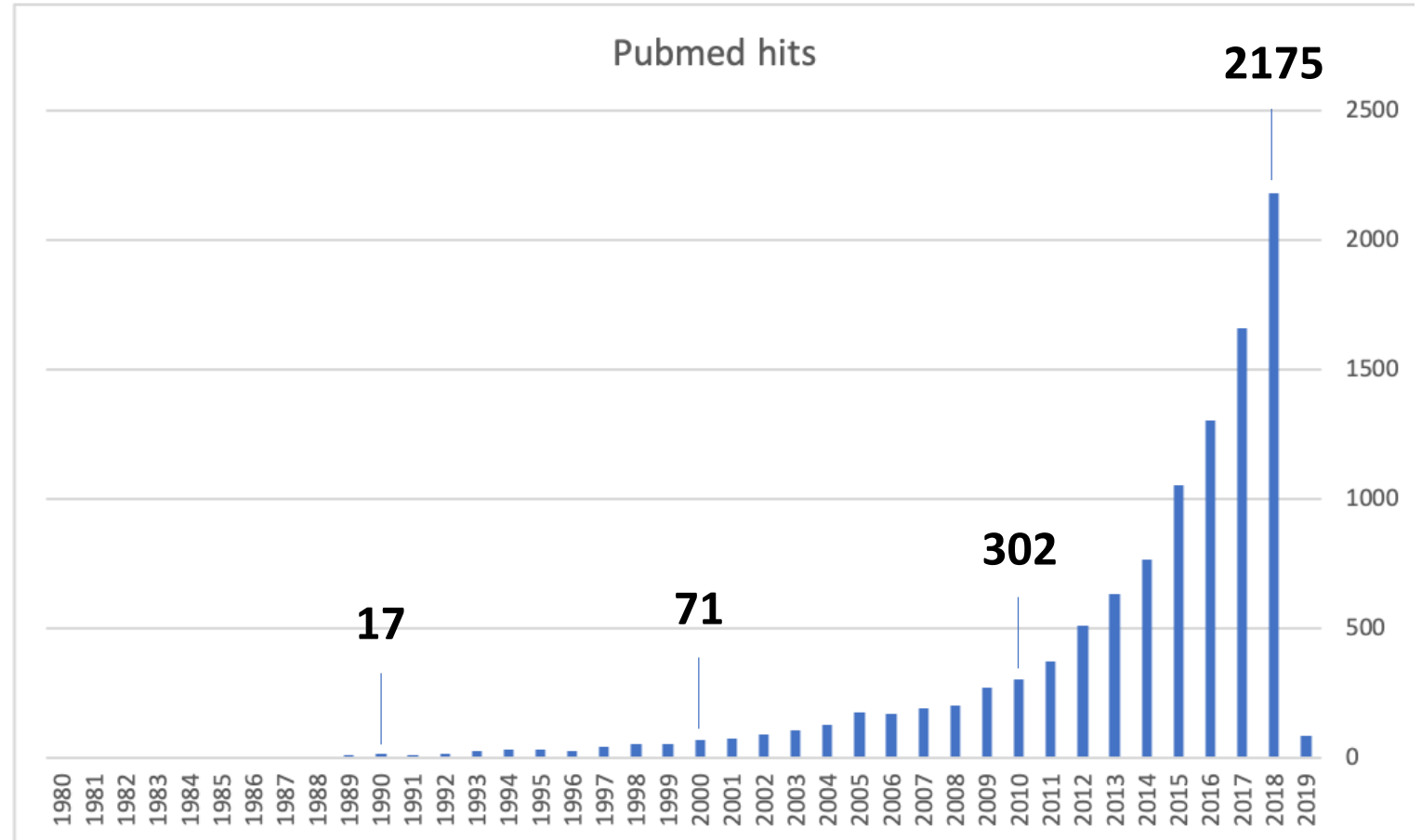


Frailty

Frailty papers
(per pubmed)

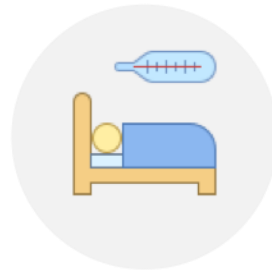


A close-up, black and white photograph of an elderly man's face. The image is heavily textured, showing deep wrinkles on his forehead, around his eyes, and on his cheeks. He has a full, white beard and mustache. The lighting is dramatic, with strong highlights and deep shadows, emphasizing the contours of his face. The background is dark and out of focus.

