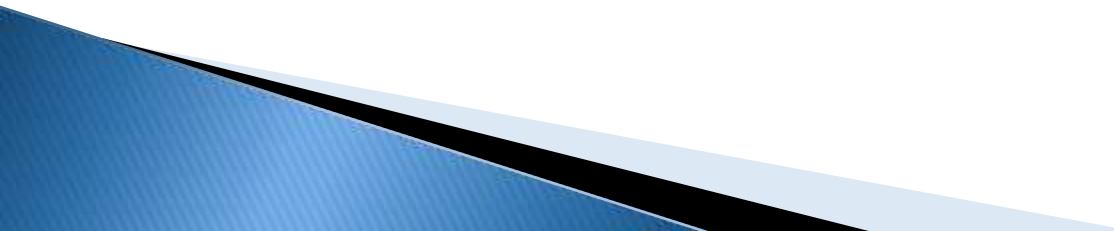


FRAILITY IN ELDERLY

PROF THAN WIN NYUNT

MRCP (UK) FRCP(Edin) DGM(Glasgow)
M.Med.Sc(Int. Med) Dr.Med.Sc (Neurology)

Outline

- Introduction
 - Definition
 - Course
 - Pathophysiology
 - Assessment
 - Aging changes and frailty
 - Associations in frailty
 - Management
- 

INTRODUCTION

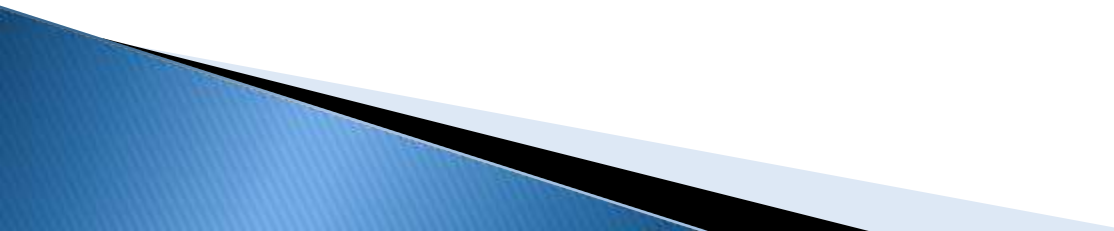


Who is frail?

**Both— 83 years old, HTN, IHD,
Hyperlipidemia**



Setting the scene

- Worldwide population is ageing
 - Impacts healthcare planning and provision
 - The most problematic expression of population ageing is the clinical condition of FRAILITY
 - Around 10% of over 65s have frailty
 - Over 25 of over 85s have frailty (in some studies >50%)
- 

Frailty

- State of increased vulnerability
 - Not an inevitable part of ageing
 - Is a chronic condition
 - May be made better or worse
-
- Identification is important and should form part of any health/social care interaction



The frailty condition

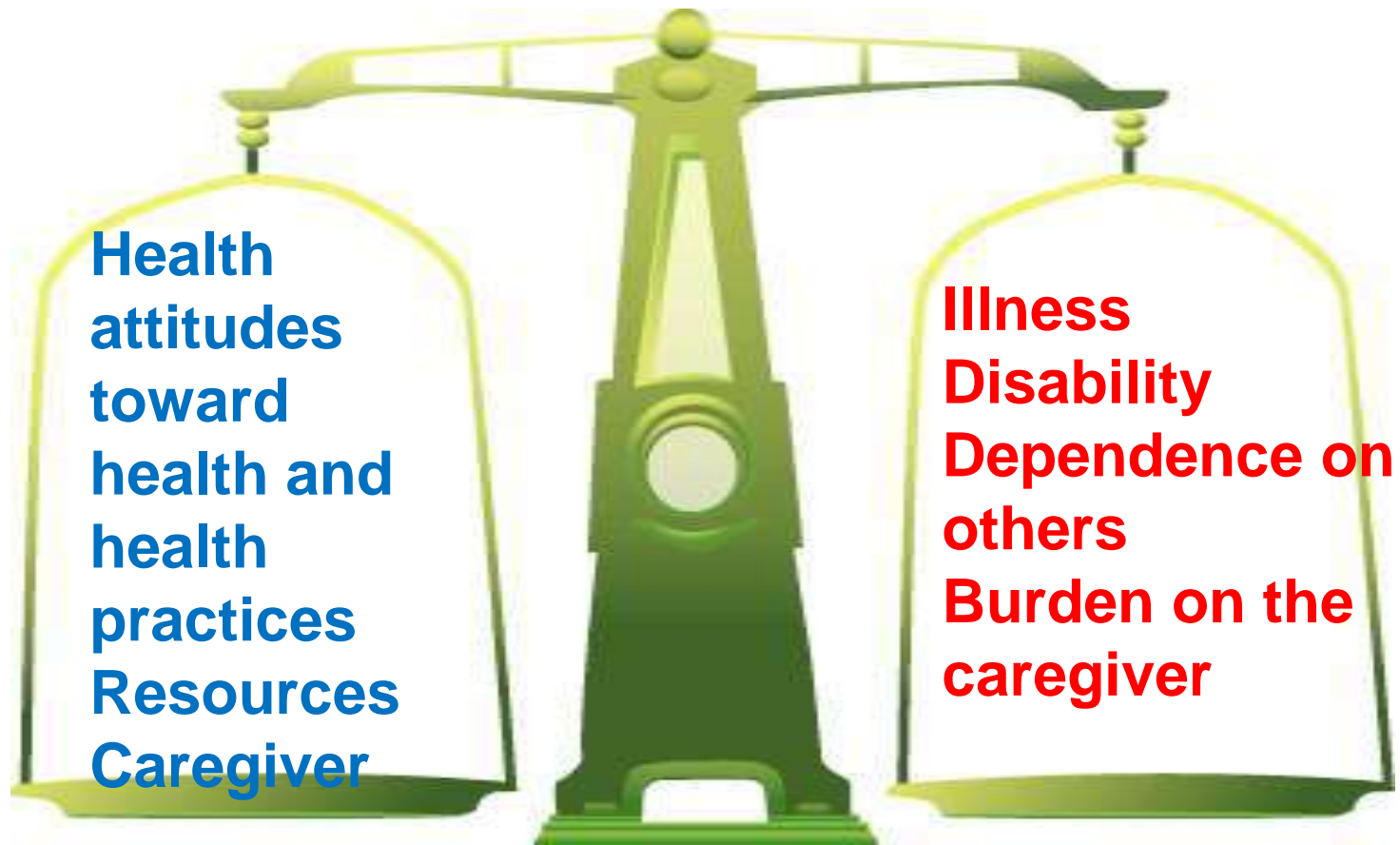
- Related to the ageing process
- Independently associated with adverse outcomes
- Common
- Progressive
- Episodic deteriorations
- Preventable components
- Impact quality of life
- Expensive

Harrison J, Clegg A, Conroy S, Young J. Managing frailty as a long-term condition. *Age Ageing* 2015;44:732-5.

