GRS Geriatrics Review Syllabus 11th Edition

FRAILTY

Michelle Martinchek, MD, MPH

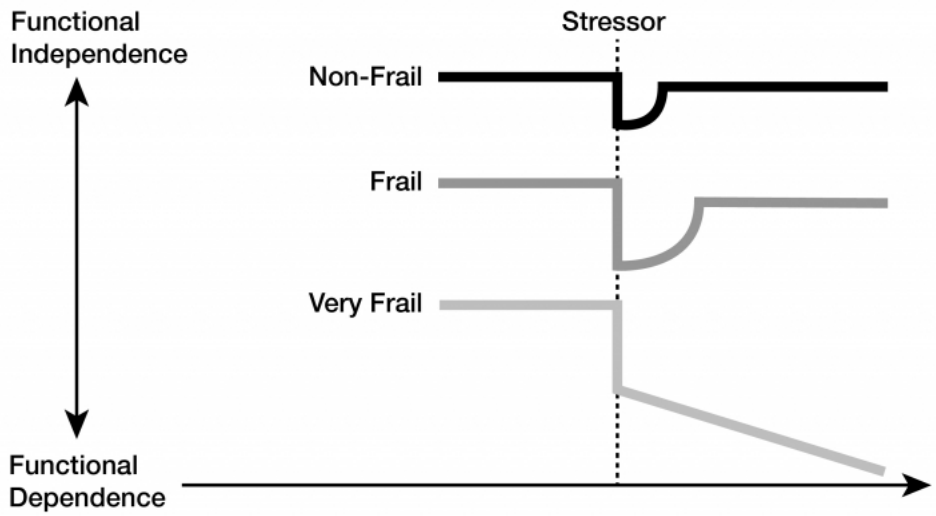
KEY POINTS

- Frailty is a clinical syndrome of dysregulation of energetics and multiple physiologic systems. Its definable clinical manifestations become apparent when physiologic dysregulation reaches a critical threshold.
- Physical frailty results from a common pathway of intrinsic physiological alterations. Index frailty, by contrast, is characterized by an accumulation of unrelated comorbidities.
- The validated physical frailty syndrome is manifested when ≥3 or more of 5 phenotypic components are present: weakness, slowed walking speed, low physical activity, low energy or exhaustion, and/or weight loss.
- Stressors, whether medical or environmental, are less well tolerated by frail older adults, leading to a high risk of adverse clinical outcomes.
- The most effective preventive approaches appear to be maintaining muscle mass and strength through resistance exercise or a multicomponent exercise program. Dietary protein supplementation may also be beneficial.

THE CONCEPT OF FRAILTY

The care of frail older adults is a central focus of geriatric medicine. Frail older adults are a subset of the older population at high risk from stressors such as extremes of heat and cold, acute infection or injury, or hospitalization or surgery. In the face of such stressors, frail older adults are more likely to be hospitalized and to experience delayed recovery from illness, to fall, to develop greater functional impairment (including becoming disabled or dependent), and/or to die (**Figure 1**). Frail older adults undergoing surgery have increased risk of mortality, surgical complications, longer length of stay, emergency department visits, readmissions, and discharge to skilled facilities.

Figure 1–The trajectory for different frailty states after a stressor (eg, fall, pneumonia)



(https://geriatricscareonline.org/display-assets?image=1&asset_ref=CH023_FIG1620101398)

Frailty is clinically observed to be a chronic, progressive condition with a spectrum of severity. Those in earlier phases may respond to treatment, which may prevent or ameliorate the clinical manifestations of frailty. The most severely frail older adults appear to be in an irreversible, pre-death phase with high risk of mortality over 6–12 months. The late phase may be an indication for palliative care approaches.

Frailty may, in some individuals, result from intrinsic aging processes, ie, *primary frailty.* In *secondary frailty*, the same phenotype and vulnerability exist in tandem with, and occur as a result of, one or more chronic diseases associated with inflammation and wasting, such as cancer, heart failure, COPD, and HIV/AIDS. The similarity of presentation of primary and secondary frailty suggests that, clinically, frailty is a physiologic entity unto itself that can be triggered by disparate causes but that, ultimately, represents a final common physiological pathway that accelerates vulnerability to adverse health outcomes.

