Frailty Syndrome: Physical Therapy

Indexing Metadata/Description

- **Title/condition:** Frailty Syndrome: Physical Therapy
- **Synonyms:** Frailty, physical therapy; senility, physical therapy; functional decline in the elderly; frailty syndrome
- **Anatomical location/body part affected:** Multiple systems/generalized functional disability
- **Area(s) of specialty:** Geriatric rehabilitation, home health
- **Description**
  - Frailty is a clinical syndrome resulting from multisystem impairments. Frailty increases in prevalence in old age (> 65 years of age) but is not considered part of normal aging (32)
  - Frailty results in a functional decline in older adults that necessitates the assistance of others to perform activities of daily living (ADLs), including either or both instrumental and noninstrumental ADLs
  - There are a number of definitions of frailty in use, and there is not one gold standard definition (32)
  - One definition, developed in 2001 by Fried, refers to a frailty phenotype in which 3 or more of the following 5 criteria are present (33):
    - Unintentional weight loss (10 lb/4.5 kg in past year)
    - Self-reported exhaustion
    - Weakness (as measured with grip strength)
    - Slow walking speed
    - Low physical activity
  - Presence of 1 or 2 of these criteria is considered “pre-frail,” “intermediate frail,” or vulnerable to frailty
  - Comprehensive evaluation of the extent of frailty in the primary care setting involves geriatric assessment in multiple physical and psychological domains with a screening instrument such as the Clinical Frailty Scale, the Tilburg Frailty Indicator, or the Survey of Health Aging and Retirement in Europe (SHARE) Frailty Index (1)
    - The SHARE Frailty Index differs from the criteria originally proposed by Fried in that:
      - weight loss is replaced with appetite loss
      - slowness is measured by a self-reported mobility limitation
  - The term frailty is used clinically to refer to older patients with low functional reserve who are vulnerable to external stressors and at high risk for adverse outcomes, including disability, hospitalization, institutionalization, and death. Frailty is not synonymous with either comorbidity or disability. Comorbidity is an etiologic risk factor for frailty, and disability is an outcome of frailty (33,35)
  - This Clinical Review focuses on the components of frailty that physical therapists can address: unintentional weight and muscle loss, persistent fatigue, increased fall risk, and functional decline in strength, gait speed, and ADLS (2,3)
• Individuals may present with deficits in cognition and sensorimotor input and integration. Multiple medication intake, dehydration, and malnutrition can also lead to frailty
• See also Clinical Review…Falls in Older Adults; Item Number: T708541

› ICD-9 code
• 797 senility without mention of psychosis

› ICD-10 code
• R54 senility

(IDC codes are provided for reader’s reference, not for billing purposes)

› G-Codes
• Mobility G-code set
  – G8978, Mobility: walking & moving around functional limitation, current status, at therapy episode outset and at reporting intervals
  – G8979, Mobility: walking & moving around functional limitation; projected goal status, at therapy episode outset, at reporting intervals, and at discharge or to end reporting
  – G8980, Mobility: walking & moving around functional limitation, discharge status, at discharge from therapy or to end reporting

• Changing & Maintaining Body Position G-code set
  – G8981, Changing & maintaining body position functional limitation, current status, at therapy episode outset and at reporting intervals
  – G8982, Changing & maintaining body position functional limitation, projected goal status, at therapy episode outset, at reporting intervals, and at discharge or to end reporting
  – G8983, Changing & maintaining body position functional limitation, discharge status, at discharge from therapy or to end reporting

• Other PT/OT Primary G-code set
  – G8990, Other physical or occupational primary functional limitation, current status, at therapy episode outset and at reporting intervals
  – G8991, Other physical or occupational primary functional limitation, projected goal status, at therapy episode outset, at reporting intervals, and at discharge or to end reporting
  – G8992, Other physical or occupational primary functional limitation, discharge status, at discharge from therapy or to end reporting

• Other PT/OT Subsequent G-code set
  – G8993, Other physical or occupational subsequent functional limitation, current status, at therapy episode outset and at reporting intervals
  – G8994, Other physical or occupational subsequent functional limitation, projected goal status, at therapy episode outset, at reporting intervals, and at discharge or to end reporting
  – G8995, Other physical or occupational subsequent functional limitation, discharge status, at discharge from therapy or to end reporting