Frailty \neq Age



Frailty lies outside the comfort zone of Guideline Based Medicine





DEFINITIONS

Formal definitions

“a state of increased vulnerability to stressors due to age-related declines in physiologic reserves across neuromuscular, metabolic, and immune systems”

American Geriatric Society 2004



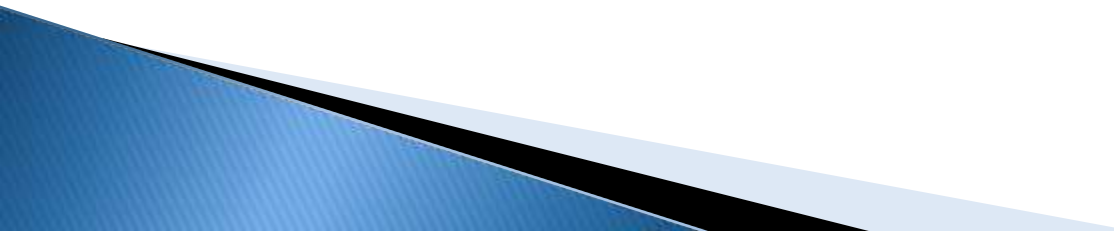
Formal Consensus

“a medical syndrome with multiple causes and contributors that is characterised by diminished strength, endurance, and reduced physiological function, that increases an individual’s vulnerability for developing increased dependency and/or death”

J Am Med Dir Assoc 2013



Definitions of Components of Frailty

- Shrinking
 - > 10 pounds lost unintentionally in past year
 - Self-reported exhaustion
 - Self-report of exhaustion on CES-D questions
 - Weakness (grip strength)
 - Grip strength lowest 20% adjusted for gender & BMI
 - Slow walking speed
 - Slowest 20% to walk 15 feet
 - Low physical activity
 - Lowest quintile of weighted kilocalorie expended per week
- 

The phenotype of Frailty:

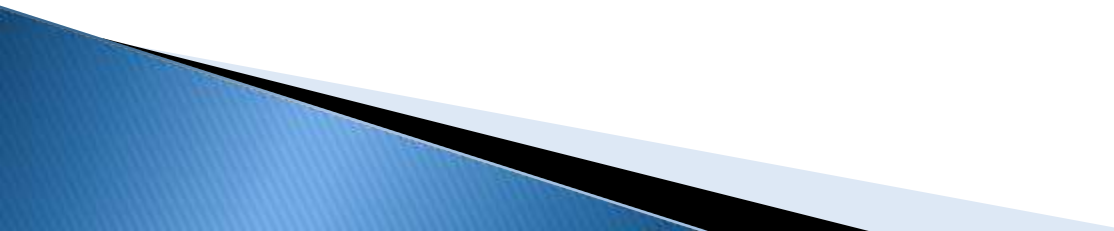
FriedCriteria

- Unintentional weight loss
- Self-reported exhaustion
- Weakness
- Slow walking speed
- Low physical activity level
- *Robust* *No criteria present*
- *Pre-frailty* *1-2 criteria present*
- *Frailty* *3-5 criteria present*

Weight loss

- In the past year, have you lost more than 10 lbs (4.5Kg) unintentionally
- Positive answer: Yes

Exhaustion

- I felt everything I did was an effort, I could not get going
 - Positive answer: more than 3 days in the past week
- 

- Physical activity
- Minnesota leisure time activity questionnaire
- Calculate Kcals /week
- Positive answer: men <383 Kcal/week
Women <270 Kcal/week

Walk time

- 15 feet (4.5 meters); stratified by height
- Positive answer:
 - Men <173cm(68 inches) >7 seconds
 - >173cm (68inches) >6 seconds
 - Women <159 cm (62.5 inches)>7 seconds
 - >159cm (62.5 inches)>6 seconds

- **Grip strength**
- Measure with grip strength dynamometer
- Positive answer

Men	BMI<24	<29Kg
	BMI24.1-26	<30Kg
	BMI26.1-28	<31Kg
	BMI>28	<32 Kg
Women	BMI <23	<17kg
	BMI 23.1-26	<17.3 Kg
	BMI 26.1-29	<18kg
	BMI >29	<21kg

Hand grip dynamometers



Techex
Online

Frailty Related Phenotype



Fried et al., *J Gerontol Med Sc* 2001

Three or more:

- Unintentional weight loss
- Self-reporting exhaustion
- Weakness (reduced grip strength)
- Slow walking speed
- Low physical activity

- Fried LP, Tangen CM, Walston J, Newman AB, Hirsch C, Gottdiener J, Seeman T, Tracy R, Kop WJ, Burke G, McBurnie MA; Cardiovascular Health Study Collaborative Research Group. J Gerontol A Biol Sci Med Sci. 2001 Mar;56(3):M146-56.

Two or more

- Inability to perform one or more ADL in three days before admission
- Stroke in prev. three months
- Depression
- Dementia
- History of falls
- One or more unplanned admission in prev. three months
- Difficulty walking
- Malnutrition
- Prolonged bed rest
- Incontinence

- BGS 2010 (Best Practice Guide 3.5)



Dimensions of Frailty

- A. Physical frailty
- B. Cognitive frailty
- C. Socioeconomic frailty
- D. Psychological frailty

