

Frailty

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Frailty :

- *medical syndrome with multiple causes and contributors characterized by diminished strength, endurance, reduced physiologic function.*
- *increases an individual's vulnerability for developing increased dependency and/or death"*



- Decline in independence and functional capacity with energy loss, weight loss .

- It is at the core of Geriatric Medicine; Geriatrics is particularly skilled in care of frail elderly.



The published report from the conference supported screening for frailty in all individuals 70 .

frailty can be prevented (eg, by regular exercise) and even partially reversed (possibly by vitamin D or simplification of polypharmacy).



increased risk of adverse health-related outcomes in older persons, including :

➤ Falls

➤ Disability

➤ Hospitalizations

➤ mortality



What do you understand by the term
“Frail Elderly ” ?

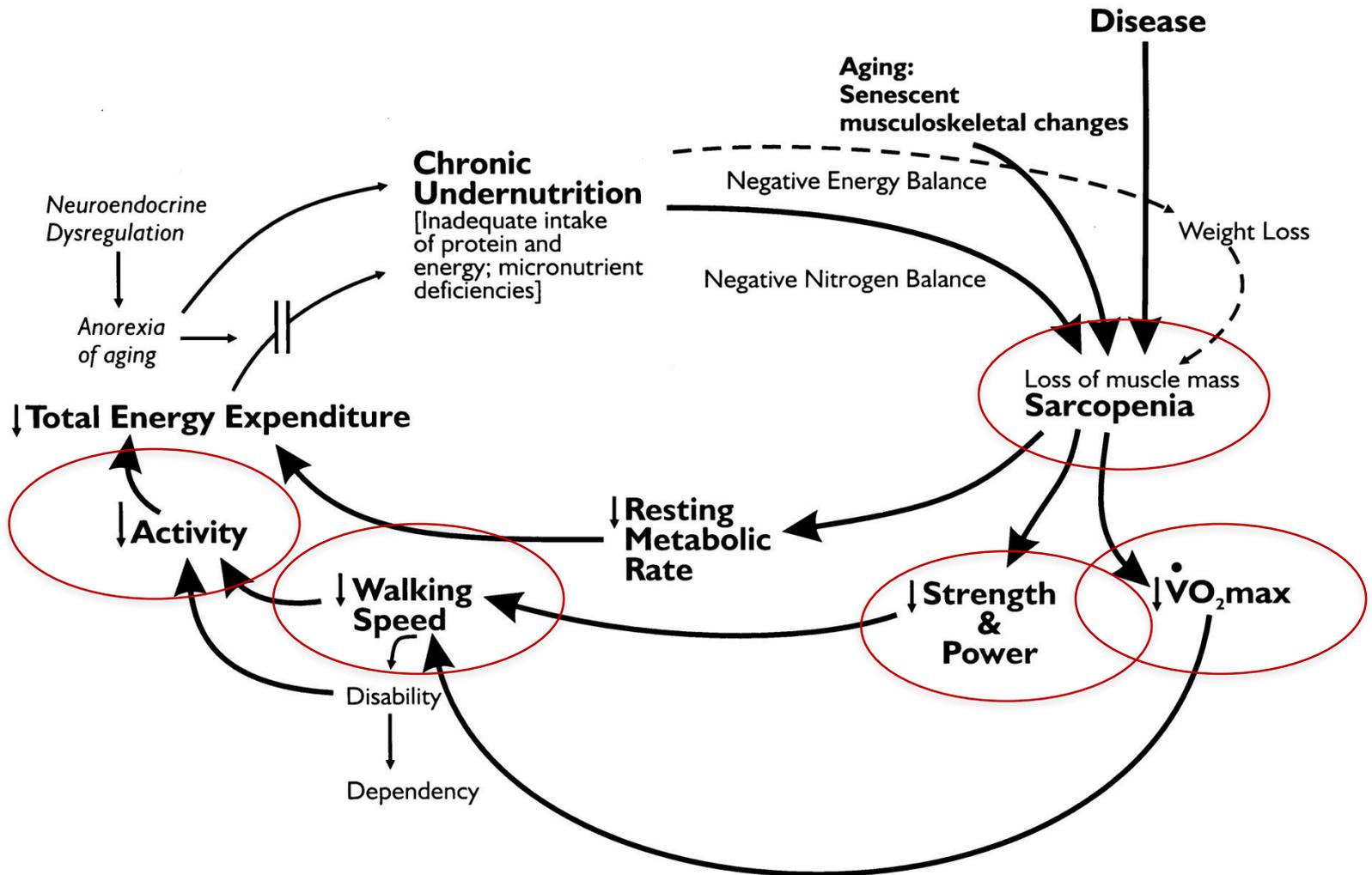
Potential Causes of Frailty :