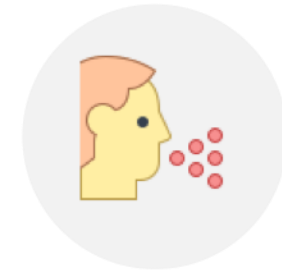
The unique features of the
old person



PATHOLOGY



DISEASE



SYMPTOMS



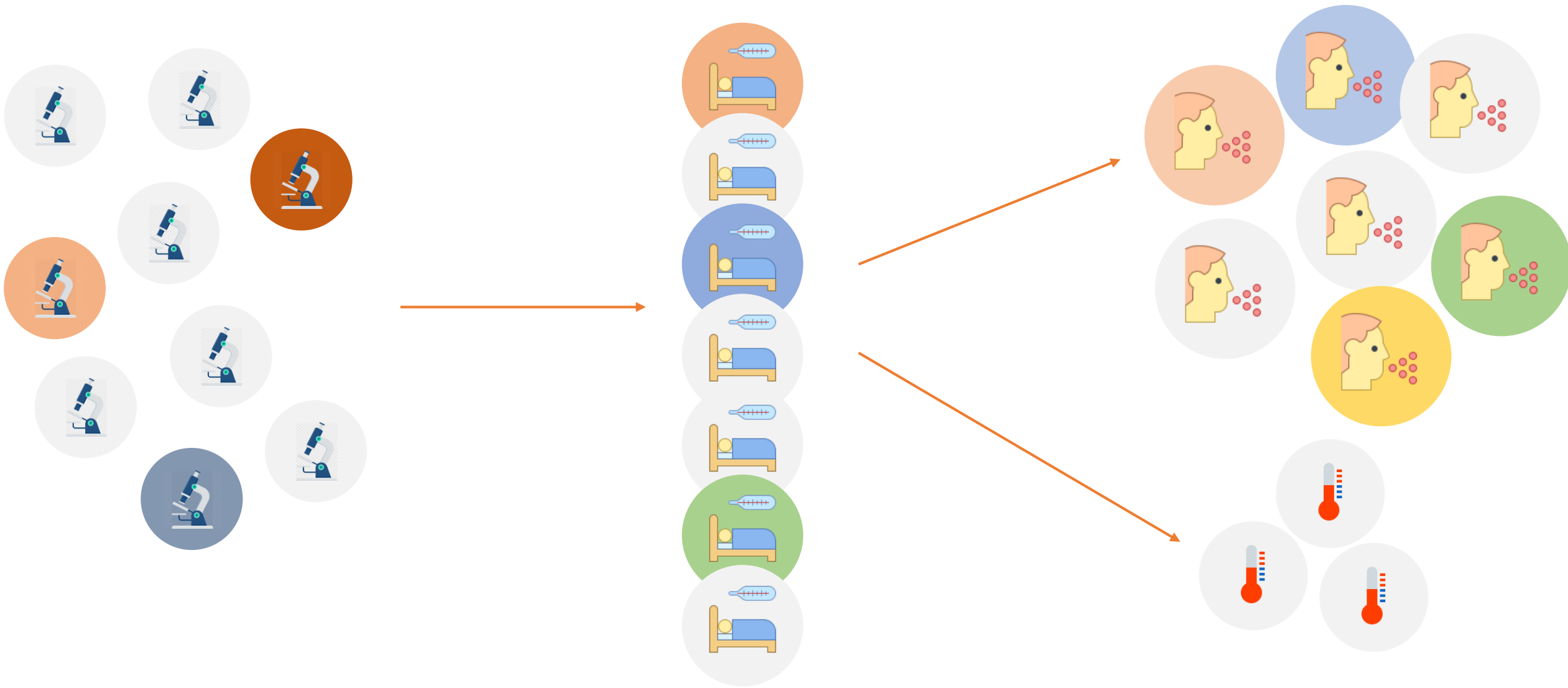
SIGNS

Identify the **disease** by its signs and symptoms

Treat (based on **pathogenesis** if possible)