› G-code Modifier
<table>
<thead>
<tr>
<th>Impairment Limitation Restriction</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH 0 percent impaired, limited or restricted</td>
</tr>
<tr>
<td>CI At least 1 percent but less than 20 percent impaired, limited or restricted</td>
</tr>
<tr>
<td>CJ At least 20 percent but less than 40 percent impaired, limited or restricted</td>
</tr>
<tr>
<td>CK At least 40 percent but less than 60 percent impaired, limited or restricted</td>
</tr>
<tr>
<td>CL At least 60 percent but less than 80 percent impaired, limited or restricted</td>
</tr>
<tr>
<td>CM At least 80 percent but less than 100 percent impaired, limited or restricted</td>
</tr>
<tr>
<td>CN 100 percent impaired, limited or restricted</td>
</tr>
</tbody>
</table>
Reimbursement: Reimbursement for therapy will depend on insurance contract coverage; no specific special agencies are applicable for this condition. No specific issues or information regarding reimbursement have been identified.

Presentation/signs and symptoms (1,2,3)

- Older adult
  - Chronological age is generally a poor indicator of physical or cognitive function, and each patient should be addressed individually
- Impaired functionality in ADLs
- Muscle weakness (e.g., reduced grip and lower extremity strength)
- Slow gait speed
- Unintentional body weight loss
- Muscle loss
- Persistent fatigue
- Impaired posture and balance that increase falls risk
- Impaired eyesight
- Poor respiratory function and cardiovascular function
- Social isolation

Causes, Pathogenesis, & Risk Factors

Causes (1,2,3)

- Age-related physical and cognitive impairments
- Multiple systems are thought to be involved in the development of frailty, including the immune, cardiovascular, neuroendocrine, metabolic, and nervous systems (32). The more of these systems that become dysregulated, the more likely a person will become frail (32).
  - Dysregulation is thought to be multifactorial in origin, with genetic, biological, physical, psychological, social, and environmental components contributing (32).
- Contributors
  - Chronic undernutrition (e.g., insufficient caloric intake) with weight loss (5)
  - Hypokinetic lifestyle (i.e., minimal physical activity) leading to reduced functional capacity
  - Sarcopenia (i.e., deficiency of muscle mass) with generalized weakness
  - Behavioral precursors include a decrease in life space, defined as the size of the area a person purposely moves through in his or her daily life, as well as the frequency of travel within a specific time frame (45).

Pathogenesis

- In general, frailty status is a continuum of the self-reported need for assistance to perform instrumental and noninstrumental ADLs (1,2). Consequently, individuals with disabling comorbidities may not be overtly frail, but rather “prefrail” or “vulnerable” to frailty (6).
- Frailty status was diagnosed independently of cognitive impairment in Italian community-dwelling patients (N = 109) with Alzheimer’s disease using the Study of Osteoporotic Fractures criteria, which include dependence in basic ADLs, especially self-dressing (7).
- It has been proposed that decreased total energy expenditure, due mainly to insufficient physical activity, initiates a “frailty cycle” that perpetuates the risk of further decline and greater disability with advancing age (8).
  - Components of the frailty cycle include neuroendocrine dysregulation, anorexia, chronic undernutrition, negative energy and nitrogen balance, weight loss, sarcopenia, reduced daily activity, decreased physical fitness (e.g., aerobic power, strength), slow walking speed, hypometabolic state, and disability in ADLs (8).
- Multiple comorbidities likely contribute to a high disease burden that promotes functional decline due, for example, to lower extremity weakness/paresis, restricted range of motion (ROM), pain in weight-bearing joints, and deficits in proprioception and balance.
- Age-related changes in blood androgens and estrogens may contribute to frailty in men (9)
• Inflammation is associated with frailty\(^{(32)}\)
  – Proinflammatory cytokines may have catabolic effects on muscle
  – The inflammatory state may be a marker of underlying oxidative stress

› **Risk factors**
  • Comorbidity (i.e., the simultaneous presence of 2 or more chronic diseases or conditions)\(^{(33)}\)
  • Anorexia\(^{(8)}\)
  • Decline of muscle mass\(^{(8)}\)
  • Reduced balance\(^{(8)}\)
  • Reduced mobility\(^{(8)}\)
  • Osteoporosis\(^{(8)}\)
  • Chronic fatigue\(^{(8)}\)
  • History of falls\(^{(8)}\)
  • Poor nutritional habits
    – Low levels of vitamin D has been associated with frailty among nursing home residents\(^{(57)}\)
  • Older adults with hearing impairments have a 63% increased risk of developing frailty\(^{(58)}\)
  • Poor health\(^{(8)}\)
  • Social isolation
  • Patients with heart failure\(^{(56)}\)
  • Obesity\(^{(36)}\)

