frailty Index is now embedded in System 1 and EMIS web.

When to assess frailty
Frailty can be identified in all healthcare settings, but each may require a different approach. Identifying frailty in the community may be beneficial as the patient can be seen in their own environment, when closer to their baseline and healthcare professionals can have a good idea of the person’s health and living status. Identifying frailty in the acute care setting is also important however, either because their community-derived frailty status is not routinely available, or their status may have changed in the lead-up to them attending hospital. Assessing frailty in the acute care setting requires methods which are quicker and require less in-depth information, which may not be available. In acute care, the Rockwood Clinical Frailty Scale has been validated and appears quick (41 seconds) and simple to use.

Prevalence of frailty
As there is no standard definition of frailty it is difficult accurately to assess its true prevalence in the population. Nevertheless, studies have estimated the prevalence according to different frailty scales. A systematic review found frailty prevalence in community dwelling adults aged over 65, to be 10.7%, although this ranged from 4.0-59.1%, in 21 studies using a range of frailty definitions 4. Prevalence of frailty also increases with age. Frailty is more highly prevalent in people with lower educational attainment, income and self-rated health, and higher rates of co-morbid disease.

Treatments for frailty
The presence of frailty carries significant implications, in terms of health resource use and the psychological burden upon the person and their family. The management of frailty is complex, and the published evidence on interventions that prevent the occurrence of frailty or reduce its degree once established is sparse. There are no specific trials as yet published that demonstrate the clinical or cost
effectiveness of interventions directed towards frailty per se, although it is likely that generic interventions such as exercise, health lifestyles and good nutrition will be important factors. The mainstay of treatment should be focused on tailoring inventions to individuals and tackling the frailty domains present within the person, akin to the comprehensive geriatric assessment (CGA). The CGA is defined as ‘a multidimensional, interdisciplinary diagnostic process to determine the medical, psychological, and functional capabilities of a frail older person in order to develop a coordinated and integrated plan for treatment and long-term follow-up’, and its use has been shown to improve outcomes for older people, including survival, cognition, quality of life and reduced length of stay, long-term care use and costs. The challenge is to develop novel, efficient and effective methods of delivering CGA within a cost-constrained and pressured health economy. A full CGA process can take hours, days or weeks to complete but can help to identify common geriatric syndromes, such as cognitive impairment and mobility problems, which can then positively influence the patient’s care trajectory. The Acute Frailty Network (AFN) is an improvement network operational in England that focuses upon the delivery of best practice care for older people with frailty and urgent care needs. The principles developed by the AFN include:

1. Establish a mechanism for early identification of people with frailty
2. Put in place a multi-disciplinary response that initiates Comprehensive Geriatric Assessment (CGA) within the first hour
3. Set up a rapid response system for frail older people in urgent care settings
4. Adopt clinical professional standards to reduce unnecessary variation
5. Develop a measurement mind-set
6. Strengthen links with services both inside and outside hospital
7. Put in place appropriate education and training for key staff
8. Identify clinical change champions
9. Patient and public involvement
10. Identify an executive sponsor and underpin with a robust project management structure

Key points
• The older population in the UK is increasing, and frailty may play a role in the identification of those at risk of adverse outcomes
• Key domains of frailty include physical function, nutritional status, mental health and cognition
• Lifestyle interventions may delay the progression of frailty in the community setting
  • It is important to identify frailty in all healthcare settings to help improve the patient trajectory
  • Comprehensive Geriatric Assessment is likely to improve outcomes for older people with frailty and urgent care needs

Self-assessment questions
1. Angela Daniels is 87 and has been brought to the Emergency Department with a sudden reduction in mobility and can no longer walk. After initial examination and investigations show no obvious abnormalities, what should the next management step be?
   a) Admit Angela to a ward for observation
   b) Initiate Comprehensive Geriatric Assessment process
   c) Organise for Angela to be discharged home with a new care package in place
   d) Organise for Angela to be discharged to a care home
   e) Refer to a specialist for more in-depth investigations
   (answer = b – CGA should results in a multidimensional stratified problem list that will guide the best course of action)

2. Dipak Samani is a 92 year old gentleman with type 2 diabetes, hypertension, chronic kidney disease, and asthma. He has attended your GP surgery with feelings of dizziness. Which of the following is it important to consider and address in this patient?
   a) Insufficient medication dose
   b) New disease onset
c) Non-compliance with medications

d) Polypharmacy interactions

e) Psychosomatic illness

(answer = d – ADEs account for at least 10% of acute care presentations in older people; it is important to have a high index of suspicion when considering new presentations in older people with multiple comorbidities)