Frailty is a state of pre-disability, thus differing from disability

Fedarko NS *Clin Geriatr Med* 2011;27:27-37

Lango PO et al. *Gerontology*,2009; 55:539-549

COURSE OF FRAILTY



A frail individual

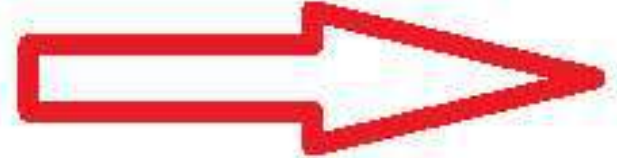
Highest order
functions lost first



A complex system
close to failure



The result of an illness
/ new tablet



E.g.
Divided attention

Upright bipedal ambulation

Opposable thumbs

Social interactions

E.g.
Delirium

Falls

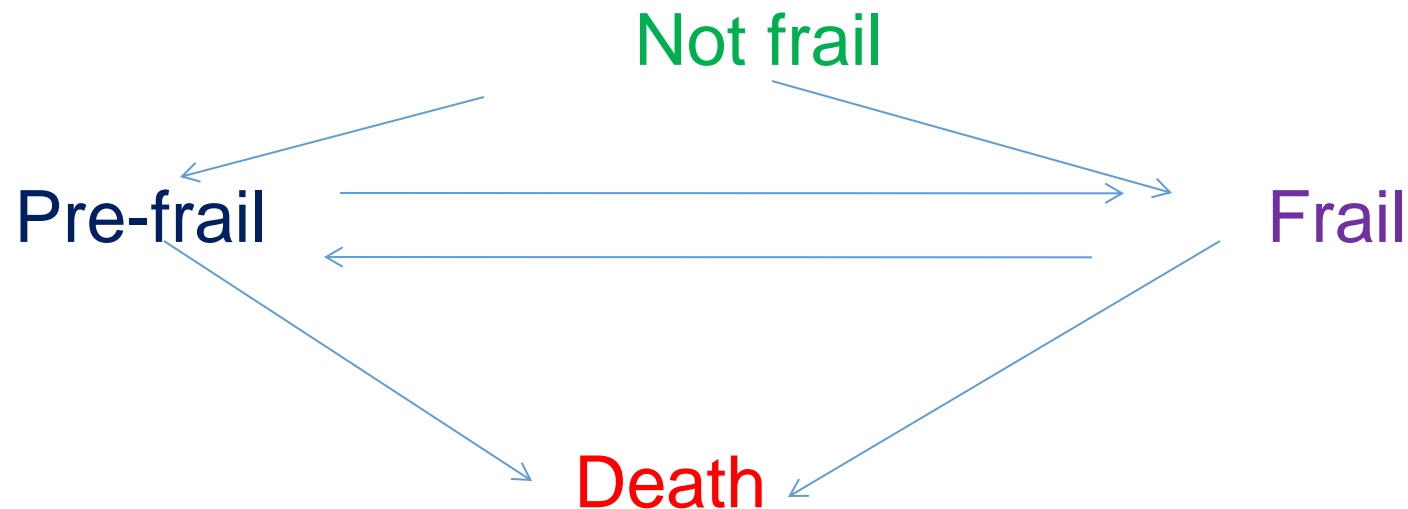
Impaired function

Social withdrawal

Impacting quality of life

Nature of Frailty

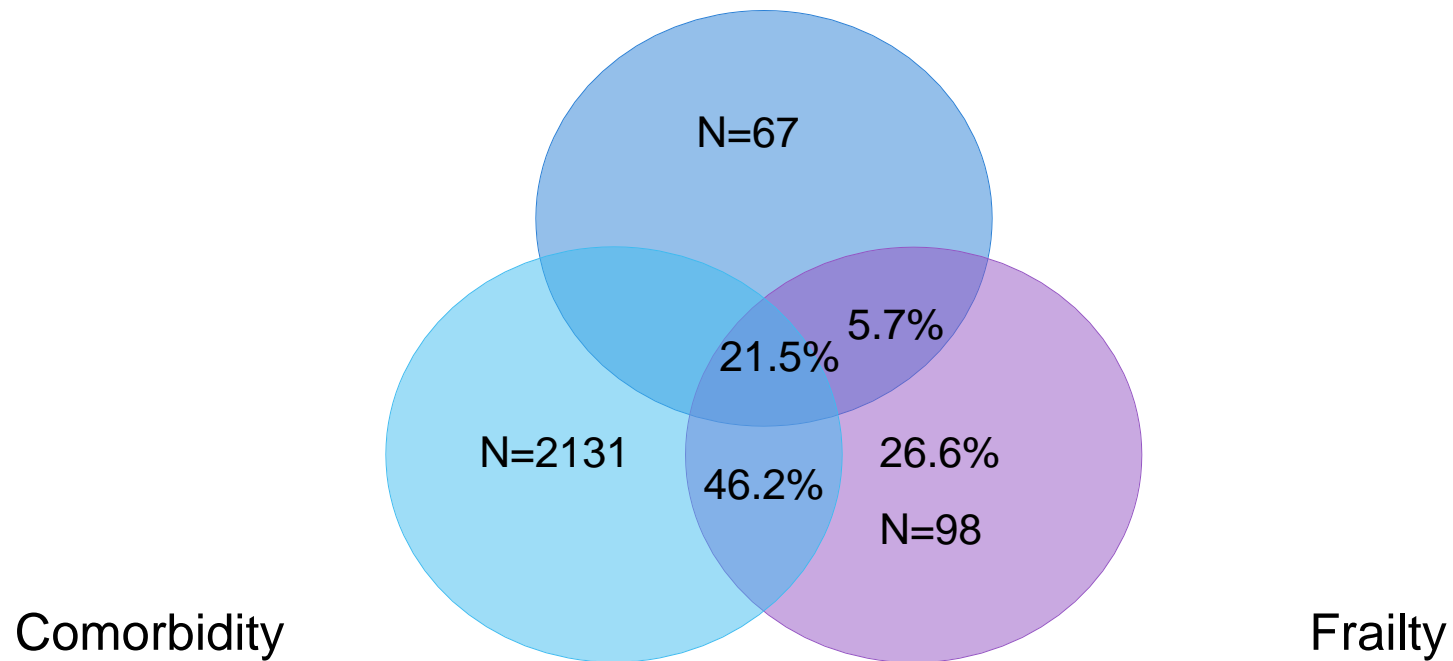
A dynamic and reversible process (characteristic)
It differs from other effects of aging
Older people can experience transitions



