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# Frailty In Geriatrics

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## Abstract

Recently, a condition called senile frailty or fragility has become more common in people over 65 years of age. The condition is also noticeable in people under the age of 65, but it is not so common. Elderly frailty is a slow decrease in the capacity of a number of organ systems. This leads to loss of muscle mass, abnormal functioning of the inflammatory and hormonal system and weakening of energy regulation. Due to the reduced capacity, the organism is no longer able to cope with excessive demands. Once senile frailty is manifested, the organism often decays rapidly. It is a condition that causes concern, above all, in family members.

**Key words:** Frailty; Concept; Measurement; Geriatrics; Care

## Introduction

Demographic trends show that independently of geographic regions and socioeconomic background, the absolute and relative number of older persons is increasing worldwide [1]. It has been estimated that the prevalence of persons aged 65 years and older worldwide will increase from 7.7% in 2010 to 15.6% in 2050. This trend is evident even among the subpopulation of those aged 80 years and older, which is predicted to more than double in size from 2010 to 2050 (1.6% and 4.1%, respectively). This is not exclusive to more developed countries, because similar trends have even been reported in the least developed regions of the world. The reduction of mortality risk at advanced age is largely the result of scientific advancements and improvement of life conditions. At the same time, as the aging population seeks care, simply extending current practices is threatening the sustainability of the health care system. In particular, current models of care do not sufficiently take into account the new (and still unmet) needs of the changing population. Not surprisingly, a recent alert by the Royal College of Physicians (London) indicated the necessity of "more consultants with skills in acute, general and geriatric medicine to be able to cope with the ageing population."

One of the major challenges of health care systems is to face the severe burden imposed by disabling conditions of old age. Because disability in the older person has to be considered as an almost irreversible condition, because it is largely caused by lifelong accrual of deficits, attention must be focused on preventing the disabling cascade and on managing people in ways that aim to mitigate, or at least not add to, their level of dependence.

Frailty has long been recognized by practitioners of medicine as a syndrome of late-life, multisystem decline associated with vulnerability to adverse health outcomes, including accelerated mortality [2]. However, until very recently few investigators have attempted to identify its underlying aetiology and how it might interact with chronic diseases such as diabetes. This is in part due to the heterogeneity with which frailty and many complex diseases of late life present. Recently, several investigators have attempted to operationalize and characterize some of the clinical and biological characteristics of frailty. However, weight loss tends to be less predictive of adverse outcomes when inserted into other frailty models, and hence it is a relatively weak predictor. The Studenski model offers utility in that it is all based on objective measurements, but it



has not been widely tested in other populations. The Fried model is currently the most widely utilized in both outcomes and biological research; this takes longer to complete because it incorporates two questionnaires, but these two criteria are more subjective. Most emerging definitions related to frailty have focused on the concept of weakness, fatigue, low levels of activity and the accumulation of deficits and incorporate performance measures into the examination.

Frailty generally refers to a state of diminished physiologic reserve rendering the patient more likely to decompensate from minor stressors, to suffer from geriatric syndromes, and to be more vulnerable to disability [3]. However, the term frailty has varying definitions in research and clinical care. A traditional and less specific definition refers to frailty as the result of unrelated chronic disease conditions acquired by an individual, who then crosses a functional tipping point into disability. More recently, frailty has been described as a specific syndrome (sometimes referred to as the frailty syndrome) characterized by sarcopenia (muscle wasting), poor exercise tolerance, slowed motor performance, decreased physical activity, and undernutrition. At the organ system level, the frailty syndrome is characterized by age-associated dysregulation of physiologic systems that help to maintain homeostasis, such as pathologic inflammation, impaired immune function, and hormonal imbalances.

Whatever the cause of frailty, patients in this functional state will often develop and present with geriatric syndromes that pose serious risk of further functional decline and death. As such, a strategy of preventing these syndromes or their sequelae is warranted in frail older adults. The etiology of these syndromes is not confined to a single organ system or pathophysiologic process, but rather to multiple causes arising from both medical and non-medical conditions and stressors. Preventive efforts for geriatric syndromes can be primary, as in counseling older adults about accident prevention in the home; secondary, as in screening older adults for gait disorders; or tertiary, as in enrolling a patient with an injurious fall in a comprehensive falls prevention program.