- *Multiple organ system decline*
- *Hypothalamic-pituitary-adrenal axis*
- *Immune dysfunction – Increase interleukins, CRP*
 - *Neuroendocrine – Cortisol level increase – Sex hormones decrease – Growth hormones decrease*
- *Sarcopenia*

model of frailty developed by Linda Fried :

- dysregulation of the stress response systems responsible for organismal resilience
- leading to loss of homeostatic capabilities
- increased susceptibility to stress.

Hypothesized Cycle of Frailty



Schematic representation of the pathologic vicious cycle supposed to lead to a progressive decline in health and function according to the Linda Fried model. (From 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.)

CRITERIA FOR FRAILTY SYNDROME ACCORDING TO FRIED¹

CHARACTERISTICS OF FRAILTY	CARDIOVASCULAR HEALTH STUDY MEASURE
1. Weight loss (unintentional)/sarcopenia (loss of muscle mass)	> 10 lb lost unintentionally in prior year
2. Weakness	Grip strength: lowest 20% (by gender, body mass index)
3. Exhaustion/poor endurance	“Exhaustion” (self-report)
4. Slowness	Walking time/15 ft: slowest 20% (by gender, height)
5. Low activity	kcal/wk: lowest 20% males: <383 kcal/wk; females: < 270kcal/wk

- Those individuals who meet at least three of the five criteria are considered frail, while those individuals who meet two criteria out of five are considered as prefrail.

FRAILITY AS A DEFICIT ACCUMULATION:

Cumulative deficit model (Rockwood et al., 2001)

- In this model manifestations from different domains are considered, including:
 - physical domain
 - cognitive, behavioral, mental health and functional domains

Frailty Index (FI)

Rockwood's approach from the CSHA (Canadian Study on Health and Aging) is based on the concept that deficit accumulation – a combination of symptoms, disease, conditions, and disability – can predict frailty

- Sum of >70 items used to construct the FI
- Includes self rated health, function, cognition, and psychosocial risk factors

The FI has a strong face validity

- it shows an age-specific
- nonlinear increase (similar to Gompertz law)
- higher values in females
- strong associations with adverse outcomes (eg, mortality)
- universal limit to its increase (at $FI \sim 0.7$).

Clinical Frailty Scale



1 Very Fit – People who are robust, active, energetic and motivated. These people commonly exercise regularly. They are among the fittest for their age.



2 Well – People who have no active disease symptoms but are less fit than category 1. Often, they exercise or are very active occasionally, e.g. seasonally.



3 Managing Well – People whose medical problems are well controlled, but are not regularly active beyond routine walking.



4 Vulnerable – While not dependent on others for daily help, often symptoms limit activities. A common complaint is being “slowed up”, and/or being tired during the day.



5 Mildly Frail – These people often have more evident slowing, and need help in high order IADLs (finances, transportation, heavy housework, medications). Typically, mild frailty progressively impairs shopping and walking outside alone, meal preparation and housework.



6 Moderately Frail – People need help with all outside activities and with keeping house. Inside, they often have problems with stairs and need help with bathing and might need minimal assistance (cuing, standby) with dressing.



7 Severely Frail – Completely dependent for personal care, from whatever cause (physical or cognitive). Even so, they seem stable and not at high risk of dying (within ~ 6 months).



8 Very Severely Frail – Completely dependent, approaching the end of life. Typically, they could not recover even from a minor illness.



9 Terminally Ill – Approaching the end of life. This category applies to people with a life expectancy <6 months, who are not otherwise evidently frail.

Scoring frailty in people with dementia

The degree of frailty corresponds to the degree of dementia. Common **symptoms in mild dementia** include forgetting the details of a recent event, though still remembering the event itself, repeating the same question/story and social withdrawal.

In **moderate dementia**, recent memory is very impaired, even though they seemingly can remember their past life events well. They can do personal care with prompting.

In **severe dementia**, they cannot do personal care without help.

International Association of Nutrition and Aging (IANA) Task Force, frailty tool should be quick, inexpensive, reliable, and easy to use in clinical settings because the identification of frail older people at risk is an important initial step potentially leading to appropriate preventive and/ or treatment interventions and ultimately to higher quality care for this vulnerable population.