Gill Tmet al. *Arch Intern Med.*2006;166;418-423

Overlap of Frailty with ADL Disability and Comorbidity

Disability: > 1 ADL

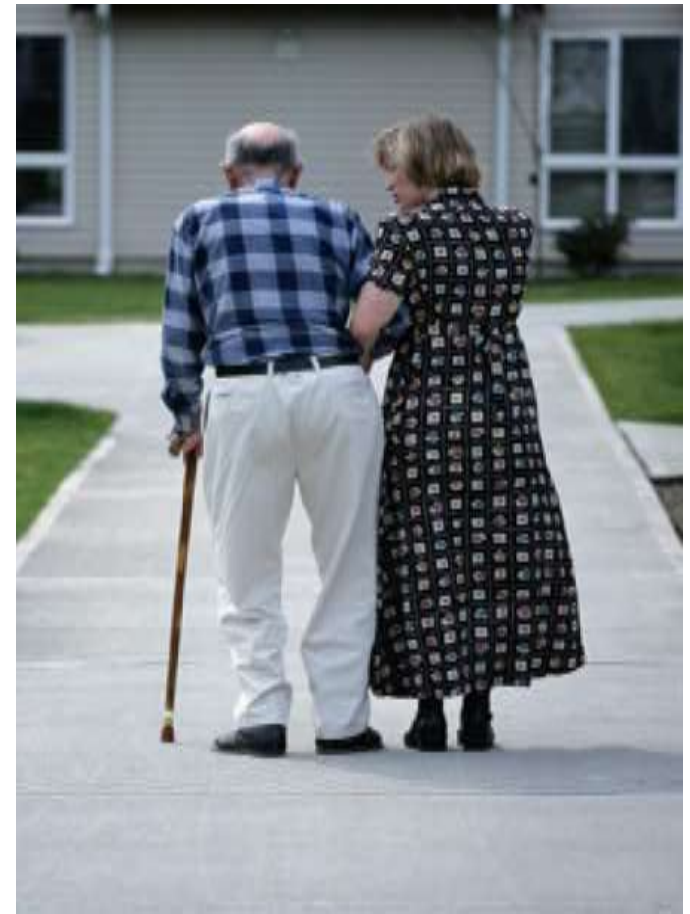


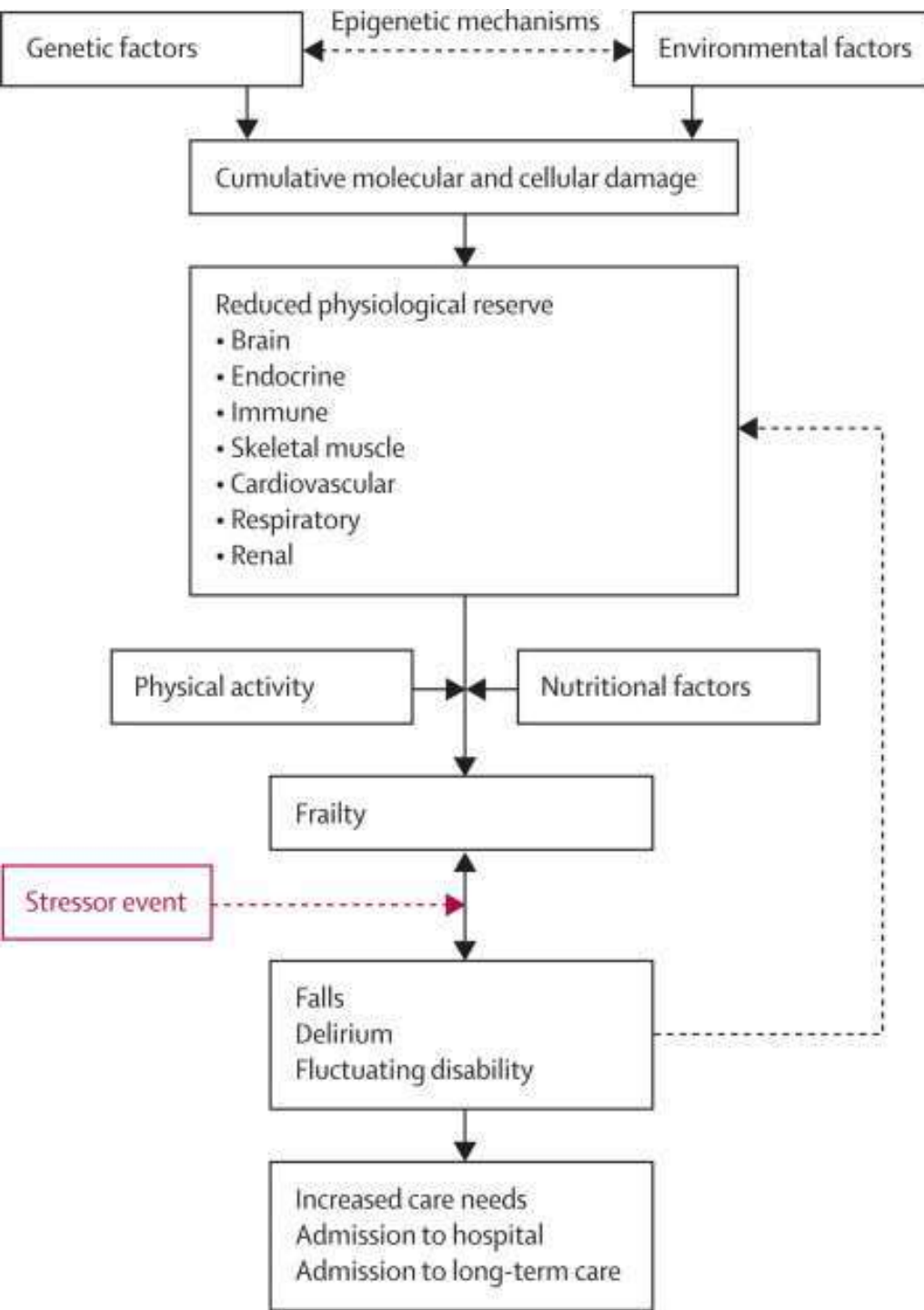
Fried LP, J Gerontol Med Sci, 2001

Disability

- It is characterized by physical and /or mental limits on activities and social participation
 - It is defined in clinical practice by difficulty of performing ADLs
 - *Basic ADL*
 - *Instrumental ADL*
 - *Advanced ADL*
-
- *Int psychogeriatr* 2001;13Supp1:159-167

PATHIPHYSIOLOGY



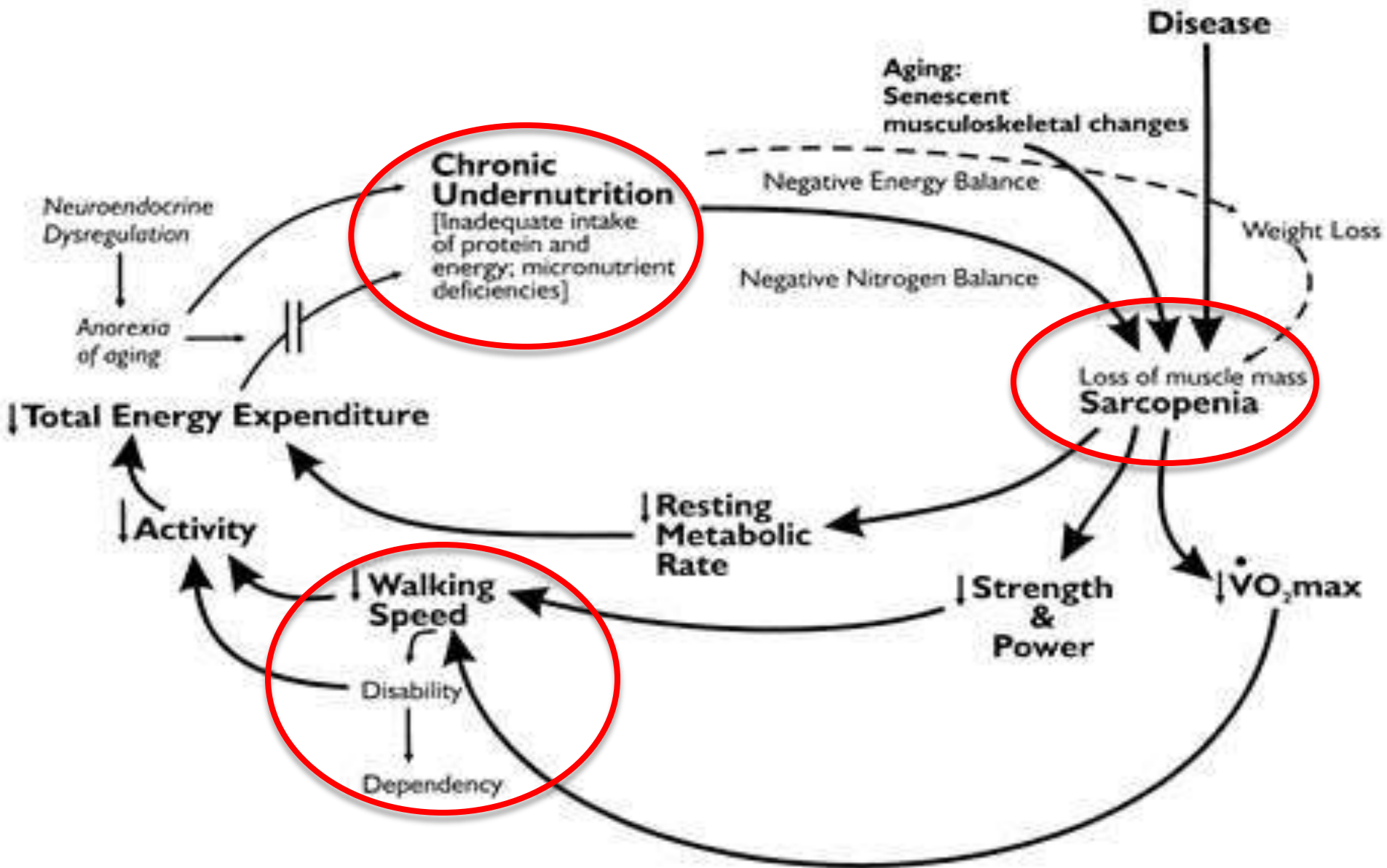


Pathophysiology of frailty

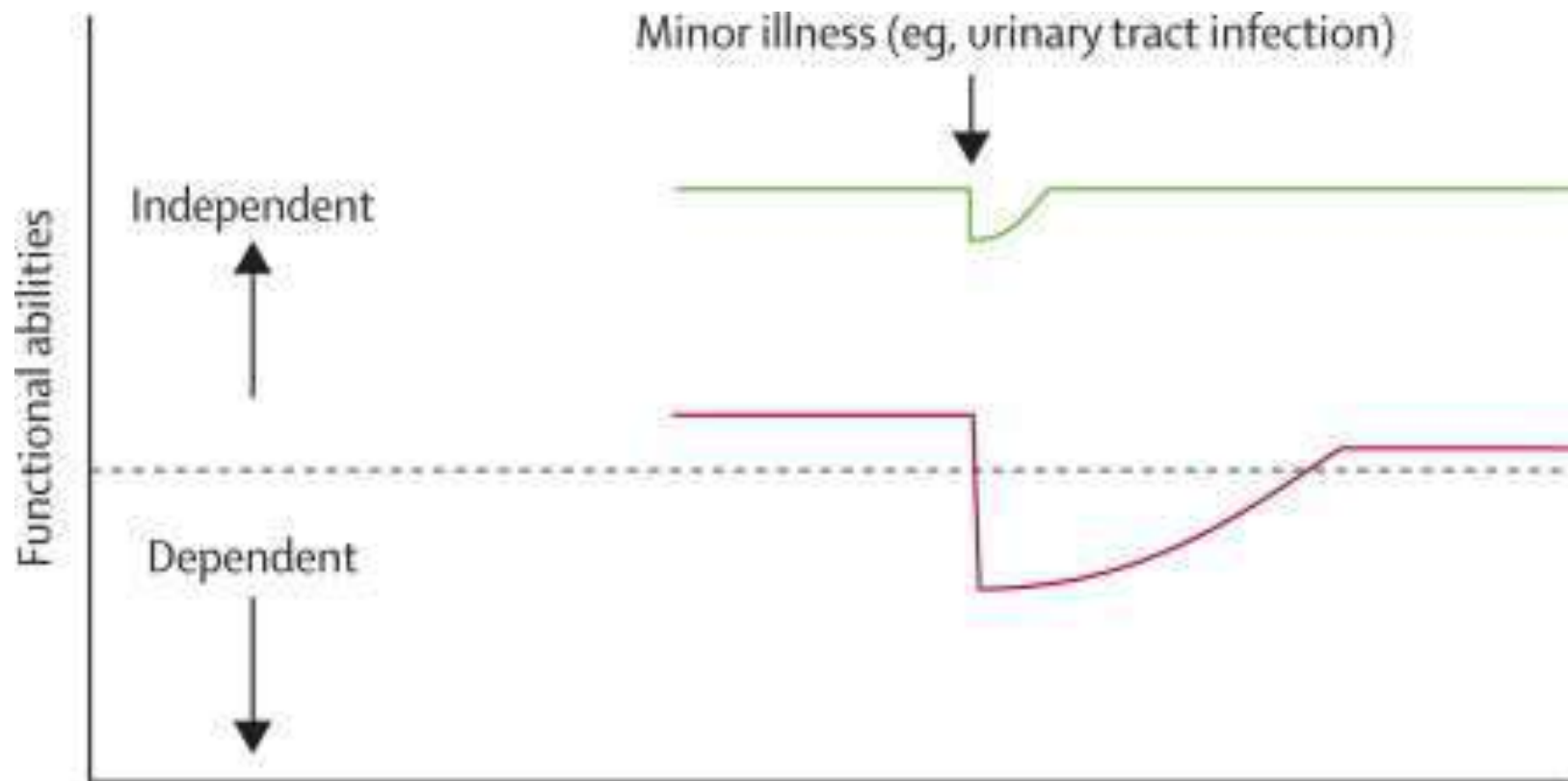
- Accelerated decrease in physiological reserve
- Failing homeostatic mechanisms