## Concept

To better appreciate the heterogeneous health status of the older persons, the frailty concept was introduced in geriatric and gerontology literature about 20 years ago [1]. Frailty is now non-controversially understood as the concept of increased vulnerability to adverse outcomes among people of the same chronologic age. It is the term used to indicate the geriatric syndrome or state characterized by a reduction of the organism's homeostatic reserves. The lower capacity of the organism to face entropic forces (coming from endogenous and exogenous sources) exposes an individual to an increased risk of negative health-related events, including falls, hospitalizations, worsening disability, institutionalization, and mortality. In a frail individual, a clinically irrelevant endogenous or exogenous stressor may become the trigger for the initiation of the burdening disabling cascade.

Frailty has been defined by an international consensus of experts as "a multidimensional syndrome characterized by decreased reserve and diminished resistance to stressors." A widely accepted definition of frailty was provided in Orlando, Florida, by an international consensus group in 2012. It stated that frailty is "a medical syndrome with multiple causes and contributors that is characterized by diminished strength, endurance, and reduced physiologic function that increases an individual's vulnerability for developing increased dependency and/or death."

However, frailty is not all or none; grades of frailty make a difference. Still, many studies classify people simply as frail or nonfrail. In some settings, such as comparing frailty prevalence in different samples, this can be useful; however, even in this case, important information gets lost. Many clinical decisions require greater precision than a nonfrail-frail status. In addition, frailty is a dynamic process where transitions across states of frailty are common. On average, health tends to decline with age, and the population-based trajectories of frailty are consistent, showing acceleration in deficit accumulation. The frailty index increases, on average, tenfold between 20 and 90 years. Even so, individual trajectories of the frailty index are generally irregular, showing that frailty reflects a stochastic dynamic process. For an individual, most transitions are gradual, and the likelihood to change their frailty level is largely conditioned on their previous frailty level. Therefore, transitioning from a nonfrail state to a severely frail state (and vice versa) is not very common. In individuals, including older adults, frailty levels increase nonmonotonically over time; however, health status can improve, which will result in a transition from a higher to a lower frailty level state.

## Biology

Frailty has been described as a phase of acceleration occurring during the aging process due to endogenous and exogenous stimuli [1]. It results from the age-related cumulative declines occurring across multiple physiologic systems. The biology of frailty has its origins in the most intimate roots of the aging process. The parallelism between aging and frailty implicitly leads to the existence of a shared pathophysiologic substrate between the aging process and frailty.

Such hypotheses can easily find support in the growing body of evidence showing that the same pathways indicated as crucial for the aging process (e.g., inflammation, oxidative damage, immune function, telomeres, natural selection) also represent key determinants in the development and maintenance of the frailty phenotypic syndrome. Furthermore, it cannot be ignored that specific innate capacities (e.g., mobility) characteristic of living beings across species (from *Drosophila* to humans) are strongly correlated with frailty and age-related conditions.

Based on the deficit accumulation approach, frailty arises from the accumulation of microscopic damage (cellular and subcellular deficits) that are not repaired or removed and may reach macro-

scopic deficits—clinical detectable deficits at the organ and system levels. As organ level deficits accumulate, they may give rise to symptoms or signs, thereby presenting as clinically evident disease. Also, damage in one organ system may predispose to damage in another organ system, showing that deficit accumulation and repair are intertwined. A recent study showed this association between the clinical macroscopic and subclinical microscopic deficit accumulation using a frailty index constructed by routine laboratory data. This supports the notion that frailty that is macroscopically detectable represents the buildup of subcellular, tissue, and organ deficits from damage that is not removed or repaired.

## Condition

Frailty (or the biologic age of the individual) is a dynamic and complex condition, largely determined by endogenous and exogenous stressors experienced by individuals during their lifetime [1-3]. Thus, it is also implicitly assumed that age is a continuous variable, and the manifestations of the aging process follow dynamic and continuous patterns during the entire course of the life experience. Every positive or negative stressor experienced during the life course may differently affect health status and determine deviations from the reference status of successful aging. Thus, it is implied that through a careful evaluation of a person's background and history, the current health status of the person should be assessed not only cross-sectionally, but also longitudinally. This also means that preventive interventions for age-related conditions should not necessarily be applied only to older adults. Age-related conditions can be successfully prevented if the modification of risk factors (e.g., poor socioeconomic conditions, unhealthy lifestyle and behaviors, little access to health care services) also involves younger adults.