The prevalence of frailty varies with the population studied and frailty instrument used. Global prevalence data for frailty is limited; however, a meta-analysis of population-level studies of adults ≥50 years old in 62 countries found pooled prevalence to be 12% using physical frailty measures and 24% using deficit accumulation frailty measures (see below, Frailty as a Clinical Syndrome), with marked variation between countries and territories. Physical frailty prevalence was lower (7%) when analyzing data from nationally representative studies alone. In general, the prevalence of frailty is higher in women than in men and increases with age. Frailty prevalence has also been found to be higher among lower income groups and among racial and ethnic minorities.

Frailty and Associated Vulnerability: Clinical Implications of Frailty

Frailty is associated with heightened likelihood of adverse outcomes, and this vulnerability is more likely to become manifest in the face of stressors. All frailty theories suggest that, regardless of the causes, frail older adults have decreased reserves to compensate for, or recover from, stressors (**Figure 1**). Aggregate loss of physiologic function is the process that is thought to increase the risk of and underlie the vulnerability to adverse outcomes. Multiple factors may modify physiologic reserve and the risk of onset or progression of frailty. These include demographic and social factors, clinical factors such as diseases or cognition, lifestyle factors such as diet and exercise, and biological factors. Research is focused on developing approaches that can identify older adults with this vulnerable physiologic status before phenotypic frailty becomes clinically apparent.

Frailty as a Clinical Syndrome

Beyond the consensus that frailty is a physiological state of heighted vulnerability, there are two major conceptual frameworks of frailty in common use. The first, and most common, is *physical frailty*, also known as *phenotypic* or *syndromic frailty*. Physical frailty arises from distinct dysregulation of physiologic processes that results in a vulnerability to adverse health outcomes and mortality, especially in the face of stressors. The second is *index frailty*, also known as *deficit accumulation frailty*. Index frailty results from accumulation of a number of diseases, impairments, and other health conditions in an individual. This state of multimorbidity is associated with increased risk of mortality and disability; the number of conditions predicts this vulnerability. In this approach, a large number of prevalent conditions mark an individual as frail. These 2 definitions and measures of frailty identify populations that overlap to a modest degree (SOE=A).

A phenotype of physical frailty has been developed and validated that links all aspects identified as clinical presentations of frailty (strength, balance, motor processing, nutrition, endurance, physical activity, mobility), based on the hypothesis that the clinical presentation of frailty results from dysregulated metabolic processes related to energy production, leading to the following:

- Decreased muscle mass, or sarcopenia, with resulting loss of strength
- Slowed motor performance (such as walking speed)
- Decreased physical activity

- Worsened exercise tolerance (or low energy or fatigue or exhaustion)
- Inadequate nutritional intake (even when physical activity is low)

The latter 3 result in further sarcopenia and, when nutritional intake is inadequate, weight loss as well. Identifying the presence of multiple manifestations (defined as ≥3 of the list above) provides specificity in formally defining an individual as frail (**Table 1**). Individuals with 1 or 2 of these are defined as pre-frail and at increased but intermediate risk of adverse outcomes and increased risk of frailty. Of note, the physical frailty phenotype does not include social or cognitive parameters.