Clegg A, Young J, Iliffe S, Rikkert M, Rockwood K. Frailty in elderly people. Lancet. 2013; 381: 752 - 762

Fried's Model of Frailty



Vulnerability of frail elderly people to a sudden change in health status after a minor illness.



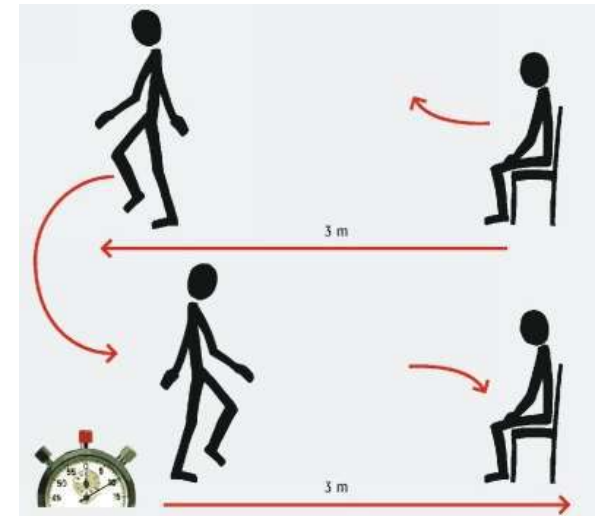
Clegg A, et al. Frailty in elderly people. Lancet. 2013; 381: 752 – 762.

ASSESSMENT



Identifying frailty in practice

1. Comprehensive geriatric assessment (CGA)
 - Structured, multidisciplinary assessment
2. Simple assessment
 - Gait speed
 - Timed-up-and-go test (TUGT)
 - PRISMA-7 Questionnaire
3. Routine data
 - Electronic frailty index (eFI)
 - Clinical frailty scale (CFS)



○ Comprehensive Geriatric Assessment

Component	Elements
Medical assessment	Problem list Comorbid conditions and disease severity Medication review Nutritional status
Assessment of functioning	Basic activities of daily living Instrumental activities of daily living Activity/exercise status Gait and balance
Psychological assessment	Mental status (cognitive) testing Mood/depression testing
Social assessment	Informal support needs and assets Care resource eligibility/financial assessment
Environmental assessment	Home safety Transportation and telehealth

- BGS (2005) Comprehensive Assessment of the Frail Older Person in Hospital .BGS Website Compendium 3.5
- BGS (2010) Comprehensive Assessment of the Frail Older Person. BGS website
- Ellis, G and Langhorn, P. (2005) Comprehensive Geriatric Assessment for Older Hospital Patients. British Medical Bulletin. 71. pp 45-59

Gait speed

Van Kan G, et al. Gait speed at usual pace as a predictor of adverse outcomes in community-dwelling older people. *JNHA* 2009;13:881-9.

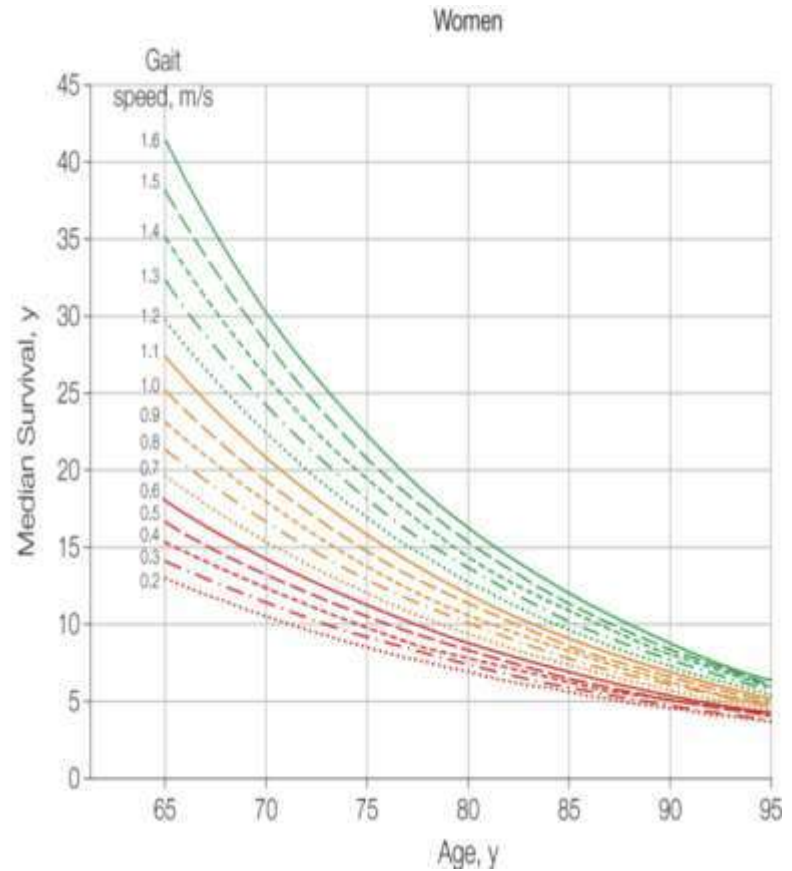
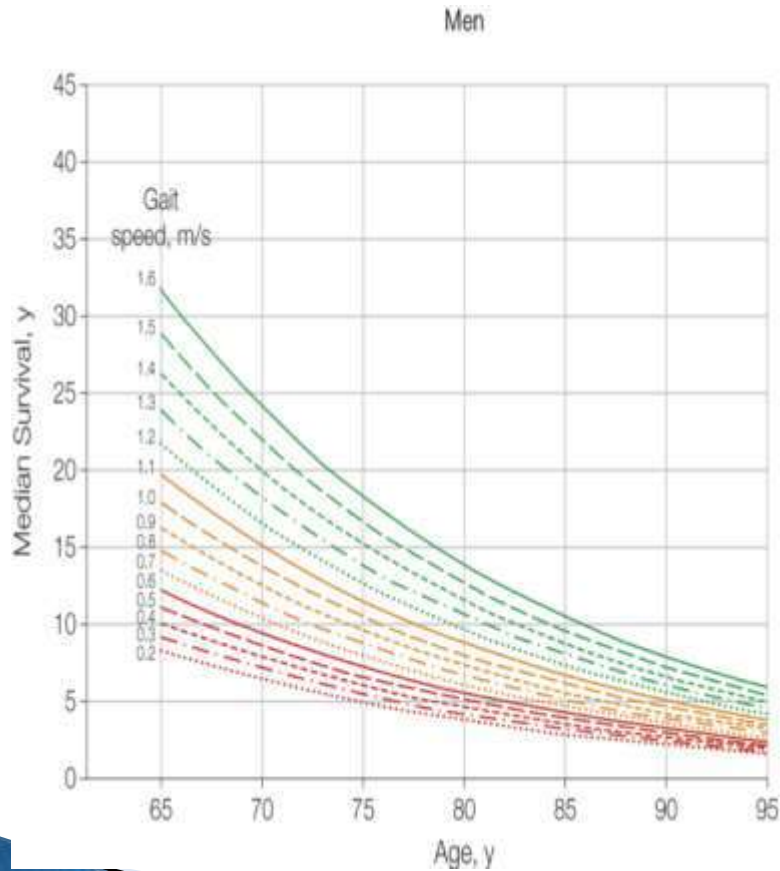
- Requires a stop watch and 4 metre distance
- Median life expectancy 0.8 m/s
- *> 5 seconds to walk 4 metres*
- Good, valid, simple single tool to predict disability, long term care, falls, mortality
- Studies suggest target further examination of gait speeds slower than 0.6 m/s ??
- Especially informative if no self report of ↓ function