In addition, there is strong evidence that exercise prescription is more beneficial than any other individual intervention for the health of frail people. This could be related to the impact of exercise across a variety of systems and its potential effect on intrinsic repair mechanisms. Multicomponent exercise interventions composed of aerobic, strength, and balance training seem to be the best strategy to improve health, treat frailty, and prevent disability in frail older adults. However, the optimal design of the exercise protocol in this population is not clear. An example of the capacity to intervene successfully in the health status of frail older adults by using exercise interventions to prevent negative health-related outcomes has recently been provided by the Lifestyle Interventions and Independence for Elderly (LIFE) trial. This multicenter study recruited 1635 community-dwelling sedentary older persons with physical limitations but able to walk 400 m. Participants were randomized in two groups, an intervention group undergoing a moderate intensity physical activity protocol and a control group receiving a health education program. Results showed that after 2.6 years of intervention, the physical activity protocol significantly reduced the onset of mobility disability compared to the health education program. Interestingly, the LIFE study (as well as secondary analyses

conducted on its pilot trial) suggests that individuals with more comorbidities and lower physical performance at baseline are those who obtain most benefit from the physical exercise intervention.

## Measurement

In recent years, there has been a surge of interest in frailty in the medical, surgical, and anesthetic literature [4]. In various surgical populations, frailty has been described as an independent risk factor for postoperative morbidity, mortality, prolonged hospitalization, and institutional discharge. Combining a measure of frailty (based on Fried criteria) with other preoperative risk assessment tools (e.g., American Society of Anesthesiologists [ASA] class, Lee index) increases the predictive power relating to postoperative morbidity, length of stay, and institutionalization. Furthermore, frailty is common in older surgical patients, with a quoted prevalence of between 40% and 50% in those undergoing elective surgery. This is in comparison to the cited prevalence of frailty in less than 10% of older community-dwelling individuals (aged 65 to 74 years), suggesting the relative vulnerability of the older surgical population. The cause of frailty is incompletely understood, but is thought to be related to the dysregulation of inflammatory pathways, with several inflammatory cytokines independently associated with frailty, including interleukin-6, tumor necrosis factor- $\alpha$  and chemokine ligand10. Many conditions that are treated surgically (e.g., neoplastic conditions, degenerative or inflammatory arthropathies, arterial pathology) also result in the dysregulation of inflammatory processes. Thus, frail older adults may be more susceptible to developing such diseases or, alternatively, patients with such inflammatory, neoplastic, or vascular-type pathology may be more likely to be frail.

Interpreting the literature examining frailty in surgical patients is hampered by inconsistent definitions of frailty and the use of different tools for measuring frailty. The measurement of frailty will depend on the intention (e.g., screening, case finding, assessment, prognostication), setting (e.g., research, clinical, community, inpatient, outpatient), and clinician (e.g., researcher, allied health care professional, geriatrician). At present, two approaches are generally used—scoring systems based on assessment across multiple domains, which include comorbidity, cognition, function, and psychosocial status (e.g., Edmonton Frail Scale, Canadian Study of Health and Aging [CSHA] Clinical Frailty Scale, Groningen Index) or surrogate single measures, such as grip strength, gait speed, or timed get-up-and-go (TGUG) test. The anesthetic literature tends to focus on the use of surrogate markers. This approach has two potential drawbacks. First the sensitivity and specificity of these surrogate markers in identifying frailty are not yet well established and second, identifying frailty to use it simply as a predictor of outcome may limit the potential to modify the perioperative risk related to frailty. The more detailed multidomain scoring systems may be more useful in this situation to identify individual components of frailty that can be modified using targeted interventions. For example, patients could be assessed using a tool such as the Edmon-

ton Frail Scale to screen for frailty-associated perioperative risk, prompting optimization in the high-risk group using comprehensive geriatric assessment. Such an approach has yet to be evaluated.