• In randomly selected Brazilian community-dwelling older persons (N = 391), associated factors were advanced age, comorbidity, and negative perception of health status\(^{(10)}\)

• Reduced lower extremity strength, assessed using the five times sit-to-stand test (FTSTST), in a convenience sample (N = 150) from a Brazilian outpatient geriatric clinic\(^{(11)}\)

• Age
  – Factors associated with prefrailty include being 70-79 years of age and with frailty being 80-89 years of age\(^{(39)}\)
    - Based on a study conducted in Brazil that involved 958 older individuals living in an urban area
  • Authors of a 2015 systematic review with meta-analysis found that ~50% of patients who reside in a nursing home are considered frail\(^{(53)}\)

• Based on a study conducted in Brazil, other factors associated with prefrailty or frailty in older adults living in urban areas include\(^{(39)}\)
  – using 1-4 medications (prefrailty) or 5 or more medications (frailty)
  – greater number of comorbidities
  – functional disabilities in IADLs
  – negative self-perception
  – absence of a partner
  – hospitalization in the past year
  – indication of depression

• Genetic factors
  – Heritability of traits that contribute to frailty phenotype is under investigation\(^{(50)}\)

---

**Overall Contraindications/Precautions**

› Obtain general restrictions for mobility and weight-bearing from physician. Multiple precautions may be warranted depending on severity of frailty

› Modify treatment to accommodate underlying diseases and conditions that may disturb balance (e.g., lower extremity weakness, visual/hearing impairment, postural hypotension, hypoglycemia, head trauma, joint pain, cardiac insufficiency, hemiplegia, incontinence)

› Use extreme caution with physical restraints (e.g., straps, belts) to prevent falls. Direct supervision is necessary when restraints are used. Unsupervised use may result in serious injury and possibly death
Examination

Contraindications/precautions to examination

- Stop the examination and refer back to physician if patient has a new or untreated injury or condition
- Consult with physician in cases of active inflammation or apparent infection of unhealed wounds
- Consult with physician in cases of severe disability requiring hands-on assistance
- In patients with low endurance and fatigability, it may be necessary to modify the examination and take more than one session to complete it
- Patient’s pain should be respected at all times
- In cases where patient is a poor historian, it may be necessary to obtain information from a caregiver

History

- **Etiology of illness:** When was frailty diagnosed in this patient? Has a comprehensive geriatric evaluation been conducted? If so, what were the conclusions regarding the cause(s) of frailty? What is the reason for referral or the patient’s main complaint?
- **Course of treatment**
  - **Medical management:** What interventions have been taken to reverse or prevent the progression of frailty in this patient? For example, was the patient started on a special nutritional program for sarcopenia? Has a home safety program been conducted to assess fall risk?
  - **Medications for current illness/injury:** Determine what medications clinician has prescribed for this condition. Are they being taken? Examples of medications used to treat symptoms seen in frailty include:
    - cholecalciferol (vitamin D)\(^{(2)}\)
    - hormones (e.g., testosterone, estrogen, progesterone)
    - topical androgen (e.g., AndroGel is used to prevent sarcopenia)
    - methylphenidate (Ritalin): used as a short-term stimulant
    - Frail older adults are more susceptible to adverse drug effects than are robust older adults due to their loss of physiological reserve and increase in comorbidities and drug use\(^{(32)}\)
  - **Diagnostic tests completed:** Tests that may be included in the comprehensive evaluation of frailty include the following:
    - Blood analysis (e.g., complete blood count [CBC] and serum concentrations of metabolic hormones, 25-hydroxyvitamin D, androgens)
    - Electrocardiogram (EKG)
    - Bone density scan
    - Estimation of body composition (i.e., lean mass, fat mass, water content)
    - Resting metabolic rate
  - **Home remedies/alternative therapies:** Document any use of home remedies (e.g., ice or heating pack) or alternative therapies (e.g., acupuncture) and whether or not they help
  - **Previous therapy:** Document whether patient has had occupational or physical therapy for this or other conditions and what specific treatments were helpful or not helpful
- **Aggravating/easing factors** (and length of time each item is performed before the symptoms come on or are eased)
- **Body chart:** Use body chart to document location and nature of symptoms
- **Nature of symptoms:** Document nature of symptoms (e.g., constant vs. intermittent, sharp, dull, aching, burning, numbness, tingling)
- **Rating of symptoms:** Use a visual analog scale (VAS) or 0-10 scale to assess symptoms at their best, at their worst, and at the moment (specifically address if pain is present now and how much)
- **Pattern of symptoms:** Document changes in symptoms throughout the day and night, if any (A.M., mid-day, P.M., night); also document changes in symptoms due to weather or other external variables
Sleep disturbance: Poor subjective sleep quality, greater nighttime wakefulness, and greater nocturnal hypoxemia are independently associated with higher odds of frailty; excessive daytime sleepiness, greater nighttime wakefulness, severe sleep apnea, and greater nocturnal hypoxemia are independently associated with an increased risk of mortality.