Table 1—Criteria that Define Physical Frailty[a]

Characteristic	Criteria for Physical Frailty[b]
Weight loss	Lost >10 pounds unintentionally last year
Exhaustion	Felt last week that "everything I did was an effort" or "I could not get going"
Slowness	Time to walk 15 feet (cutoff depends on sex and height)
Low activity level	Expends <270 kcal/week (calculated from activity scale incorporating episodes of walking, household chores, yard work, etc)
Weakness	Grip strength measured using hand dynamometer (cutoff depends on sex and BMI)

[a] Syndrome present when ≥3 characteristics identified

[b] For specific measures and details for determining frailty criteria, see Fried LP, Tangen CM, Walston J, et al. Frailty in older adults: evidence for a phenotype. *J Gerontol Med Sci*. 2001;56A:M146–156. https://doi.org/10.1093/gerona/56.3.m146 (https://doi.org/10.1093/gerona/56.3.m146)

Research has shown this construct is consistent with the definition of a clinical syndrome, and that it is chronic and progressive, with early stages generally predicting progression to more severe frailty. However, frailty is heterogenous in presentation and trajectory. While many frail individuals progress, others may show improvement. Early stages of frailty are likely most amenable to intervention.

Observations support the concept of frailty as a clinical syndrome, the manifestations of which become apparent when physiologic dysregulation reaches a critical threshold. It has recognizable causes at the level of both altered physiology and potentially altered genetic, cellular, and molecular processes.

In this model, physical frailty is distinguished from disability, although clinically an individual may display both. In disability, individuals have a physical or mental impairment that substantially limits one or more major life activities, as well as the ability to interact with the world around them. In frailty, the presence of the criteria described above identify individuals who have reduced ability and reserve for adapting to stress, whatever their functional state. So, a functionally normal person could be frail but at high risk of decline and even disability after a stressor, while an individual who is disabled from an automobile accident may have intact physiologic compensatory mechanisms and thus not be frail. Similarly, physical frailty is also distinct from comorbidity, which refers to multiple chronic diseases or conditions. While comorbidity and frailty overlap substantially, comorbidity alone does not indicate a state of decreased reserve. The complex relationships between frailty and chronic diseases are still being explored. Likewise, older age itself is not synonymous with frailty; although the risk of frailty increases with age, many older adults remain robust while others may become frail at younger ages.

Many patients present for medical attention without the full syndromic definition of frailty, and clinicians caring for older adults should be adept at constructing a differential diagnosis in these cases. Evaluation for weight loss, depression, medication effects, occult malignancies, endocrine abnormalities, and neurologic decline should be considered.

EVIDENCE AS TO CAUSE

Primary Frailty

Sarcopenia, or loss of lean body mass, is a central manifestation of physical frailty and a key predictor of the other clinical manifestations. Predictors of loss of muscle mass and strength with aging include decreased anabolic factors such as testosterone and IGF-1, diminished physical activity, reduced nutritional intake (including protein, energy, vitamin D, and other micronutrients), and older age itself.

Although the fundamental underlying cause of frailty is still unknown, the intermediate process appears to entail the dysregulation of a critical number of physiologic systems, such as the endocrine, immune, and energy-response systems. In addition to sarcopenia, systemic abnormalities include a pro-inflammatory state (indicated by increased IL-6 and C-reactive protein), decreased immune function, anemia, altered clotting processes, glucose intolerance, increased insulin resistance, low levels of DHEA-S and IGF-1, increased cortisol, low testosterone, decreased heart rate variability, and nutritional derangements (low levels of certain vitamins and carotenoids, reduced intake of protein and energy). The number of abnormal systems is a stronger predictor of frailty than dysfunction in any one system, and there is evidence that abnormal physiological systems synergistically interact to increase frailty risk. There is no evidence to date that intervention on any one system modifies frailty risk.

In frail older adults, dysfunction in a physiological system may not be apparent at rest but is unmasked by a stressor. For example, in a resting state, levels of blood glucose and insulin may be in normal ranges but after a glucose tolerance test, levels are increased and the return to baseline is delayed in those who are frail compared with those who are not.

Secondary Frailty

A variety of primary diseases independently predict development of the frailty phenotype, potentially through inflammation and/or their effect on cardiopulmonary function and inactivity. Such diseases include immune disorders (eg, HIV/AIDS), heart failure, COPD, cancers, chronic kidney disease, metabolic syndrome, and chronic infections. Frailty has also been shown to increase adverse outcomes for chronic diseases and to predict worse outcomes from interventions for disease. Data on HIV-positive men indicate that HIV infection is associated with rates of a frailty-like presentation that would be found in HIV-negative men who are 10 years older. Additionally, frailty in association with HIV/AIDS predicts a lower response to therapy and a worse prognosis than HIV infection alone. Similarly, there is evidence that frailty is a risk factor for intolerance of some cancer chemotherapies and worse outcomes after kidney transplantation.