For identifying frailty:

Gait speed $< 0.8 \text{ m/s}$ = Sensitivity 0.99, specificity 0.64

Predicted Median Life Expectancy by Age and Gait Speed

Studenski S, et al. JAMA. 2011;305(1):50-58.



Timed up and go test

Podsiadlo, D. et al. The timed, Up & Go: a test of basic functional mobility for frail elderly persons. *Journal of American Geriatric Society* 1991;39:142-8.

- TUGT > 10 seconds
- Positive predictive value = 0.17
- Negative predictive value = 0.99
- Very good for excluding frailty
- Similar to gait speed and PRISMA-7 would need further clarification of results

For identifying frailty:
TUGT>10s = Sensitivity 0.93, specificity 0.62

Get Up and Go Test

- The get up and go test asks a person to:
 - stand from a chair without using their arms
 - walk 10 feet
 - turn around and walk back
 - and sit in the chair
- Can be timed with a time of ≥ 20 seconds indicating risk for adverse outcomes.
- Can also observe for unsteady gait.

PRISMA – 7

Raiche M, et al. PRISMA-7: A case finding tool to identify older adults with moderate to severe disabilities. *Archives of Gerontology and Geriatrics* 2008;47:9-18.

The “PRISMA 7” Questions

1. Are you more than 85 years?
2. Male?
3. In general do you have any health problems that require you to limit your activities?
4. Do you need someone to help you on a regular basis?
5. In general do you have any health problems that require you to stay at home?
6. In case of need, can you count on someone close to you?
7. Do you regularly use a stick, walker or wheelchair to get about?

- ≥ 3 or above at risk
- Sensitivity 78.3%
- Specificity 74.7%S
- Used to identify those who may benefit more comprehensive assessment

For identifying frailty:
PRISMA-7 = Sensitivity 0.83, specificity 0.83

Cumulative deficiency model

aka the frailty index

‘The more things that are wrong with you, the more likely you are to be frail’

- Canadian study of health and ageing
- Simple calculation of the presence of absence of a variable
- Based on 92 baseline variables
- Cumulative effect of individual deficits
- 92 reduced to 36 without loss of predictability

Rockwood K, Song X, Macknight C et al. A global clinical measure of fitness and frailty in elderly people. *CMAJ* 2005;**173**:489-95.

Frailty as a deficit accumulation



Rockwood et al. Lancet 1999;353:205-6

Electronic Frailty Index (eFI)

HSJ Supplement 22 November 2012

- Validated using 500,000 patients
- Calculated as cumulative deficit model

E.g. 18 deficits $18/36 = 0.5$

- Scoring:
 - 0 - 0.12 = Fit
 - 0.13 – 0.24 = Mild Frailty
 - 0.25 – 0.36 = Moderate Frailty
 - >0.36 = Severe Frailty

- Relates to the risk of adverse outcomes

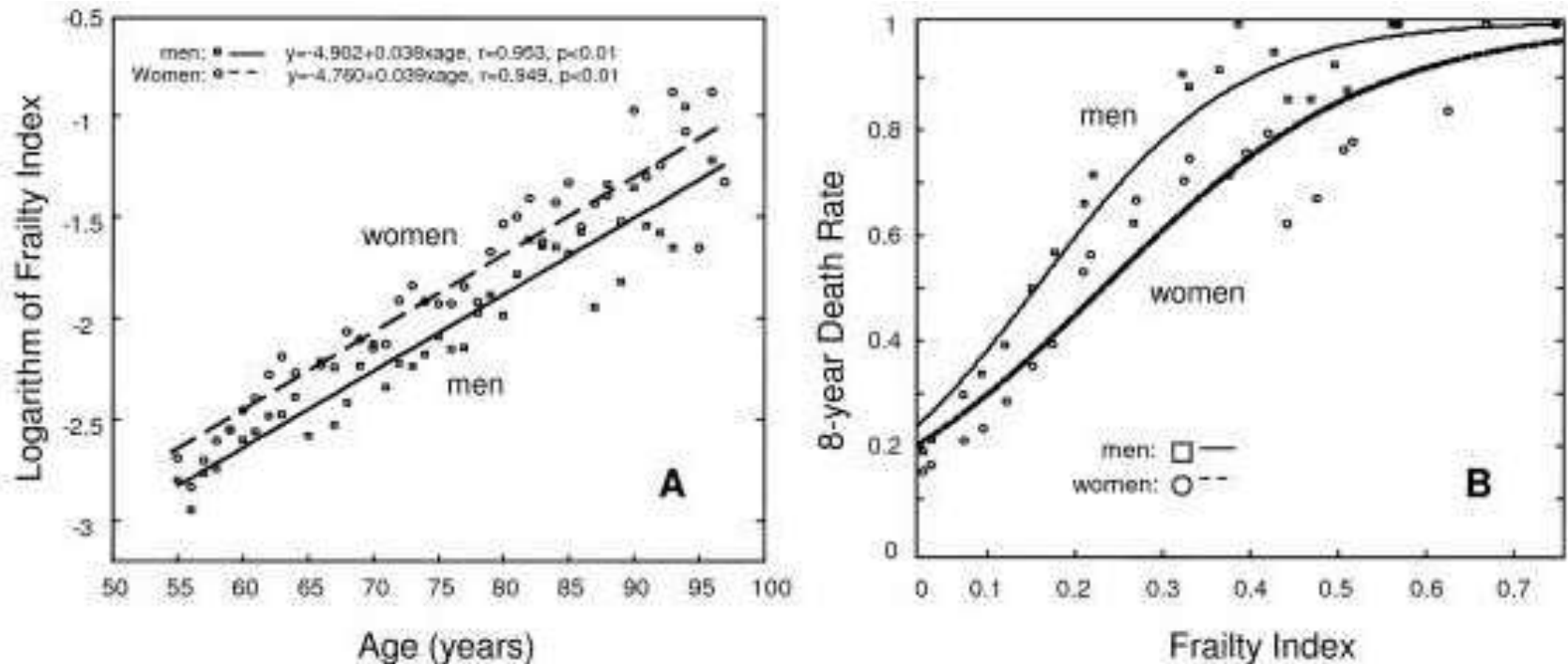


List of 36 deficits contained in the eFI

- Activity limitation
- Anaemia & haematinic deficiency
- Arthritis
- Atrial fibrillation
- Cerebrovascular disease
- Chronic kidney disease
- Diabetes
- Dizziness
- Dyspnoea
- Falls
- Foot problems
- Fragility fracture
- Hearing impairment
- Heart failure
- Heart valve disease
- Housebound
- Hypertension
- Hypotension/syncope
- Ischaemic heart disease
- Memory & cognitive problems
- Mobility and transfer problems
- Osteoporosis
- Parkinsonism & tremor
- Peptic ulcer
- Peripheral vascular disease
- Polypharmacy
- Requirement for care
- Respiratory disease
- Skin ulcer
- Sleep disturbance
- Social vulnerability
- Thyroid disease
- Urinary incontinence
- Urinary system disease
- Visual impairment
- Weight loss & anorexia