## Malnutrition

In America, where obesity is an increasing problem, undernutrition and malnutrition are significant problems for the older adult population [5]. Statistics show that a large number of older adults are at risk for malnutrition, whether they are living independently or are institutionalized. Malnutrition is defined as a disorder of nutrition resulting from unbalanced, insufficient, or excessive diet or from impaired absorption, assimilation, or use of food. The risk for developing nutritional deficiencies increases with aging, but determining nutritional status can be challenging. Older adults who appear to be healthy may have unhealthy nutritional practices. An obese older adult may be malnourished, whereas someone thin may be well nourished. Studies have shown that a majority of older Americans believe that nutrition is important for good health but that they do not always follow good nutritional practices. Information from the National Council on Aging Nutritional Assessment Self-Test reveals that older adults have a disproportionately high risk for poor nutrition, which, in turn, has a negative effect on their health. Poorly nourished older adults are more likely to experience functional impairments, fatigue, decreased muscle strength, poor tissue healing, pressure ulcers, and infections. They are likely to develop more postoperative complications, spend a longer time in the hospital, and are at increased risk for death.

Estimates of the number of malnourished older adults vary depending on the screening tool used, but generally fall within the following ranges:

- Older adults in the community: 45%
- Older adults cared for at home: 45% to 51%
- Hospitalized older adults: 54% to 82%
- Older adults in residential care facilities: 84% to 100%

These data reveal the magnitude of the problem that needs to be addressed by health care providers and demonstrate greater malnutrition as one becomes more frail and dependent on others.

Symptoms of nutritional problems include unintentional weight loss, lightheadedness, disorientation, lethargy, and loss of appetite. Similar symptoms occur with a variety of illnesses, making it difficult to determine whether the primary problem is medical or nutritional in origin. Weight loss is one of the signs of frailty syndrome in older adults, a syndrome characterized by increased susceptibility to stressors that can lead to negative health outcomes and functional impairment. The associated nursing diagnosis Frail Elderly Syndrome can be used to address this complex problem. Nurses working in all health care settings must assess, plan, and implement strategies to maintain or improve the nutritional status of the older adults in their care.

## CGA

CGA (comprehensive geriatric assessment) is a multidimensional, interdisciplinary diagnostic process to determine the medical, psychological, and functional capabilities of a frail elderly person in order to develop a coordinated and integrated plan for treatment and long-term followup [6]. While integrating standard medical diagnostic evaluation, CGA emphasizes quality of life, functional status, prognosis, and outcome that require a workup of more depth and breadth. The hallmarks of CGA are the employment of interdisciplinary teams and the use of any number of standardized instruments to evaluate aspects of patient functioning, impairments, and social supports.

Currently, the CGA is performed in a large number of institutional and community settings. CGA plays a very important role in services such as hospital geriatric units, primary care units (as a standard medical evaluation), and also in community-based services such as programs that provide comprehensive care for frail and disabled elderly patients. The short form of the CGA is known as the Multidimensional Geriatric Assessment. This abbreviated screening approach is performed by community health professionals to help decide when a referral is needed to geriatric specialty programs for a more comprehensive evaluation and management. In patients with cancer, CGA was shown to improve emotional limitation, mental health, and bodily pain. Performing the CGA did not affect length of hospitalization or overall hospital costs. This evaluation was easily administered in an abbreviated form in the outpatient setting and was effective in identifying cognitive and functional deficits in cancer patients.

The focus of a more extensive CGA is on the elderly who are frail (i.e., at risk of loss of homeostasis and incident disability), disabled, or both. Frailty is a clinically recognized syndrome that is common in older adults. Using recently developed criteria, the prevalence of marked frailty is less than 10% in community-dwelling adults 65 years and older, with high risk of mortality over 3 and 7 years.

From its inception, geriatric medicine has recognized that frail and disabled older adults are at the highest risk for adverse outcomes and are also most likely to benefit from geriatric care. Subsequent health services and clinical research has sought to define the healthcare delivery modalities as well as specific interventions that would mitigate or even prevent frailty and its outcomes. The CGA has been central to this approach and has the objectives of improving diagnostic accuracy, optimizing medical treatment and health outcomes, improving function and quality of life, extending community tenure, reducing use of unnecessary formal services, and instituting or improving long-term care management.