- Document number of wakings/night. Does the patient complain of daytime fatigue? Does the patient report taking medications to assist with falling asleep or staying asleep? Does the patient nap during the day? How frequently?
- Does the patient report nocturia? How many times per night? Nocturia is a common cause of disturbed sleep in older adults that fragments the sleep cycle and has a negative impact on the quality of sleep. It has been associated with daytime sleepiness, falls, and fall-related morbidity.

Other symptoms: Document other symptoms patient may be experiencing that could exacerbate the condition and/or symptoms that could be indicative of a need to refer to physician (e.g., dizziness, chest pain or tightness, incontinence, fever, confusion)

Respiratory status: Does the patient require supplemental oxygen, mechanical ventilator, etc.? Any shortness of breath or chronic cough? Does the patient use a continuous positive airway pressure (CPAP) machine for sleep apnea?

Barriers to learning
- Are there any barriers to learning? Yes__ No__
- If Yes, describe _________________________

Medical history
- Past medical history
  - Previous history of same/similar diagnosis: Document prior management for this condition. Does the patient have a history of falls or near-falls? How many in the past year?
  - Comorbid diagnoses: Ask patient or caregiver about other problems, including cognitive impairment, diabetes, cancer, heart disease, complications of pregnancy, psychiatric disorders, orthopedic disorders, osteoporosis, arthritis, infections, etc.
  - Medications previously prescribed: Obtain a comprehensive list of medications prescribed and/or being taken (including over-the-counter drugs)
  - Other symptoms: Ask patient about other symptoms he or she may be experiencing, including loss of appetite, memory problems, fatigue, and depression

Social/occupational history
- Patient’s goals: Document the patient’s and/or caregiver’s goals for treatment
- Vocation/avocation and associated repetitive behaviors, if any: What are the roles and responsibilities of the patient? What activities does the patient participate in? How much daily physical activity does the patient typically perform?
- Functional limitations/assistance with ADLS/adaptive equipment: Document requirements for assistance and aids. Obtain results of occupational therapy ADL testing where available
- Living environment: Stairs, number of floors in home, who patient lives with, caregivers, etc.? Identify if there are barriers to independence in the home; are any modifications necessary?

Relevant tests and measures: (While tests and measures are listed in alphabetical order, sequencing should be appropriate to patient medical condition, functional status, and setting)

- Anthropometric characteristics: Document height, weight, and body mass index (BMI)
  - Although unintended weight loss is a well-known criterion for frailty, obesity has also been identified as a major cause of frailty in older adults.

- Arousal, attention, cognition: Assess orientation x 4 (name, place, date, reason) and ability to follow instructions. The Mini-Mental State Examination (MMSE) can be used to screen for cognitive impairment
  - Cognitive function is worse across multiple domains in prefrail and frail people over age 50 than in people over age 50 who are robust (defined as not meeting any of the 5 criteria for frailty phenotype).
  - Based on a study conducted in Ireland using data from the Irish Longitudinal Study on Aging that involved 4,649 people
  - The cognitive battery administered included the MMSE, Montreal Cognitive Assessment, Color Trails Test, Cambridge Mental Disorders of the Elderly Examination memory and executive function subtests, 10-word recall, Sustained Attention to Response Task, and choice reaction time
  - Cognitive function across all domains except self-rated memory and processing speed was significantly worse in prefrail and frail participants than in robust participants