The FRAIL scale:

simple tool consisting of five yes/no questions:

- Fatigue
 - Resistance (inability to climb stairs)
 - Ambulation (inability to walk a certain distance)
 - Illnesses (more than five of comorbidities)
 - Loss of weight (more than 5%).
- predict mortality and incident ADL and IADL disabilities among community-dwelling older people in recent meta-analysis studies.

Edmonton Frail Scale (EFS):

nine domains of frailty (cognition, general health status, functional independence, social support, medication usage, nutrition, mood, continence, functional performance) Test results can be from 0 to 17.

the EFS was validated in the hands of non-specialists who had no formal training in geriatric care and the administration requires few minutes .

Frailty domain	Item	0 point	1 point	2 points
Cognition	Please imagine that this pre-drawn circle is a clock. I would like you to place the numbers in the correct positions then place the hands to indicate a time of 'ten after eleven'	No errors	Minor spacing errors	Other errors
General health status	In the past year, how many times have you been admitted to a hospital?	0	1–2	≥2
	In general, how would you describe your health?	'Excellent', 'Very good', 'Good'	'Fair'	'Poor'
Functional independence	With how many of the following activities do you require help? (meal preparation, shopping, transportation, telephone, housekeeping, laundry, managing money, taking medications)	0–1	2–4	5–8
Social support	When you need help, can you count on someone who is willing and able to meet your needs?	Always	Sometimes	Never
Medication use	Do you use five or more different prescription medications on a regular basis?	No	Yes	
	At times, do you forget to take your prescription medications?	No	Yes	
Nutrition	Have you recently lost weight such that your clothing has become looser?	No	Yes	
Mood	Do you often feel sad or depressed?	No	Yes	
Continence	Do you have a problem with losing control of urine when you don't want to?	No	Yes	
Functional performance	I would like you to sit in this chair with your back and arms resting. Then, when I say 'GO', please stand up and walk at a safe and comfortable pace to the mark on the floor (approximately 3 m away), return to the chair and sit down'	0–10 s	11–20 s	One of : >20 s , or patient unwilling , or requires assistance
Totals	Final score is the sum of column totals			

Scoring :

0 - 5 = Not Frail

6 - 7 = Vulnerable

8 - 9 = Mild Frailty

10-11 = Moderate Frailty

12-17 = Severe Frailty

TOTAL

/17

Administered by : _____

NOVEL APPROACH: FRAILITY AS AGE-RELATED BIOLOGICAL DECLINE

identified four main “aging phenotypes” that we hypothesize are closely related to frailty and late-life decline:

- (1) signalling networks that maintain homeostasis;
- (2) body composition;
- (3) balance between energy availability and energy demand
- (4) neurodegeneration/neuroplasticity,

whose changes occur in parallel in all aging individuals and are strongly intercorrelated