ASSESSMENT

To date, frailty assessment has not been fully integrated into clinical practice, in part because of a lack of clear evidence as to how best to manage frail patients once they are identified. Further research is also needed to address questions around frailty measures, screening, frailty trends and trajectories, prevention, and outcomes. Although the benefits of screening for frailty have not been conclusively demonstrated, an international consensus conference has recommended that adults at least 70 years old be screened, as well as those with significant weight loss (≥5%) due to chronic illnesses. The presence of frailty can be determined by use of several established methods. The approach chosen may differ depending on the setting and goal. In the clinical setting, assessing older adults for frailty may be appropriate to identify those at risk of adverse medical or surgical outcomes and to gauge the severity of risks, find those who may benefit from prevention or treatment, track change in status over time, help frame care plans, or determine eligibility for palliative care for those at end stage.

Reaching a single operational definition of frailty has been challenging given different conceptual frameworks, but numerous instruments have been developed that can be used to assess frailty in clinical practice. Most frailty instruments have been developed based on either the physical frailty model or the deficit accumulation model (**Table 2**). The physical frailty phenotype is a widely used method of assessing physical frailty. One component of this phenotype, gait speed, has by itself also been found to be a useful measure. It, along with grip strength, is an early manifestation of frailty and can serve as a marker in screening (SOE=A). Deficit accumulation frailty is generally assessed with a frailty index, which is useful to characterize aggregate morbidity burden and predicts risk of mortality. Other rapid screening/assessment tests have been developed for ease of use in clinical settings, such as the interview-based FRAIL scale, the Study of Osteoporotic Fractures tool, and the Edmonton Frailty Scale. Similarly, the Clinical Frailty Scale is a brief screening tool for frailty as a clinical composite. These brief screening tools should be followed up using more specific clinical evaluations for the syndrome of frailty (eg, comprehensive geriatric assessment).

Table 2—Examples of Frailty Instruments

Instrument	Brief description	Pros	Cons
Physical frailty phenotype[a]	Measurement of distinct phenotypic presentation; diagnosis and severity determined by number of criteria present out of five (see **Table 1**)	Commonly used	Requires hand dynamometer and space for walking; takes 5–10 min to complete
Gait speed	Gait speed alone	Predictive of adverse outcomes in many settings; takes a short time to administer	Requires space for walking
Study of Osteoporotic Fracture frailty measure[b]	Measurement of 3 components of physical frailty (weight loss, self-report energy, and chair rise)	Easy to administer in clinical settings	Requires chair and space for chair stands
Deficit accumulation index (Frailty Index)[c]	Measures based on number of deficits from multiple domains (including illnesses, signs and symptoms, laboratory findings, physical function or cognitive impairment, disability, or social)	Can be integrated into electronic medical records (EMR) system; variable number and types of measures included	Cumbersome if EMR data not available; time to complete variable depending on number/type of measures used
Edmonton Frail Scale[d]	Assesses 9 domains: cognition, general health status, functional independence, social support, medication use, nutrition, mood, continence, and functional performance	Identifies a number of clinically relevant domains	Requires space for Timed Up and Go test and pen/paper for clock-draw test
Clinical Frailty Scale[e]	9-point pictorial scale with corresponding text, which describes different frailty classifications; clinician assigns category based on observation, history, and medical record review	Fast screening tool with both pictorial and text representations	Requires clinical judgement to help inform score
FRAIL scale[f]	5-item questionnaire with questions about fatigue, resistance, ambulation (gait speed), illness, and loss of weight	Fast screening tool; takes <5 minutes to complete	Uses self-report measures