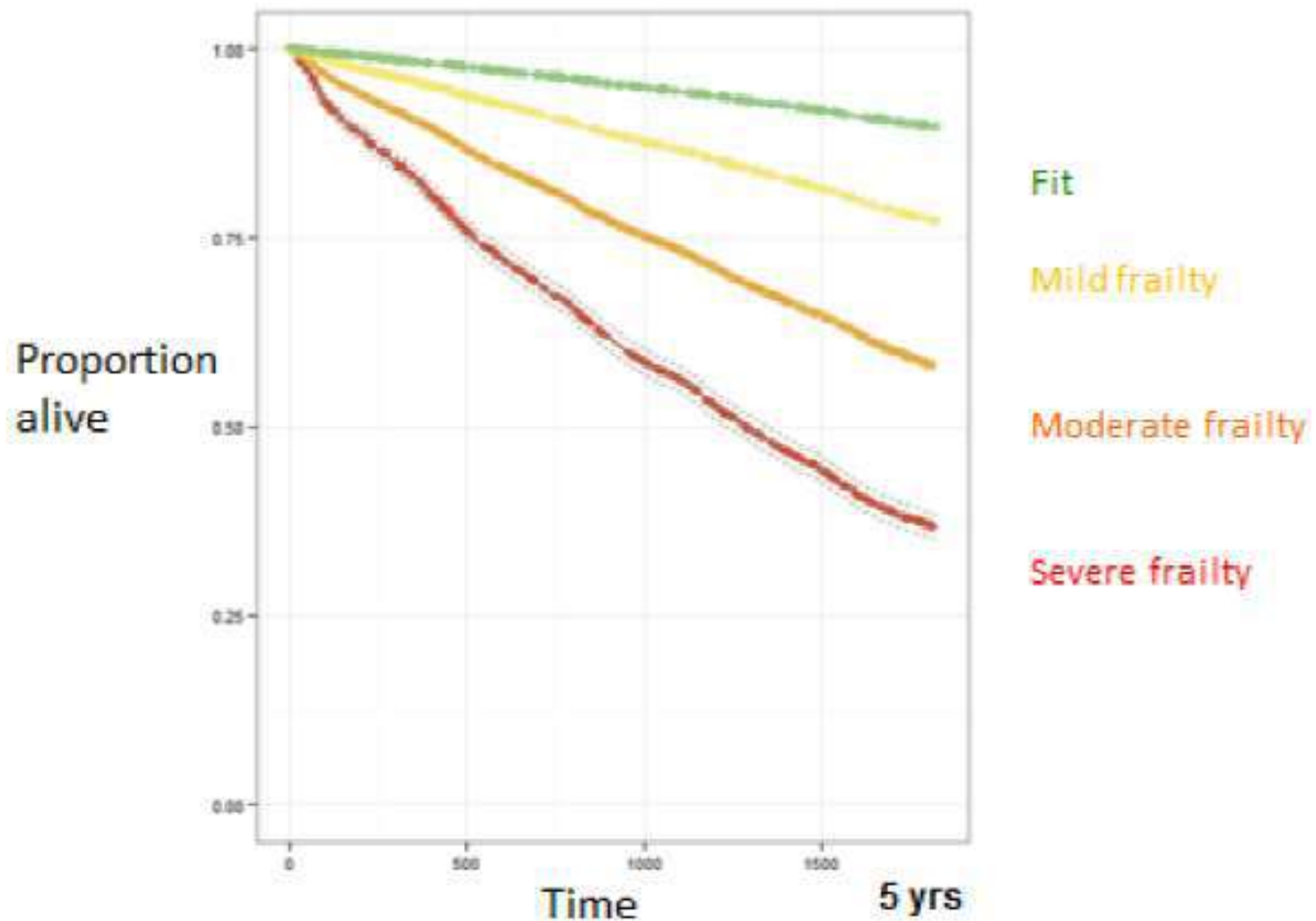
> 2000 Read codes

Deficit accumulation and mortality link



The relationship between age and the mean value of the FI (Panel A) and the eight-year death rate as a function of the FI (Panel B). Men: squares and solid line; women: circles and dashed line.

Primary care electronic Frailty Index (eFI): survival plots



Accuracy of frailty instruments against a reference standard

Preliminary Predictive Validity of Primary Care Electronic Frailty Index (eFI)

N=454,051 > 65y; 43 'deficits'; 2,233 Read codes

Frailty Grade	Prevalence	1y Mortality	5y Mortality
Mild	23%	2.31	2.03
Moderate	2.3%	3.97	3.28
Severe	0.2%	5.99	7.13

Useful when discussing planning future care needs / interventions??

Young J. 2014 Frailty is the future talk.

Clinical Frailty Scale

Rockwood K, et al. A global clinical measure of fitness and frailty in elderly people. *CMAJ* 2005;173:489-95.

- Predictive validity similar to Frailty Index
- Good correlation with other scales
- Unclear inter-rater reliability
- Best used with CGA and geriatrician
- Timely assessment
- Ongoing studies

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, medication). 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.

* 1. Canadian Study on Health & Aging, Revised 2008
2. K. Rockwood et al. A global clinical measure of fitness and frailty in elderly people. *CMAJ* 2005; 173:489-495.

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DALHOUSIE UNIVERSITY
Expanding Horizons

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.



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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.



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2. K. Rockwood et al. A global clinical measure of fitness and frailty in elderly people. CMAJ 2005;173:489-495.



Photo: Health Canada/Santé Canada

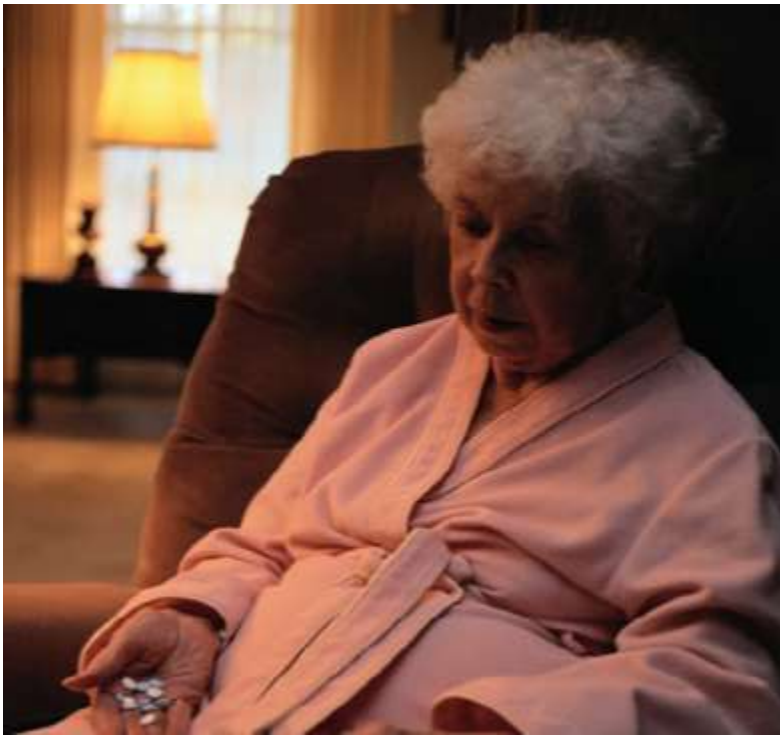
VERY FIT



WELL



**WELL , WITH TREATED
COMORBIDITIES**



Apparently vulnerable (slowed up or disease symptoms)