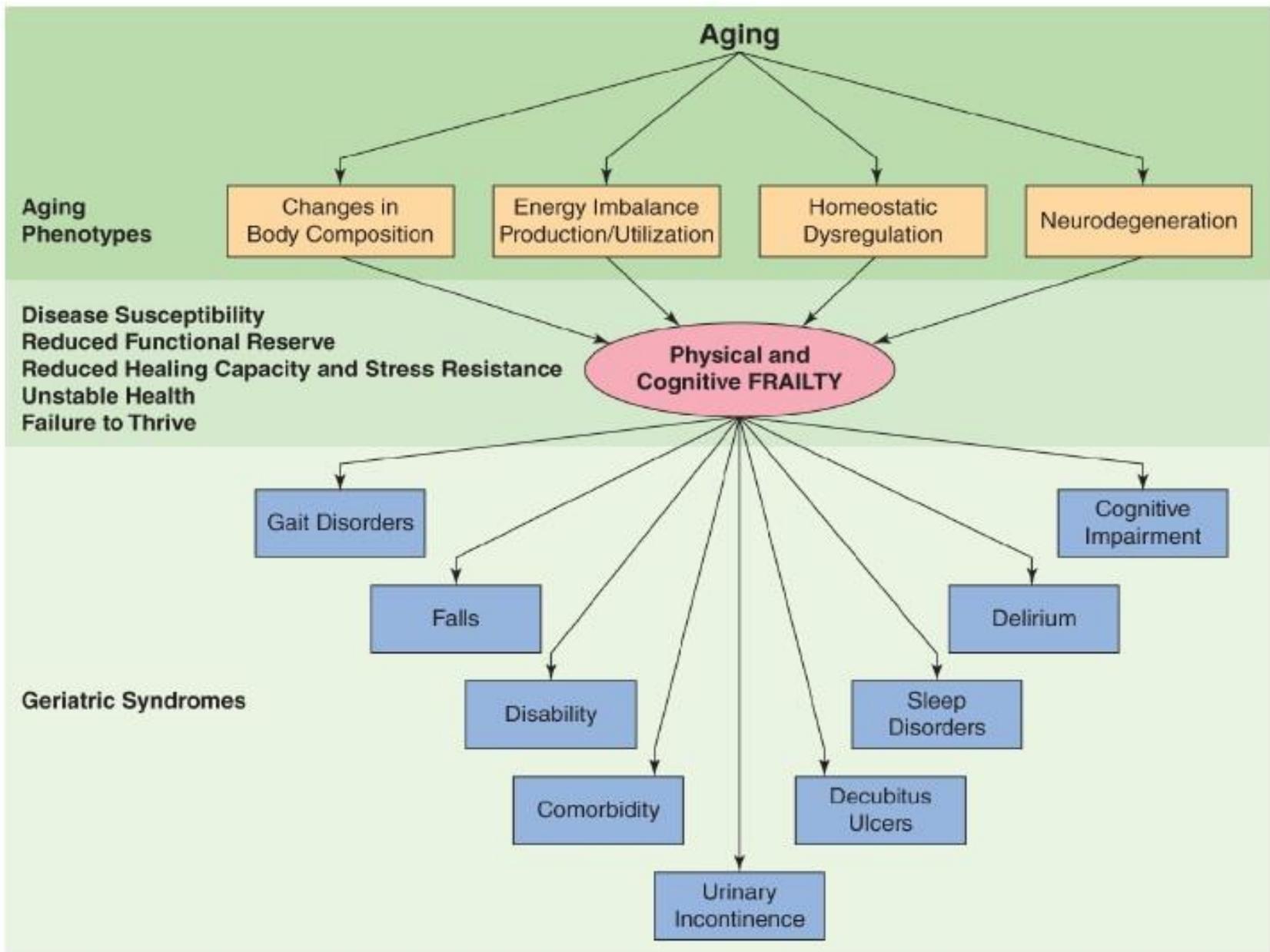


FIGURE 46-5. Schematic representation of the domains of the aging phenotype, and their relationship with frailty and with the geriatric syndrome. (From Ferrucci L, Studenski S. Clinical problems of aging. In: Longo DL, Fauci AS, Kasper DL, et al., eds. *Harrison's Principles of Internal Medicine*. 18th ed. New York NY: McGraw Hill; 2012.)

- ❖ RMR accounts for 60% to 70% of the total daily energy expenditure and can be assessed by indirect calorimetry.
- ❖ RMR normalized by body size declines rapidly from birth up to the end of the third decade, and then continues to decline more slowly from adulthood until death, mostly but not completely, as a consequence of the age-related loss of lean body mass.
- ❖ In older adults higher RMR has been found to be an independent risk factor for mortality and to predict future greater burden of chronic diseases; consequently it should be considered a marker of health deterioration in older adults.

THE EPIDEMIOLOGY OF FRAILITY

- prevalence of frailty, in community-dwelling adults aged 65 and older, is on average 10.7% (range 4.0%–59.1%).
- prevalence of frailty increases with age, reaching 15.7% in individuals aged 80 to 84 and 26.1% in those aged 85 or more.
- Independent of the type of definition, the prevalence is higher in women than men (Fried Scale: 9.6% vs 5.2%; FI: 39.0% vs 37.3%).

- ❖ frailty, shows a U-shaped relationship with body mass index (BMI), with higher levels of frailty in individuals with both low and very high BMI.

- ❖ In older hospitalized patients, the frailty prevalence varied from 27% to 80%.