- Assistive and adaptive devices: Assess patient’s need for ambulatory aid or adaptive device. If such a device has been prescribed, is it being used correctly?
- For more information see *Clinical Review...Ambulatory Assistive Devices*; Item Number: T708914

**Balance:** There is no gold standard screening test; assess balance statically and dynamically, in sitting and standing
- A score below 45 on the Berg Balance Scale (BBS; 14 items, each scored on a 4-point scale) is associated with increased risk of falling, with a sensitivity of 91% and specificity of 82%\(^{(12,13)}\)
- A difference less than 7 inches between the reach distance at loss of balance and the patient’s arm length on the Functional Reach Test (FRT; the patient makes a fist with right shoulder in 90° forward flexion and leans slowly forward as far as possible to loss of balance) is associated with limitations in ADLs, balance, and mobility\(^{(12)}\)

**Cardiorespiratory function and endurance:** If appropriate for patient’s functional status, administer 6-minute walk for distance test (6MWT). In an assisted living setting in the United States, older adult patients (72 to 96 years of age) improved their walk distance on follow-up after exercise training for 12 months\(^{(14)}\)

**Circulation:** Assess distal pulses in lower extremities. Assess blood pressure in supine, sit, and stand. Document symptoms of postural hypotension

**Functional mobility** (including transfers, etc.): Assess safety, ability, and need for adaptive equipment in general mobility
- Administer the Timed Up and Go (TUG) test (stand up, walk 3 meters, turn around, walk back, and sit down again)
  - More than 30 seconds is associated with the need for assistance with mobility tasks; 20 seconds or less is considered functional\(^{(12)}\)
- Utilize FIM for objective measurement, as indicated

**Gait/locomotion**
- Note step length, step symmetry, and gait abnormalities (e.g., limp, shuffle, contact between swing foot and stance foot)
- Measure preferred and maximal gait speed using 10-meter walk test (10MWT). Gait speed over a short distance can identify frail older adults; slow gait speed is a strong predictor of adverse outcomes associated with frailty\(^{(3)}\)
- A score of 22 or less on the Functional Gait Assessment (FGA; 10 items scored on a 0 to 3 scale, 30 points possible) was found effective for classifying fall risk in older adults\(^{(15)}\)
- The Dynamic Gait Index (DGI) or modified Dynamic Gait Index (mDGI) can be used to assess safety during ambulation

**Motor control:** Screen for motor control impairments, including reduced coordination and dexterity, abnormal tone, movement disorders (e.g., dyskinesia, bradykinesia), and tremors

**Muscle strength:** Assess gross functional strength of upper and lower extremities with manual muscle testing (MMT). Pay special attention to quadriceps and calf strength in relation to ambulatory function. The FTSTST can be used to assess functional strength of the lower extremities
- Measure grip strength with dynamometer. Decreased grip strength is an identified criterion for the presence of frailty syndrome\(^{(33,35)}\)

**Posture:** Assess posture in sitting and standing. Forward head position and thoracic kyphosis contribute to postural instability and increased reliance on hip strategies to maintain balance\(^{(16)}\)

**Range of motion:** Assess gross functional ROM. Decreased ankle ROM (e.g., due to contracture or limited by ankle foot orthosis) can restrict the use of ankle strategy to maintain balance and increase postural sway, causing greater reliance on hip strategies and trunk muscle strength\(^{(16)}\)

**Reflex testing:** Assess patellar and Achilles tendon reflexes

**Self-care/activities of daily living** (objective testing): Assess need for adaptive equipment (handrails, shower bench, raised toilet seat, cane or walker) to complete instrumental ADLs safely. Utilize Barthel Index for objective measurement

**Sensory testing:** Assess sensation to light touch and proprioception in lower extremities. Altered proprioception and reduced sensation of the lower extremities can contribute to greater reliance on hip strategies to maintain balance.\(^{(16)}\) A patient with impaired vision should be referred for an eye examination to assess for deficits in acuity, peripheral vision, and depth perception

**Special tests**\(^{(2)}\)
- Tilburg Frailty Indicator (TFI)
  - The 15 single components and the frailty domains (physical, psychological, social) of the TFI correlate well with validated measures, demonstrating good construct validity. The predictive validity of the TFI and its physical domain is good for quality of life, disability and receiving personal care, nursing, and informal care\(^{(46)}\)
  - Test-retest reliability is good\(^{(46)}\)
– SHARE Frailty Index
  - Measures frailty by appetite loss, exhaustion, weakness, slowness, and reduced physical activity [34]
  - Has been found to be a valid construct with a qualitatively similar factor structure across the 12 European countries identified as SHARE countries [24]