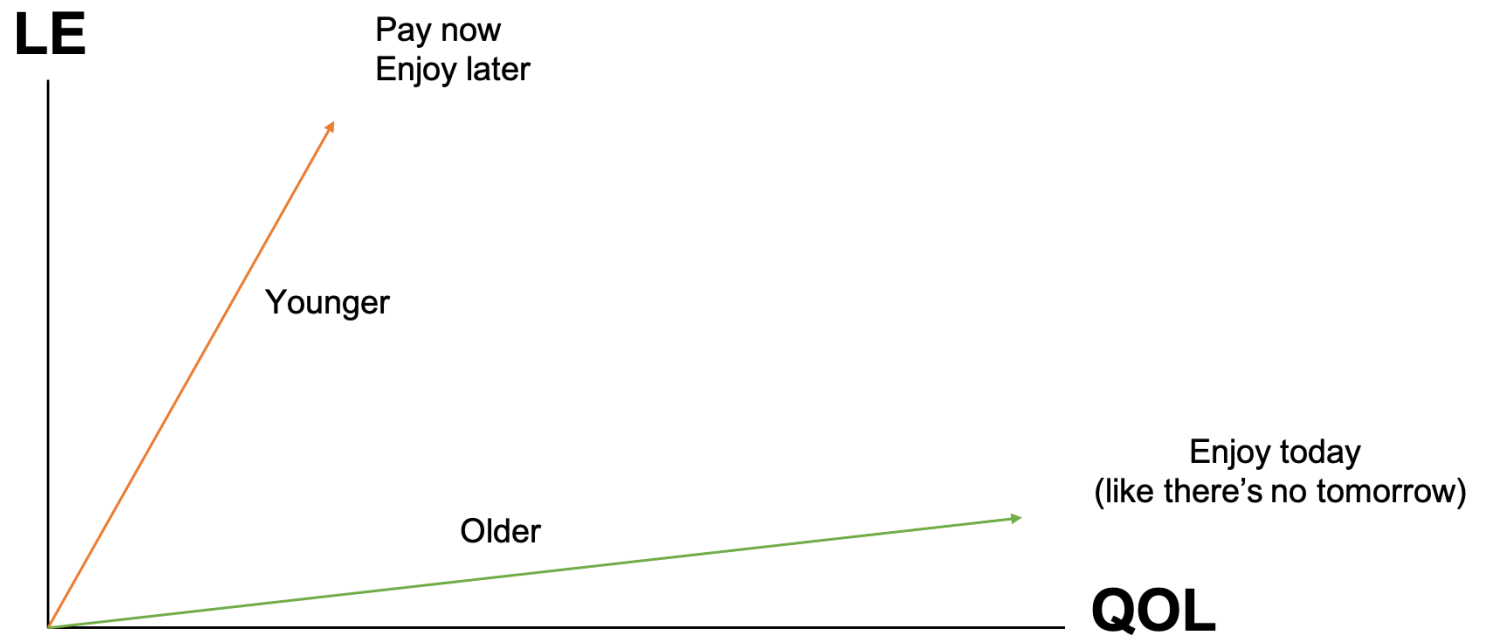
Treat **symptoms** as well

Disease based care dogma

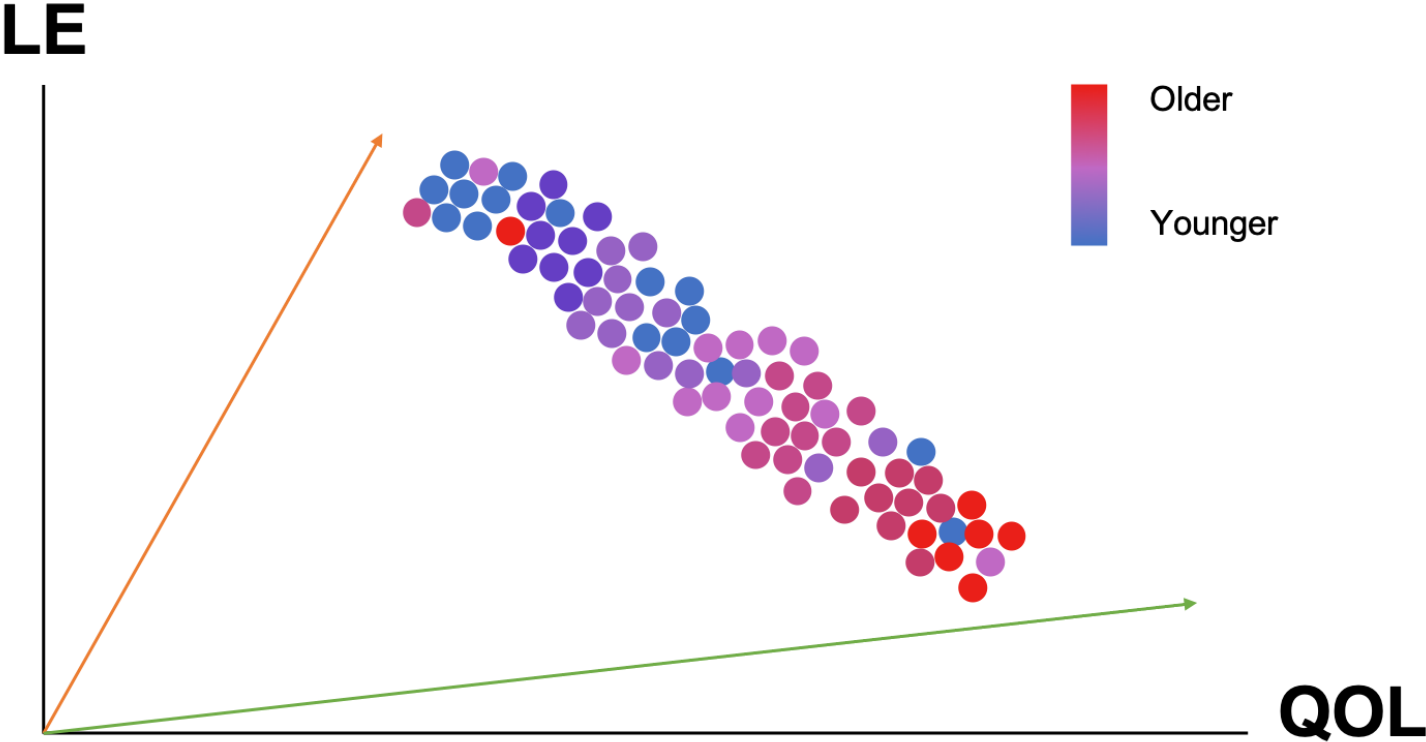


Disease based care (in the older patient)