COGNITION, DEMENTIA, AND FRAILITY

- higher prevalence of cognitive impairment and lower cognitive performance in frail older adults than in fit ones.
- frailty increases the risk of future cognitive decline and incident dementia in longitudinal studies.
- term ***“cognitive frailty”*** has been used to describe a clinical condition characterized by the simultaneous occurrence of both physical frailty and cognitive impairment, in the absence of a diagnosis of dementia or underlying neurologic conditions.

cognitive frailty:

(1) physical frailty;

(2) mild cognitive impairment (MCI), according to the Clinical Dementia Rating (CDR, score equal to 0.5)

(3) exclusion of Alzheimer disease (AD) and other dementias.

it has been suggested that the occurrence of physical frailty

FRAILITY IN THE CONTEXT OF SPECIFIC MEDICAL CONDITION:

Frailty to evaluate surgical risk.

patients have an excess risk of postoperative adverse outcomes.

surgical diseases and surgery itself are stressors that may alter physiologic homeostasis.

assessing frailty has a particular clinical relevance for older patients who are considered as candidates for surgery.

Traditional risk assessment measures have limitations as they are mostly based on specific comorbid conditions and they do not estimate individual physiologic reserve.

“Alternative” tools, is the assessment of frailty, are emerging. is a multidimensional frailty score

- benign/malignant disease,
- comorbidity (Charlson index),
- albumin level,
- physical function (ADL and IADL),
- dementia (MMSE-KC), risk of delirium (Nu-NESC),
- nutrition (MNA)
- mid arm circumference.

This multidimensional frailty score was more useful than conventional methods for predicting outcomes in geriatric patients undergoing surgery

Frailty and cancer:

cancer and its treatments are often associated with comorbid conditions (weight loss and cachexia), negatively affect patients' quality of life, tolerance to treatments, and ability to respond to rehabilitation.

Polypharmacy, as result of the presence of comorbidity, is an important issue in older adults with cancer

part of oncologic practice to include comprehensive geriatric assessment (CGA) in the evaluation of older adults with cancer, with particular attention to functional status (ADL, IADL), presence of comorbidity, social support, cognitive status, geriatric syndromes.

In geriatric oncology, in particular, CGA identifies reversible conditions that might interfere with the treatment of older patients, it ascertains an estimate of life expectancy and treatment tolerance.

- ❖ CGA is very time consuming; therefore, a number of screening tests have been proposed, such as the Vulnerable Elderly Survey 13 (VES-13).
- ❖ Patients who screen positive (ie, VES-13 score of 3 or higher) should undergo a complete CGA

Frailty and chronic kidney disease :

Older adults with the more severe stages of CKD frail individuals with

- reduced physiologic reserves
- homeostatic dysregulation
- comorbid conditions
- Polypharmacy
- geriatric syndromes
- Disability
- need for institutional care
- frequent hospitalization
- high mortality rate.

CKD even at earlier stages has been associated with clinical manifestations of frailty.

Frailty is extremely common among patients starting dialysis

- adverse outcomes among incident dialysis patients (higher risk of hospitalization and death).

In these patients, frailty may be either a result of uremia or independent of CKD.

Frail patients are started on dialysis earlier (at a higher estimated glomerular filtration rate) on average than nonfrail patients, although there are no data to suggest that frail patients derive any benefit from early initiation of dialysis either in the form of improved survival or functional status.

Frailty and HIV:

Patients with HIV experience accelerated aging and greater risk of geriatric syndromes such as frailty and difficulty with daily activities than HIV-negative people of the same age.

Prevalence of frailty in younger HIV-infected individuals is ranging from 5% to 20%.

decline in prevalence of frailty was observed with increased use of effective antiretroviral therapy.

Duration of HIV infection, in addition to other markers of advanced HIV disease (CD4+ T-cell count < 350 cells/mm³), are independently associated with the occurrence of a frailty-related phenotype.

The presence of clinical AIDS,
previous opportunistic illnesses,
CD4+ T-cell count less than 100 cells/mm³.

} risk factors for HIV-related frailty

frail HIV-infected persons have greater comorbidity including chronic kidney disease, cognitive impairment, and depression.

Frailty and diabetes:

increased expression of inflammatory markers in frail older adults may negatively influence late-life glucose tolerance leading to the development of diabetes and may also have an adverse impact on the microvascular effects of diabetes itself.

Frailty and cardiovascular disease (CVD):

- Frailty has become a high priority in the management of cardiovascular patients due to their increasing aging and complexity.
- Frailty is about three times more prevalent among persons compared with those without heart disease.
- frail subjects were more likely to have subclinical CVD,
- and subjects with subclinical CVD were more likely to have impaired physical or mental function during followup.

identifying frailty has important implications for clinical care of older patients with CVD.

assessment of frailty is particularly relevant when counseling older patients with CVD regarding their prognosis following a procedure in order to plan personalized management and treatment, increase their likelihood of positive outcomes.