[a] For specific measures and details for determining frailty criteria, see Fried LP, Tangen CM, Walston J, et al. Frailty in older adults: evidence for a phenotype. *J Gerontol Med Sci*. 2001;56A:M146–156. https://doi.org/10.1093/gerona/56.3.m146 (https://doi.org/10.1093/gerona/56.3.m146)

[b] For specific measures and details for determining frailty criteria, see Ensrud KE, Ewing SK, Taylor BC, et al. Comparison of 2 frailty indexes for prediction of falls, disability, fractures, and death in older women. *Arch Intern Med*. 2008;168(4):382–389. https://doi.org/10.1001/archinternmed.2007.113 (https://doi.org/10.1001/archinternmed.2007.113)

[c] For specific measures and details for determining frailty criteria, see Mitnitski AB, Mogilner AJ, Rockwood K. Accumulation of deficits as a proxy measure of aging. *Scientific World J*. 2001;1:323–336. https://doi.org/10.1100/tsw.2001.58 (https://doi.org/10.1100/tsw.2001.58).

[d] For specific measures and details for determining frailty criteria, see Rolfson DB, Majumdar SR, Tsuyuki RT, et al. Validity and reliability of the Edmonton Frail Scale. *Age Ageing*. 2006;35(5):526–529. https://doi.org/10.1093/ageing/afl041 (https://doi.org/10.1093/ageing/afl041)

[e] For specific measures and details for determining frailty criteria, see Rockwood K, Song X, MacKnight C, et al. A global clinical measure of fitness and frailty in elderly people. *CMAJ.* 2005;173(5):489–495. https://doi.org/10.1503/cmaj.050051 (https://doi.org/10.1503/cmaj.050051)

[f] For specific measures and details for determining frailty criteria, see Morley JE, Malmstrom TK, Miller DK. A simple frailty questionnaire (FRAIL) predicts outcomes in middle aged African Americans. *J Nutr Health Aging.* 2012;16(7):601–608. https://doi.org/10.1007/s12603-012-0084-2 (https://doi.org/10.1007/s12603-012-0084-2)

Agreement between frailty instruments varies widely, and these instruments may not always identify the same individuals in a population as frail. Thus, these instruments cannot be assumed to be interchangeable. Clinicians should ideally select a frailty instrument based on its purpose and validity in the specific setting (SOE=B).

Frailty assessment has been increasingly used in a variety of specialties, such as oncology, cardiology, infectious diseases, nephrology, transplant, and surgery. In these areas, frailty has been used for risk assessment and to support clinical decision-making about interventions or treatment options. Among patients with chronic kidney disease, for example, frailty screening may identify those who may benefit most from a geriatric assessment and may help guide shared decision-making about care plans. Frailty assessment in specialty settings may also help identify individuals who may benefit from rehabilitation/prehabilitation or other medical care before a surgery or intervention and may help frame recovery expectations.

PREVAILING MANAGEMENT STRATEGIES

Comprehensive geriatric assessment and management is a clinical care model designed to optimize outcomes for frail older adults, particularly preservation of their independence. This team-based, multidisciplinary approach results in positive effects on polypharmacy, falls, functional status, and nursing-home admission, and reduces mortality. The assessment can also help to identify other medical, functional, social, psychological, or cognitive issues. It should include accurate frailty assessment combined with ongoing, expert geriatric care. Considering the frailty severity may inform more person-centered care. The focus of care should be 1) to exclude any modifiable precipitating causes of frailty, particularly those that are treatable or environmental; 2) to improve the clinical manifestations of frailty, especially low physical activity, strength, exercise tolerance, and nutrition; and 3) to minimize the consequences of the vulnerability of frail older adults by directing attention to environmental risks, extent of social support, falls prevention, and the risks from stressors such as acute illness or injury, hospitalization, or surgery. Frail adults subject to such stressors should be provided support for a potentially prolonged recovery.