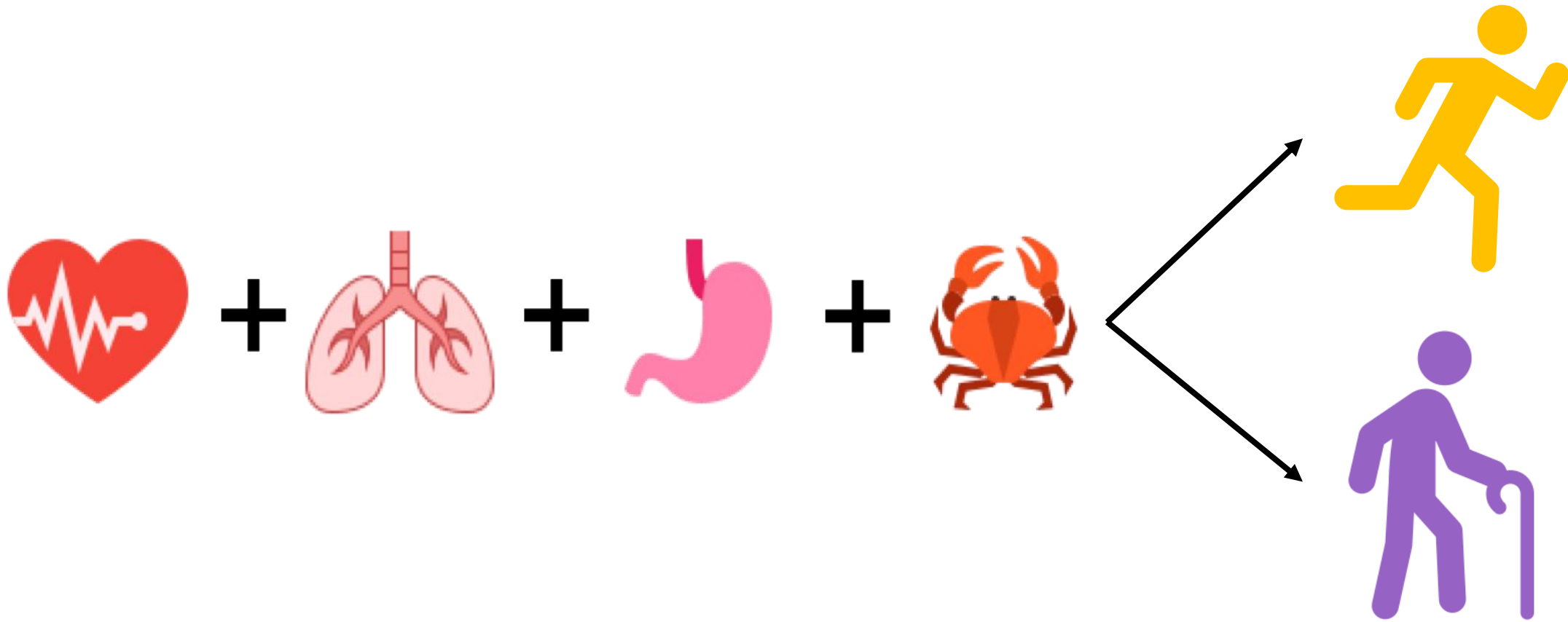
Life extension vs. Quality of life



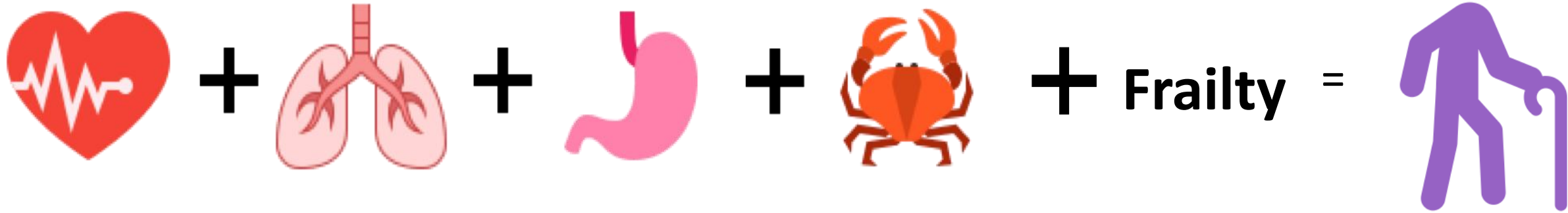
Life extension vs. Quality of life



The sum is greater than its parts



The sum is greater than its parts



Frailty definition

“Medical syndrome with multiple causes and contributors, characterized by diminished strength, endurance, and reduced physiologic function that increases an individual’s vulnerability for developing increased dependency and/or death”

Morley JE, Vellas B, van Kan GA, et al. **Frailty consensus: a call to action.**

J Am Med Dir Assoc. 2013;14(6):392–397.