Mildly frail (some dependency in IADLs)



**Moderately frail (help with
IADLs and ADLs)**



Severely frail (dependent for ADLs)

The FRAIL Scale

- **Fatigue**

Tired all or most of the time during the past four weeks (No/Yes)

- **Resistance**

Difficulty walking up 10 steps without resting or aids (No/Yes)

- **Ambulation**

Difficulty walking several hundred yards alone without aids (500-600 meters) (No/Yes)

- **Illnesses**

5 or more illnesses (No/Yes)

- **Loss of weight**

Weight loss > 5% within the past month (No/Yes)

Robust=0; Pre-frail=1-2; Frail=3

[Morley et al J Nutr Health Ageing 2012; 16(7): 601-608]

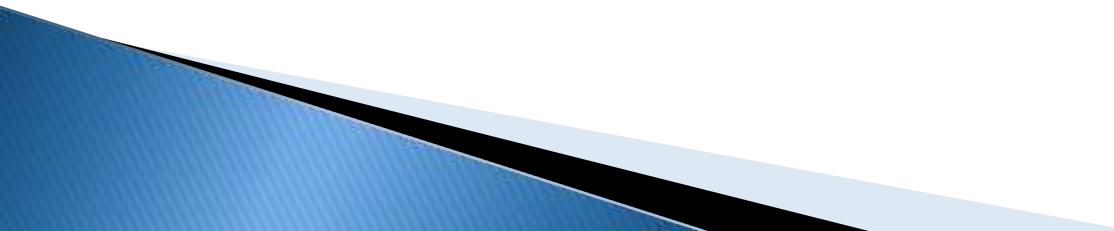
AGING CHANGES AND FRAILTY



Changes in Body Composition

- There is a net decrease in:
 - Bone mass
 - Lean muscle mass
 - Water content
- There is a net increase in:
 - Total body fat
 - Especially intra-abdominal (fat located inside the belly area/abdominal cavity)

Pathologic Changes Common in Aging

- Chronic diseases and restrictive diets
 - Dental problems
 - Depression
 - Alcohol abuse
 - Medication side effects
- 

ASSOCIATIONS WITH FRAILY



Nutrition and frailty

- Undernutrition and obesity are both associated with Frailty
- Low nutrient intake increases risk of frailty
- Most of older people at risk of malnutrition are either pre-frail or frail
- Low protein intake, and low vitamin D levels are associated with risk of frailty

- Bollwein J , et al. *J Nutri Health Aging*, 2013;17:351-356
- Beasley JM et al. *J Am Geriatr Soc*. 2010;58:1063-1071
- Shardell M, et al. *J Gerontol A Bio Sci Med Sci*. 2009; 64:69-75

HORMONES AND FRAILTY

- Growth hormone, insulin-like growth factor
 - Testosterone
 - Cortisol
 - Dehydroepiandrosterone(DHEA)
-
- Kyung-Shik Lee, Chang Hae Park . *Textbook of Geriatric Medicine International*. 2010;2:331-339

Growth Hormone, IGF-1

- Reduction in GH secretion is associated with loss of lean body and bone mass, which are both components of the frailty phenotype.
 - However, GH replacement therapy has failed to produce any positive effects in frail elderly and has been associated with many side –effects.
-
- Kyung-Shik Lee, Chang Hae Park .*Textbook of Geriatric Medicine International*. 2010;2:331-339

Testosterone

- Age-related declines in testosterone levels
 - Increased binding between sex hormone and globulin leads to further decline
 - This fall is associated with declines in muscle strength and mass, bone mineral density, and cognition.
 - Testosterone replacement in older men demonstrated an increase in grip power, lower extremity strength, muscle mass, and protein synthesis
-
- Kyung-Shik Lee, Chang Hae Park .*Textbook of Geriatric Medicine International*. 2010;2:331-339

Cortisol

- Aging---increasing decline in cyclical release and an overall increase in total amount.
- It reduces lean body mass.
- It is also related to neurodegeneration, atrophy of hippocampus (memory).

Kyung-Shik Lee, Chang Hae Park *Textbook of Geriatric Medicine International*.
2010;2:331-339

Dehydroepiandrosterone (DHEA)

- Adrenal cortex releases it. Its level declines with age.
- High doses of DHEA (100mg/day) improved muscle strength in males.
- However, A year long study at 50 mg/day of DHEA in older males and females produced only minimal effects.
- Therefore, it is not recommended for prevention or reversal of frailty.
- Kyung-Shik Lee, Chang Hae Park .*Textbook of Geriatric Medicine International*. 2010;2:331-339

Immune dysfunction and frailty

- Very old people have abnormally elevated levels of catabolic cytokines that induce an inflammatory state.
 - They also induce loss of lean body mass and increased fat mass and neuroendocrine dysregulation.
 - They also exert detrimental effects on bone , cardiac function, hematopoiesis, and cognition.
-
- Kyung-Shik Lee, Chang Hae Park .*Textbook of Geriatric Medicine International*. 2010;2:331-339

Associations with frailty

- Adverse outcomes
- Worsening disability
- Falls
- Admission to hospital
- Increasing length of stay
- Risk of admission to long term care
- Death



MANAGEMENT



Supported self management plan for Healthy Living in Later Life

Preventable components for 'Frailty'

- Affect (Mood problems)
- Alcohol excess
- Cognitive impairment
- Falls
- Functional impairment
- Hearing problems
- Nutritional compromise
- Physical inactivity
- Polypharmacy
- Smoking
- Social isolation and loneliness
- Vision problems

Stuck et al. Soc Sci Med.
1999 (Systematic review
of 78 studies)

Additional topics:

- Look after your feet
- Make your home safe
- Vaccinations
- Keep warm
- Get ready for winter
- Continence
-others.....??

New care model for older people & frailty

Young J. 2014 A primary care-based model for frailty. Kingsfund presentation.

TODAY

'The Frail Elderly'
(i.e. a label)



Presentation late & in crisis
(e.g. delirium, falls, immobility)



**Hospital-based: episodic,
disruptive & disjointed**

TOMORROW

**"An older person living with
frailty"**
(i.e. a long-term condition)



**Timely identification for
preventative, proactive care by
supported self-management &
personalised care planning**



**Community-based: person-
centred & co-ordinated**
(Health + Social + Voluntary
+ Mental Health)

DIET AND EXERCISE

- Nutrition and exercise can help frailty.
- Healthy diet is inversely associated with development of frailty.
- A mediterranean-style diet reduces the odds of becoming frail.
- Protein supplementation improves physical performance in frail elderly.
- Resistance training are associated with reduced frailty.

• Talegawekar SA ,et al *J Nutri.* 2012;142:2161-2166

• Tieland M, et al . *J Am Med Dir Assoc.*2012;13:720-726

• Chan Dc, et al *BMC Geriatr* .2012;12:58

- Elderly individuals experience more efficient protein synthesis when protein supplementation is accompanied by exercise.

- Dideriksen K, et al. *Nutrients*. 2013;5:852-876
- 

Thank You