Resistance, or strengthening, exercise, appears to be a key management approach for frailty and its prevention (SOE=C). This can be supplemented by walking for exercise and balance training. Resistance training alone or as part of a multicomponent exercise program has been found to increase strength and function in older adults with fewer adverse health outcomes. The optimal frequency, intensity, time, and type of exercise is not yet known. Added nutritional support, particularly protein-calorie supplementation, has shown benefit when combined with exercise and should be considered if the individual exhibits weight loss or undernutrition. A comprehensive management plan should also include a medication review to address polypharmacy and an evaluation of other medical causes of weight loss or exhaustion as needed.

The approach that many older adults use to adapt to age-related psychosocial losses and behaviors can also be applied to challenges in physical health and frailty. In the face of diminished resources or reserves, older adults must carefully choose their goals, focus on optimizing the abilities needed to reach their goals, and then compensate for any diminished competencies by increased reliance on other functions or by replacement. Such compensations could include social support services such as meal delivery services or supportive residential environments that offer personal care or meals if needed. Clinical management needs to include such approaches for care of frail older adults, as well as more standard medical approaches. Further, implementing systematic approaches to decrease the stress of environments such as hospitals, surgical centers, and rehabilitation facilities may also be effective.

For some frail older adults with advanced illness or limited remaining life expectancy, certain screening tests or treatments may be of little benefit, may be burdensome or potentially harmful, and may not be in line with their preferences or goals. The National Committee for Quality Assurance has allowed exclusions to the Healthcare Effectiveness Data and Information Set (HEDIS) measures for patients with advanced illness and frailty. Patients ≥65 years old with both advanced illness and frailty can be excluded from certain screening and treatment measures, and patients ≥80 years old with frailty alone can be excluded. For severe frailty, palliative care or hospice may be appropriate, depending on severity and patient preferences.

POTENTIAL APPROACHES FOR PREVENTION

Points of Vulnerability and Precipitants

Exposure to any of a variety of stressors appears to put frail older adults at risk of adverse outcomes and may precipitate clinically apparent frailty in those already at risk. Immobility is one key precipitant, causing frailty to develop or worsen, as well as accelerating the onset of adverse outcomes such as dependency. This holds regardless of whether immobility results from pain, illness, or in the context of hospitalization or surgery. Depression may result from frailty but may also be a precipitant, given its association with decreased activity, energy, and nutritional intake, as well as with inflammation and social isolation. Overall, attention should be paid to minimizing potential precipitants and their associated stress, through systematic screening, case finding, and quality improvement approaches. However, evidence supporting the benefit of such efforts in the context of frailty is limited.

Potential Pharmacologic Treatments

Although vitamin D deficiency has been associated with physical frailty, no large-scale study has demonstrated a significant treatment effect on frailty with vitamin D repletion. Similarly, replacing deficiencies of any one hormone or repleting defects in other systems as a sole intervention has not been demonstrated to prevent or ameliorate frailty. Theoretically, this is understandable, given that the number of deficits in multiple physiologic systems most strongly predicts frailty, rather than the presence of any one deficit alone. This suggests that improving only one system (eg, immune, hormonal, musculoskeletal) may not be clinically effective, and future effective treatments will likely be those that target multiple systems simultaneously.

Behavioral Approaches to Prevention or Treatment

Maintaining physical activity and muscle mass is critical in older adults at risk of frailty. Evidence is substantial that resistance, or strengthening, exercise is effective in increasing muscle mass, strength, and walking speed in frail older adults (SOE=A). Other forms of exercise, including stretching, Tai Chi, and aerobic exercise, are also helpful to improve physical function. Prevention of immobility is critical. Overall, exercise has proven beneficial physiologic effects on sarcopenia, inflammation, and other systems associated with frailty, making maintenance of physical activity and strength a cornerstone of prevention, prehabilitation, and treatment. Importantly, randomized controlled trials of exercise interventions have demonstrated increased gait speed and reduced functional limitations.