– Clinical Frailty Scale
  - A 7-point scale that correlates well with other established tools

Assessment/Plan of Care

 › Contraindications/precautions
   • Patients with this diagnosis are at risk for falls; follow facility protocols for fall prevention and post fall prevention instructions at bedside, if inpatient. Ensure that patient and family/caregivers are aware of the potential for falls and educated about fall prevention strategies. Discharge criteria should include independence with fall prevention strategies
   • Take precautions to prevent falls while patient exercises, especially during functional training to improve posture, balance, and gait (e.g., use gait belt, parallel bars, or the assistance of another therapist when necessary)
   • Be sensitive to fatigue levels of patients
   • Evidence is lacking to support the use of physical or electrotherapeutic modalities for management of frailty per se. Clinicians should follow the guidelines of their clinic/hospital and what is ordered by the patient’s physician
   • Consider use of protective equipment such as hip pads to prevent falls injury
   • Only those contraindications/precautions applicable to this diagnosis are mentioned above. Rehabilitation professionals should always use their professional judgment

 › Diagnosis/need for treatment: Functional decline consistent with frailty/reduced gait speed associated with lower extremity weakness and deficits in posture and balance; increased falls risk

 › Rule out: Elder abuse (e.g., excessive use of physical restraints); severe depression; psychosis

 › Prognosis
   • Frailty is thought to be reversible. Individuals can move back and forth between robust, prefrail, and frail states [32]
   • Improved outcomes are associated with physical activity interventions, especially PRE training, in older adults who live at home [4, 17]. Nutritional supplementation without exercise training was not effective for improving muscle strength of physically frail, community-dwelling people who averaged 87 years of age [18]
   • Approximately a third of patients who were initially diagnosed as frail are readmitted to the hospital within 90 days following discharge from a rehab facility. The protective barriers from rehab were diminished within 60 days from discharge [33]

 › Referral to other disciplines
   • Geriatrician for assessment and treatment of multiple health problems and chronic conditions in patients over 65 years of age
   • Dietician for nutrition analysis and dietary therapy
   • Speech-language pathologist (SLP) for nutrition issues secondary to swallowing problems
   • Dentist for nutrition concerns related to dental health
   • Ophthalmologist for vision assessment and correction
   • Audiologist to address hearing impairments
   • Neurologist for assessment and treatment of neurological disorders such as vestibular disease or movement disorders as indicated
   • Psychiatrist to treat mental health problems such as anxiety and depression
   • Community center for community-based activity program
   • Social worker for placement and social environment issues
   • Orthopedics/orthotist for postural bracing system, footwear
   • Nursing for skin care, medication compliance, and continence issues

 › Other considerations
   • Most frail but ambulatory patients should have a home safety evaluation to prevent falls
   • Review for and monitor medications that may contribute to physical inactivity (e.g., sedatives) or cause electrolyte imbalances and weakness (e.g., diuretics)
• Social isolation and loneliness are common problems in older adults and have been linked to poor health outcomes. Older patients with frailty syndrome should be screened for depression and suicide risk.

– A passive death wish was found to be significantly associated with being categorized as frail, independent of depressive symptomatology, in a study conducted in Ireland.

– A passive death wish increases risk for suicide.

• Late-life depression with comorbid frailty syndrome has been demonstrated and a possible contribution to causality may exist. Based on a 2015 systematic review of the relationship between depression and frailty syndrome, authors of the systematic review support that frailty and depression are comorbid geriatric syndromes in a subgroup of older adults but at the same time frailty is also a risk factor for the development and persistence of depressive symptoms. A possible explanation for the comorbidity in the subgroup of frail individuals may be the presence of common underlying processes (e.g., low grade inflammation is related to both).

• Nutritional supplements
  – Vitamin D and calcium
  – Dehydroepiandrosterone (DHEA) supplementation for 6 months improved lower extremity strength and function in frail older women, who also participated in a gentle exercise program of chair aerobics or yoga (90 minutes, twice weekly), compared to controls.
  – Amino acids
  – Carotenoids
  – Creatine

• Results of a cross-sectional study conducted in Germany that included 478 men and 462 women indicated that high levels of 25-hydroxyvitamin D were inversely associated with being frail or prefrail.