MANAGEMENT OF FRAIL OLDER ADULTS



Management

- Once a frail or prefrail patient is identified there are no succinct guidelines on how to best manage them.
1. Diagnosis, differential diagnosis (rule out underlying medical or psychological issues that may be driving signs and symptoms of frailty)
 2. CGA: Laboratory Testing (in order to rule out treatable conditions, A suggested initial screen, based on the differential diagnosis, might include: Complete blood count, basic metabolic panel, liver biochemical tests, including albumin, vitamin B12, vitamin D, and TSH).
 3. Establishing Goals of Care: goal setting with patients and their families is crucial in providing care, establishing individual priorities, weighing risks and benefits of interventions
 - At late stages of frailty, the appropriate interventions, although useful, might have limited benefit to reverse the frailty state.

Exercise

1. Exercise is believed to be the most effective intervention in older adults to improve quality of life and functionality.

However, data on specific exercise interventions designed to improve outcomes in patients with frailty are limited.

2. The demonstrated benefits of exercise in older adults include increased mobility, enhanced performance of activities of daily living (ADL), improved gait, decreased falls, improved bone mineral density, and increased general well-being.

3. Even simple interventions can be helpful. For example, walking as little as a mile in a 1-week period was associated with a slower progression of functional limitations over a follow-up period of 6 months

Nutritional, hormonal Supplementation

1. In treatment of weight loss, oral nutritional supplements between meals (low-volume, high caloric drinks or puddings) may be helpful in adding protein and calories.
2. Vitamin D supplementation for those with low serum vitamin D levels (< 20 ng/ml) is effective for fall prevention, improving balance, and preserving muscle strength.
3. those taking leucine-enriched whey protein plus vitamin D had significant improvement in physical frailty related measurements
4. Whey protein, omega 3 fatty acids rich items, amino acid glutamine, carnitine have been suggested for their useful role.
5. Even growth hormone, DHEA, testosterone when deficient, may be considered

Multidisciplinary approach

- Optimize sensory inputs
- Assess cognition and mood
- Exercise
- Diet
- Ensure that chronic disease control is optimised.

Pharmacological approach

- not adequately evaluated.
- Such hormonal therapy as testosterone, while it improves muscle strength, has significant systemic side effects.
Estrogen-replacement therapy in postmenopausal women also has an unfavorable safety profile.
- Friedlander et al reported that IGF-1 therapy had a beneficial impact on bone density, muscle strength, or physical function in elderly women with no clinical IGF-1 deficiency.

- Currently available anti-inflammatory agents, while not formally evaluated in clinical trials in treating the frailty syndrome, also have significant adverse effects, particularly in the elderly. Statin has no effect in management of frailty.
- While vitamin D has favorable pharmacological and safety profiles, their clinical utility in the prevention and treatment of frailty has yet to be investigated

Frailty sarcopenia overlap



The term “sarcopenia” was coined by Rosenberg (1989) to indicate the loss of muscle mass that accompanies aging.

- The European Working group on sarcopenia diagnosis is based on loss of muscle mass combined with decreased strength and or poor physical performance

THANK YOU



- Loss of muscle mass (DXA, MRI, Bioimpedance analysis, CT)
- Decreased strength (grip strength, knee extension strength)
- Poor physical performance (gait velocity, TUG)

Osteosarcopenia

- Fracture risk increase dramatically with age much greater than corresponding BMD decline .

- Sarcopenia can explain the increase in fracture risk attributed to age

- ***Staging***

1. Presarcopenia – low muscle mass no impact on strength or physical performance
2. Sarcopenia – low muscle mass +low strength or physical performance
3. Severe sarcopenia – all three criteria

- It cannot be ignored that the Physical Frailty phenotype presents substantial overlaps with sarcopenia, “a syndrome characterized by progressive and generalized loss of skeletal muscle mass and strength with a risk of adverse outcomes such as physical disability, poor quality of life and death”.
- Many of the adverse outcomes of frailty are probably mediated by sarcopenia.

- sarcopenia may be considered both as the biological substrate for the development of PF and the pathway through which the negative health outcomes of frailty ensue.
- Determining whether frailty is due to sarcopenia or sarcopenia is a clinical manifestation of frailty is consuming considerable efforts, but (from a very practical viewpoint) rather resembles the problem of "the egg and the chicken".
- However, the interventions specifically targeting the skeletal muscle may provide therapeutic and preventive advantages against frailty and its clinical correlates.