Consumption of a Mediterranean diet lowered the risk of becoming frail in community-dwelling adults ≥65 years old (SOE=C). More broadly, attention to preventing nutritional inadequacy is important, including supplementation of protein, calories, and micronutrients as needed, particularly when weight loss or undernutrition has been diagnosed. In many studies, nutritional supplementation, when added to exercise, appears to improve physical performance markers, such as muscle strength and walking.

FRAILTY AND FAILURE TO THRIVE

A clinical concept that is an antecedent of current conceptualizations of frailty is that of failure to thrive. In geriatrics, this was historically used as a blanket diagnosis at admission to a hospital or long-term care setting, in the context of an older patient with a range of severe symptoms, including fatigue, poor nutritional intake, weight loss, social withdrawal, and/or decline in cognitive and physical function, often in a state of functional collapse, and without an apparent cause. It was commonly thought that depression was a key component as well. This diagnosis was associated with poor response to treatment or rehabilitation, increased rates of pressure injury, infection, diminished cell-mediated immunity, and high surgical and short-term mortality rates. Some experts have argued that the term should be abandoned because it does not assist thoughtful evaluation, while others have expressed concern that the application of a term initially used for delayed development in children appeared pejorative when applied to older adults. Nevertheless, there may well be conceptual overlap between the concept of failure to thrive and very severe, or end-stage, frailty.

FRAILTY AND PALLIATIVE CARE

Frailty predicts functional decline and onset and progression of dependency at the end of life. As frailty progresses, other geriatric syndromes, including cognitive impairment, delirium, falls, incontinence, pressure injury, and functional decline may also become apparent. Severe frailty, with 4 or 5 syndrome characteristics (**Table 1**), and metabolic abnormalities of low cholesterol and albumin predict particularly high short-term mortality rates in frail older adults (SOE=B); these characteristics can be considered to mark a pre-death phase of severe frailty. Clinical case series document a poor response to treatment in those with end-stage frailty. Adopting palliative approaches for such patients may be appropriate, if consistent with goals of care, to address varied physical and psychosocial needs at the end of life.

RESOURCES

- Apóstolo J, Cooke R, Bobrowicz-Campos E, et al. Effectiveness of interventions to prevent pre-frailty and frailty progression in older adults: a systematic review [published correction appears in *JBI Database System Rev Implement Rep*. 2018;16(5):1282–1283]. *JBI Database System Rev Implement Rep*. 2018;16(1):140–232. **https://doi.org/10.11124/JBISRIR-2017-003382 (https://doi.org/10.11124/JBISRIR-2017-003382)**
- Dent E, Morley JE, Cruz-Jentoft AJ, et al. Physical Frailty: ICFSR International Clinical Practice Guidelines for Identification and Management. *J Nutr Health Aging*. 2019;23(9):771–787. **https://doi.org/10.1007/s12603-019-1273-z (https://doi.org/10.1007/s12603-019-1273-z)**
- Fried LP, Tangen CM, Walston J, et al. Frailty in older adults: evidence for a phenotype. *J Gerontol A Biol Sci Med Sci*. 2001;56(3):M146–M156. **https://doi.org/10.1093/gerona/56.3.m146 (https://doi.org/10.1093/gerona/56.3.m146)**
- Mrdutt MM, Papaconstantinou HT, Robinson BD, et al. Preoperative frailty and surgical outcomes across diverse surgical subspecialties in a large health care system. *J Am Coll Surg*. 2019;228(4):482–490. **https://journals.lww.com/journalacs/Abstract/2019/04000/Preoperative_Frailty_and_Surgical_Outcomes_Across.28.aspx (https://journals.lww.com/journalacs/Abstract/2019/04000/Preoperative_Frailty_and_Surgical_Outcomes_Across.28.aspx)**
- van Loon IN, Goto NA, Boereboom FTJ, et al. Frailty screening tools for elderly patients incident to dialysis. *Clin J Am Soc Nephrol*. 2017;12(9):1480–1488. **https://doi.org/10.2215/CJN.11801116 (https://doi.org/10.2215/CJN.11801116)**