Comprehensive frailty model

Ferrucci L, Studenski S. Clinical problems of aging. In: Longo DL, Fauci AS, Kasper DL, et al.
Harrison's Principles of Internal Medicine. 18th ed. New York, NY: McGraw Hill; 2012.

Frailty as accelerated aging

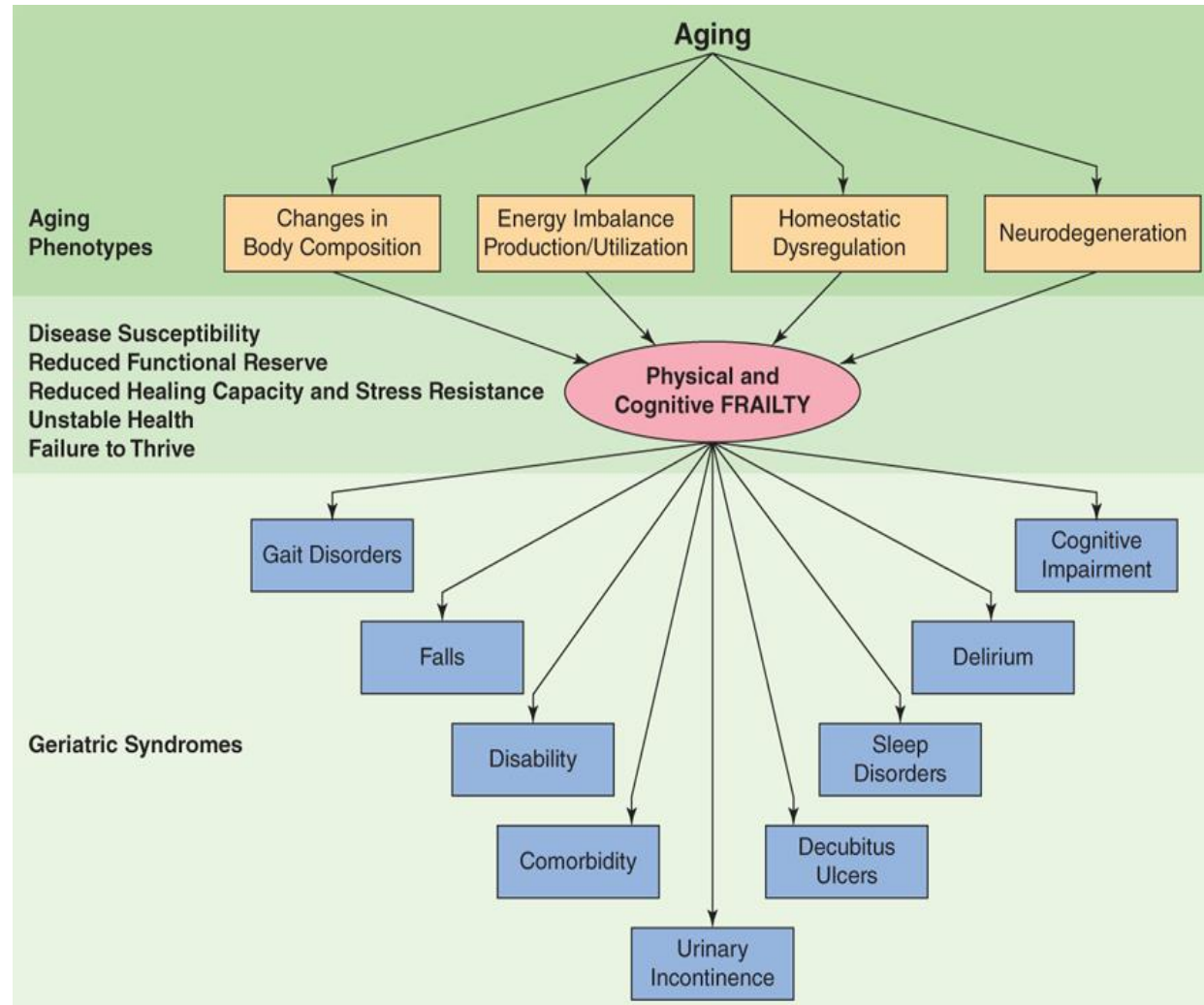


Changes in physiologic dimensions that change with aging in all humans



Disease states cannot define frailty (do not affect all humans)