3. You are a GP who wants to assess which of your older patients have frailty and decide to send out postal questionnaires for patients to self-complete. Which of the following tools should you send them to complete?

   a) Clinical Frailty Scale
   b) Frailty index based on deficit accumulations
   c) PRISMA-7
   d) Study of Osteoporotic Fractures criteria
   e) Timed-up-and-go

(answer = c – PRISMA-7 is suitable for postal completion. A score of > 3 is considered to identify frailty.)
### Domains and criteria for the Fried model of frailty

<table>
<thead>
<tr>
<th>Characteristic of frailty</th>
<th>Measure proposed by Fried et al.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shrinking</td>
<td>Weight loss &gt;10 lb (4.5 kg) unintentionally in previous year</td>
</tr>
<tr>
<td>Weakness</td>
<td>Grip strength in lowest 20% of the population</td>
</tr>
<tr>
<td>Exhaustion</td>
<td>Self-reported exhaustion, according to the Center of Epidemiological Studies – depression scale</td>
</tr>
<tr>
<td>Slowness</td>
<td>15-feet (4.6-m) gait speed in slowest 20% of the population</td>
</tr>
<tr>
<td>Low activity</td>
<td>kcal/week in lowest 20% of the population</td>
</tr>
</tbody>
</table>

**Table 1**
Criteria for the Study of Osteoporotic Fractures model of frailty

<table>
<thead>
<tr>
<th>Characteristic of frailty</th>
<th>Measure proposed by Ensrud et al.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shrinking</td>
<td>Weight loss of ≥5% between examinations</td>
</tr>
<tr>
<td>Exhaustion</td>
<td>Self-reported exhaustion according to the Geriatric Depression scale.</td>
</tr>
<tr>
<td>Physical function</td>
<td>Inability to rise from chair five times without using arms</td>
</tr>
</tbody>
</table>

Table 2
Guidelines for deficit selection and construction of a frailty index

- Variables must be deficits associated with health status
- Deficits must generally increase with age
- Chosen deficits must not saturate too early with age (e.g. presbyopia has a ceiling effect as it is nearly universal by age 55)
- The deficits that make up the frailty index must cover a range of systems
- On serial use on the same people, the items in the frailty index must be the same. This does not apply when comparing samples rated by the frailty index

Table 3
### Three-year incidence outcomes and hazard ratios for frail patients

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Incidence % (3 years)</th>
<th>Hazard ratio 3 years adjusted for co-variates</th>
<th>95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>First fall</td>
<td>28</td>
<td>1.29</td>
<td>1.00, 1.34</td>
</tr>
<tr>
<td>Worsening activities of daily living</td>
<td>39</td>
<td>1.67</td>
<td>1.41, 1.99</td>
</tr>
<tr>
<td>First hospitalization</td>
<td>59</td>
<td>1.13</td>
<td>1.03, 1.25</td>
</tr>
<tr>
<td>Mortality</td>
<td>18</td>
<td>1.49</td>
<td>1.11, 1.99</td>
</tr>
<tr>
<td>Worsening mobility</td>
<td>51</td>
<td>1.58</td>
<td>1.41, 1.76</td>
</tr>
</tbody>
</table>

Table 4
**Table 5**

PRISMA 7 scoring criteria. Score of 3 or above is indicative of frailty.

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes = 1, No = 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are you more than 85 years old?</td>
<td></td>
</tr>
<tr>
<td>Are you male?</td>
<td></td>
</tr>
<tr>
<td>In general, do you have any health problems that require you to limit your activities?</td>
<td>Yes = 1, No = 0</td>
</tr>
<tr>
<td>Do you need someone to help you on a regular basis?</td>
<td>Yes = 1, No = 0</td>
</tr>
<tr>
<td>In general, do you have any health problems that require you to stay at home?</td>
<td>Yes = 1, No = 0</td>
</tr>
<tr>
<td>In case of need, can you count on someone close to you?</td>
<td>Yes = 1, No = 0</td>
</tr>
<tr>
<td>Do you regularly use a stick, walker or wheelchair to get about?</td>
<td>Yes = 1, No = 0</td>
</tr>
</tbody>
</table>
KEY REFERENCES

Further Reading:
• The Silver Book