## PCMH

The vast changes occurring in medicine today are most prominent in ambulatory care [7]. With the Patient Protection and Affordable Care Act passed in 2010, and growing urgency to curtail the

rising costs of health care, ambulatory care has seen rapid changes to practice. The patient-centered medical home (PCMH) is one of the most widely adopted models of ambulatory health care that has been disseminated across the United States in recent years. The Centers for Medicare and Medicaid Services and the Veterans Affairs (VA), have both been implementing PCMH models at community health centers and VA medical centers around the country; private insurers and health plans are also redesigning their practices into PCMH models.

Why is PCMH being so strongly promoted as the ideal model of ambulatory care? PCMH is an approach to providing comprehensive, cost-effective primary care for patients of all ages. It aims to improve the delivery and experience of care for patients and clinicians through team-based coordinated care rather than the more ubiquitous fragmented health care norm that most patients have experienced for decades. Geriatric medicine is particularly well-suited to the PCMH approach to care because the principles of geriatrics ambulatory care (such as strong patient-provider relationships that recognize the role of family and caregivers, inter-professional team-based care, and continuous care throughout life stages and health care settings) are aligned with PCMH principles. Additionally, geriatrics-trained providers have specific skills that apply to many of the processes that comprise PCMH care.

Continuous and comprehensive care carries significantly more weight for older patient populations than younger populations. Older adults have more chronic illnesses than younger adults, and are more likely to transition through multiple care settings and services (hospital and nursing home care, home health and hospice services, in addition to ambulatory clinic-based care). Geriatrics clinicians are uniquely trained in the care of patients in all of these care settings. With the increasing frailty that often accompanies aging with chronic conditions, older adults benefit from personal relationships with primary care providers who understand and can lead team care across the spectrum of settings, from enrollment in the primary care clinic through end-of-life stages. Providing coordinated transitional care, home-based, and palliative care are hallmarks of geriatrics ambulatory care which align with PCMH's principle for continuous and comprehensive care.

### Long-term Care

The term long-term care conjures up many images; few of them are felicitous [8]. This reaction may represent a profound psychological defense against death, to be sure, but its immediate effect is to place long-term care center stage in an unfavorable light. The images of long-term care are images of frailty and despair, loneliness and destitution, and above all a profound sense of loss, a loss not only of things, but of who and what we are. These attitudes undoubtedly reflect society's perceptions of the institutions that are often thought to be the main providers of long-term care, namely, nursing homes. Anthropologists and sociologists regard nursing homes as anything but humane. They are frequently seen as plac-

es of exploitation (of staff as well as of residents). They stimulate either moral outrage or revulsion. These reactions are shaped by latent image: a blabbering, incoherent, disheveled elder strapped into a gerichair, withdrawn or beckoning for attention, but invariably ignored by staff who, without emotion, expression, or enthusiasm, perfunctorily perform the onerous tasks of daily bed and body work that are made even more difficult by the niggling demands of residents. The image is coupled with the olfactory assault of urine, excrement, and myriad other unpleasant odors that suffuse drab corridors or insipid sitting rooms where residents sit transfixed, each in his or her own world. There are also disturbing sounds of people moaning from down the hall, crying out, one elder scolding another harshly, others weeping in protest. Long-term care seems suffused with a terrifying absence, the absence of a meaningful sense of control, dignity, or identity. It is an appalling state of living death, somewhere just this side of madness.

### Conclusion

Chronic frailty can occur after a certain acute illness or as an end stage of a chronic condition, such as atherosclerosis, infection, cancer, and depression. Elderly frailty takes place in several stages. In the first stage, called pre-weakness, the person has less than three characteristic signs of senile frailty. There is a possibility of developing senile frailty in full form and decay, placement in a specialized institution or death. Yet, the likelihood of some of this happening is much higher in people with developed senile frailty syndrome. In the final stage, weakness progresses, which includes functional decline, progressive apathy, decreased appetite, and death.

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### Conflict of Interest

None.

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