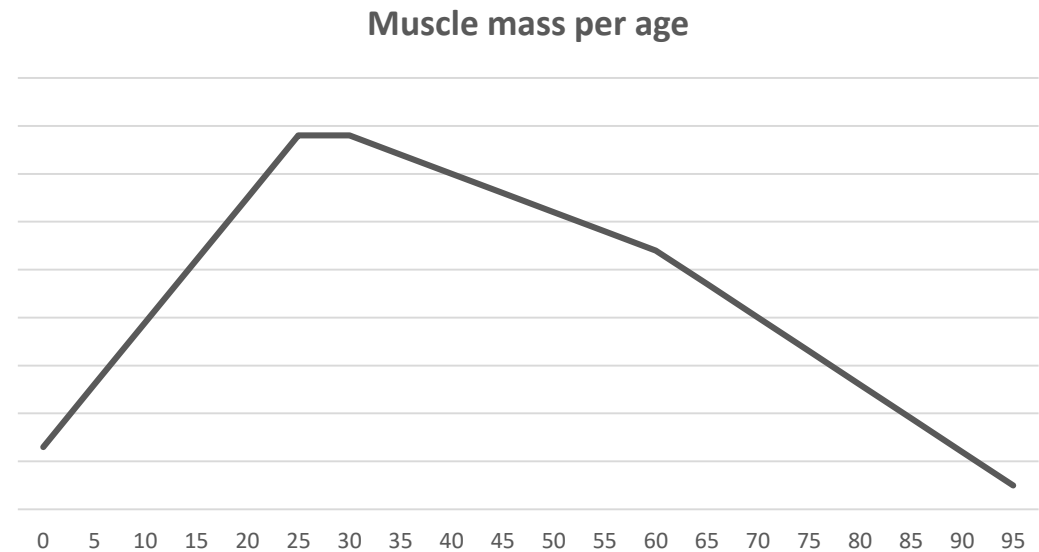
Accelerated aging



Ferrucci L, Studenski S. Clinical problems of aging. In: Longo DL, Fauci AS, Kasper DL, et al. *Harrison's Principles of Internal Medicine*. 18th ed. New York, NY: McGraw Hill; 2012.

Body Composition

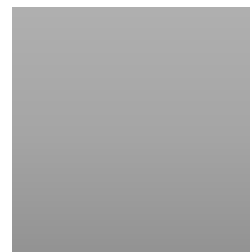
- Muscle
 - Mass
 - Composition
 - Fat infiltration
 - NMJ dysfunction
 - Impaired repair mechanisms
- Bone
 - Demineralization -> Osteoporosis



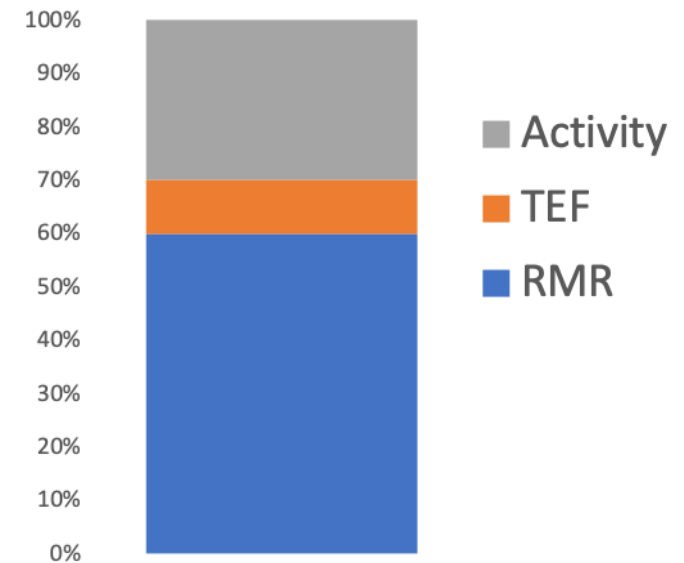
Impaired energy balance in frailty



$VO_2 \text{ max} \cong \text{energy availability}$
 $\text{Total energy expenditure (TEE)} \cong \text{Energy consumption}$



$VO_2 \downarrow \downarrow \downarrow \downarrow 2$
 $\downarrow \downarrow \downarrow \downarrow \downarrow$
 $\downarrow \downarrow \downarrow \downarrow \downarrow$
 $\downarrow \downarrow$
RMR \uparrow