• Transdermal testosterone supplementation (without exercise training) for 6 months improved muscle strength, physical function, and lean mass in prefrail and frail older adult men with low testosterone levels. However, the benefits did not persist at 6 months after stopping treatment.

› Treatment summary

• Findings of systematic reviews support exercise interventions for improving balance and preventing falls in older people.

• Progressive resistance exercise (PRE) training may reduce the functional decline and increased risk of falls associated with muscle weakness in old age.

  – Based on a 2009 Cochrane systematic review.

• In a 2012 systematic review with meta-analysis, authors found that prescribed exercise training in frail older adults improved strength, gait speed, BBS scores, and performance in ADLs compared to usual care. In contrast, no significant differences in TUG test scores or quality of life were found between exercise and control groups after the exercise interventions.

• Results of a 2014 systematic review with meta-analysis also indicate that exercise has some benefits in frail older adults.

  – Compared with control interventions, exercise was shown to improve normal gait speed, fast gait speed, and Short Physical Performance Battery scores.

  – Results were inconclusive for endurance outcomes, and there was no consistent effect on balance and ADL functional mobility.

  – Which exercise types and parameters (e.g., frequency, duration) are most effective is uncertain.

• Results of a randomized controlled trial conducted in France indicate that regular physical activity may reduce frailty, especially in people at higher risk for disability.

  – Four hundred twenty four community-dwelling older adults (mean age, 76 years) with sedentary lifestyles were randomized to a 12-month physical activity intervention or to a group receiving education about successful aging.

  – Number of frailty phenotype criteria reached were assessed at baseline, 6 months, and 12 months.

  – There was a significant difference in the prevalence of frailty at 12 months in the groups that participated in physical activity.
Physical exercise training also leads to improved cognitive functioning and psychological well-being in frail older adults\(^{(42)}\)

- Based on a randomized controlled trial conducted in Canada\(^{(43)}\)
- Eighty three participants aged 61-89 years were randomly assigned to an exercise training group or a control group (waiting list). Patients were assessed using frailty criteria to determine whether they were frail, prefrail, or robust
- Exercise training was 3 times per week for 12 weeks and included aerobic exercise and strength training
- Outcomes assessed were physical capacity, cognitive performance, and quality of life
  - Physical capacity measures included the modified Physical Performance Test (PPT), grip strength, physical endurance (6MWT), TUG test, and gait speed
  - Six cognitive domains were tested: global cognitive functioning (MMSE), abstract verbal reasoning, processing speed, working memory, episodic memory, and executive functions
  - The Quality of Life Systemic Inventory assessed the capacity to achieve personal goals in 28 life domains
- The intervention group showed significant improvement in physical capacity (endurance and functional performance), cognitive performance (executive functions, processing speed, and working memory), and quality of life compared to the control group
- Physical exercise training led to improved scores in robust participants as well as in prefrail and frail participants

Authors of a literature review found PRE training combined with supplements to increase total calories and protein intake is the most relevant protective countermeasure to forestall sarcopenia and poor muscle strength in frail older adults\(^{(28)}\)

Guidelines for aerobic and resistance exercise prescription to intervene in the “frailty cycle” have been proposed.\(^{(29)}\) The take-home message is that programs should be individualized because of the wide variability in physical capacity

- Focus should be on stabilizing the primary diagnosis; preventing secondary complications, including bed sores, pneumonia, and contractures; and restoring lost function\(^{(30)}\)
- A multicomponent exercise program that focuses on proprioception, aerobic, strength, and stretching exercises 5 days a week for 65 minutes has the potential to reverse frailty and improve cognition in community-dwelling frail older adults\(^{(59)}\)

<table>
<thead>
<tr>
<th>Problem</th>
<th>Goal</th>
<th>Intervention</th>
<th>Expected Progression</th>
<th>Home Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower extremity muscle weakness. Limited walking endurance</td>
<td>Adequate strength and endurance for ADLs</td>
<td><strong>Therapeutic exercise</strong></td>
<td>The intensity and duration of exercises should be progressed in the final phase to improve functional mobility</td>
<td>Provide the patient with home-based resistance exercises</td>
</tr>
<tr>
<td></td>
<td></td>
<td>General strengthening exercises in either sitting or standing. Focus on quadriceps and spinal extension exercises to improve posture and balance. Aerobic exercises as tolerated Group exercises</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decreased ankle, hip, and knee ROM</td>
<td>Adequate ROM for normal posture and dynamic balance reactions</td>
<td><strong>Therapeutic exercise</strong></td>
<td>Gradual progression of intensity of stretching exercises</td>
<td>Daily repetition of exercises</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Address specific ROM restrictions, especially hamstring and Achilles tendons</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---
| Functional decline in transfers, balance, and gait | Adequate mobility for transfers, balance, and gait stability | **Functional training** | Gradual progression in intensity and duration of exercises | Provide patient and family/caregivers with written instructions regarding functional activities that can be performed at home and correct use and/or application of adaptive equipment such as sliding boards for transfers and rolling walkers for ambulation
Assess the ability, safety, and body mechanics of the caregiver when performing transfers, and educate as indicated

**Reduced safety and increased falls risk in ADLs**

| Improve safety at home and in community | **Functional training**
ADL training | Progress tasks and challenges as appropriate | If safe, prescribe home exercise program incorporating functional activities
Implement home modifications
Educate patient and caregivers on falls risk

**Limitations that require assistance in ADLs**

| Improve independence in ADLs | **Prescription, application of devices and equipment**
Provide necessary assistive devices/adaptive equipment and remove environmental hazards | N/A | Educate patient and caregiver appropriately about equipment use and home modifications

### Desired Outcomes/Outcome Measures

- Increased strength
  - MMT
- Increased ankle ROM
  - Goniometry
- Improved posture
  - Posture measure
- Functional balance
  - BBS, FRT
- Improved functional mobility
  - FIM
  - Barthel Index
- TUG test
- FTSTST
- Increased gait speed and walking endurance
  - 6MWT
  - 10MWT (gait speed)
  - FGA
- Improved quality of life
  - Medical Outcomes Study 36-Item Short-Form Health Survey
- Reduced frailty score
  - SHARE Frailty Index

**Maintenance or Prevention**
- Continue therapeutic exercise and functional training programs
- Continue dietary intervention and nutritional supplementation as indicated
  - Authors of a 2015 prospective study found that habitual dietary intake of resveratrol (antioxidant found in red grape skin) reduced the risk of developing frailty syndrome\(^{(51)}\)
  - Intake of fruit and vegetables in a ratio of 3 fruits per day and 2 portions of vegetables per day was associated with lower short-term risk of frailty\(^{(52)}\)
- Implement fall prevention strategies (e.g., home modifications); implement safety precautions (e.g., oven timers, medication reminders)
- Preventing frailty syndrome should focus on an exercise program with the following components: \(^{(31)}\)
  - Aerobic conditioning: at least 30 minutes of moderate aerobic activity should be performed on 5 or more days per week
  - Resistance training: should incorporate 8-10 exercises for the major muscle groups for 10-15 repetitions per set at least twice a week
  - Flexibility: static stretching activities should be performed for at least 10 minutes with 10-30 seconds per stretch
  - Balance: balance activities are recommended for patients with mobility problems and individuals at high risk for falls
- Prevention of social isolation\(^{(48)}\)
  - At-risk individuals should be referred to available community resources in order to prevent social isolation or further isolation

**Patient Education**

### Coding Matrix

*References are rated using the following codes, listed in order of strength:*

<table>
<thead>
<tr>
<th>M</th>
<th>SR</th>
<th>RCT</th>
<th>R</th>
<th>C</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td>Published meta-analysis</td>
<td>Published systematic or integrative literature review</td>
<td>Published research (randomized controlled trial)</td>
<td>Published research (not randomized controlled trial)</td>
<td>Case histories, case studies</td>
<td>Published guidelines</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RV</th>
<th>RU</th>
<th>QI</th>
<th>L</th>
<th>PGR</th>
<th>PFR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Published review of the literature</td>
<td>Published research utilization report</td>
<td>Published quality improvement report</td>
<td>Legislation</td>
<td>Published government report</td>
<td>Published funded report</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PP</th>
<th>X</th>
<th>GI</th>
<th>U</th>
<th>CP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Policies, procedures, protocols</td>
<td>Practice exemplars, stories, opinions</td>
<td>General or background information/texts/reports</td>
<td>Unpublished research, reviews, poster presentations or other such materials</td>
<td>Conference proceedings, abstracts, presentation</td>
</tr>
</tbody>
</table>

### References

Nicholson NR. A review of social isolation: an important but underassessed condition in older adults.