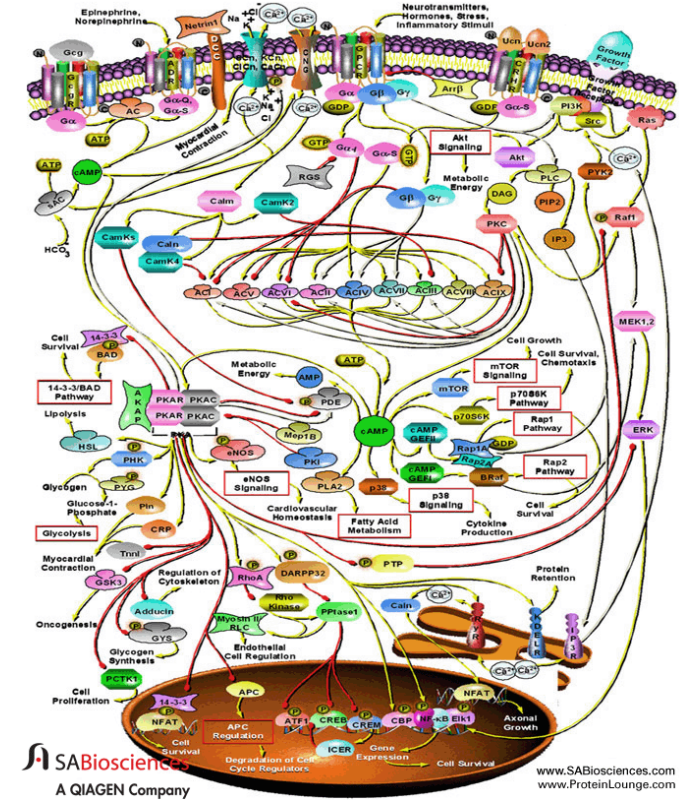
Homeostatic dysregulation



Inflammaging



Hormonal dysregulation

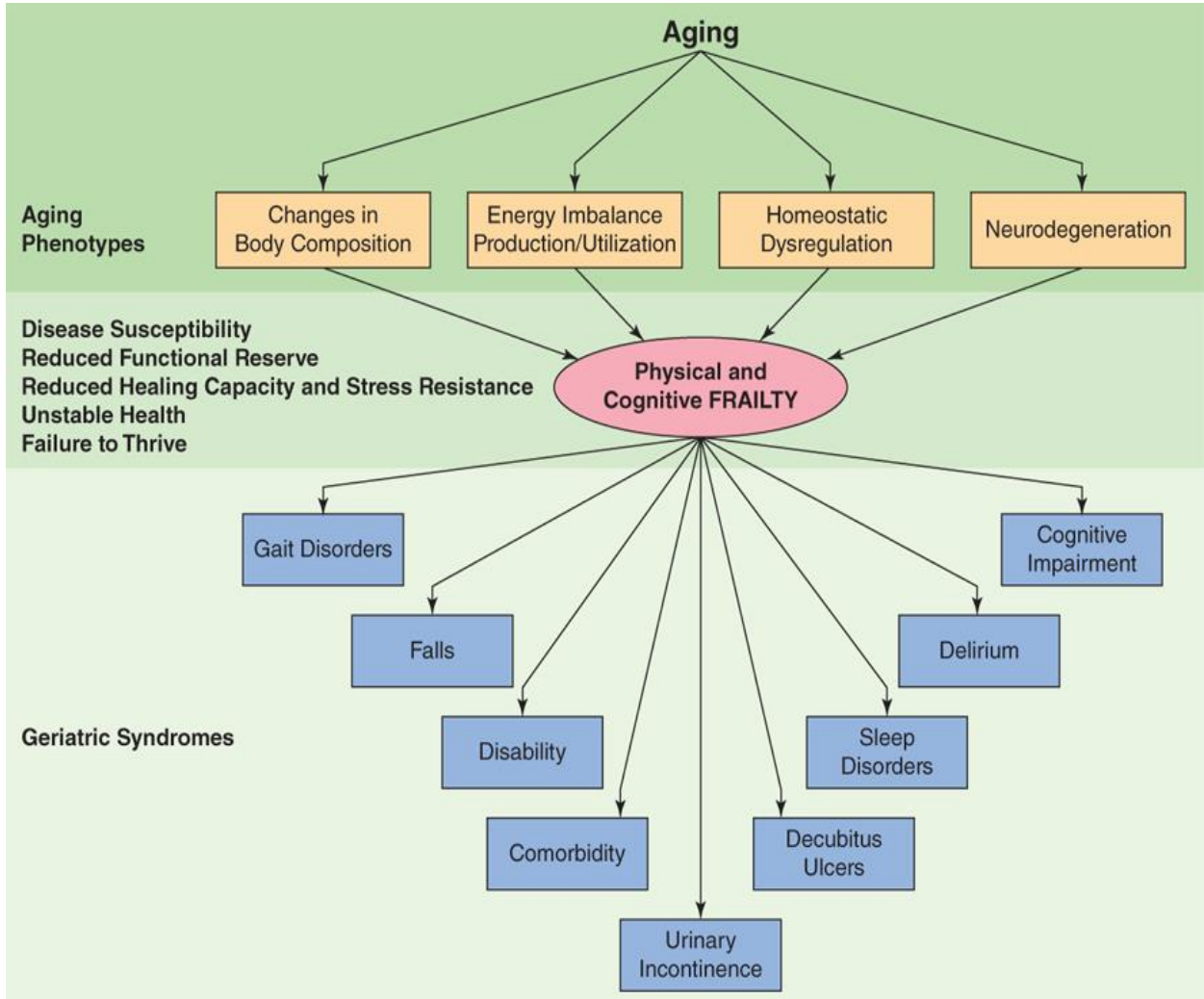




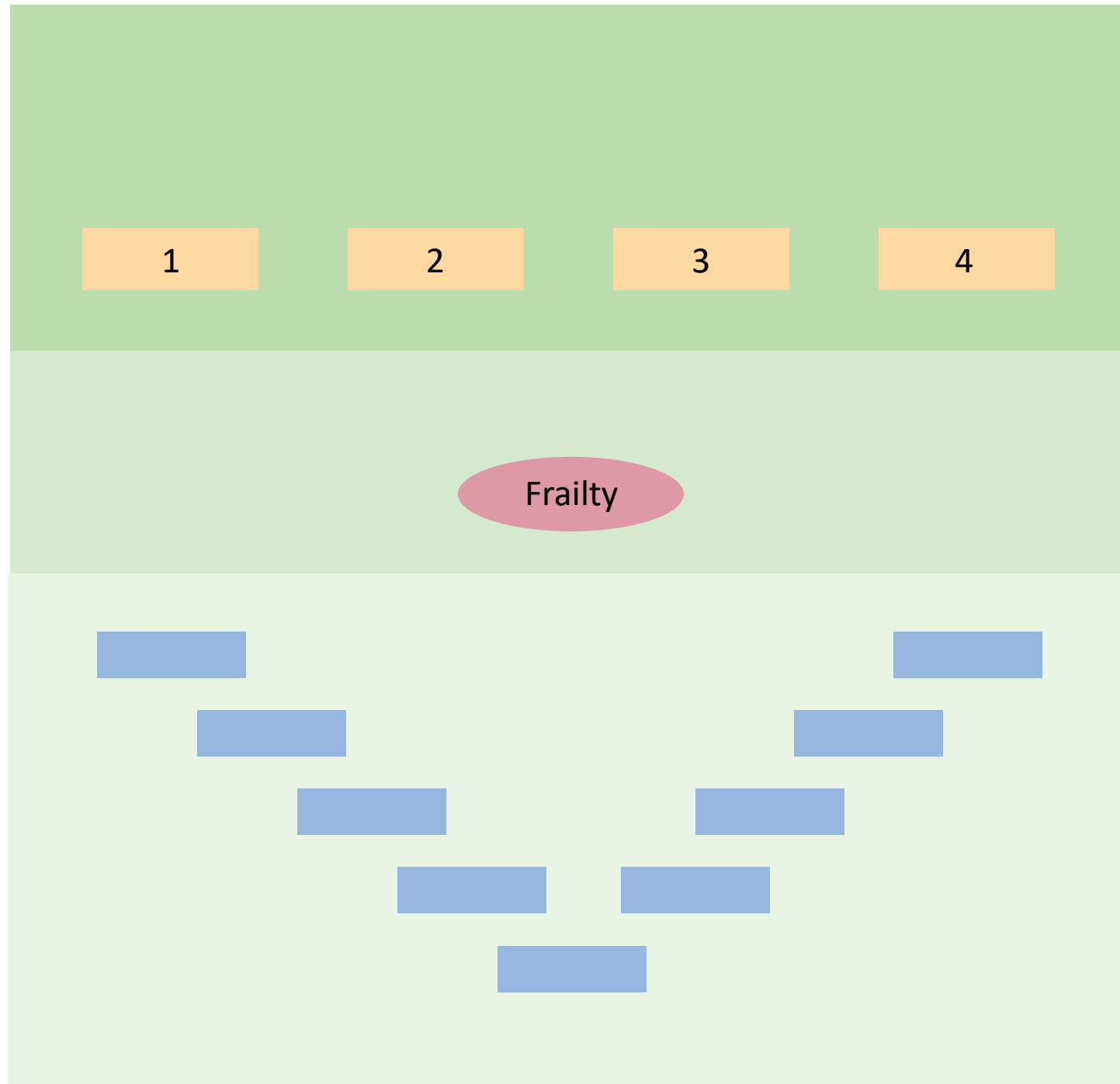
Neurodegeneration

- CNS
 - Memory
 - Processing speed
 - Multitasking
- PNS
 - Motor neuron number ↓
 - Motor unit number ↓
 - Motor unit size ↑
 - Fine motor control ↓
 - Increased demyelination

Accelerated aging



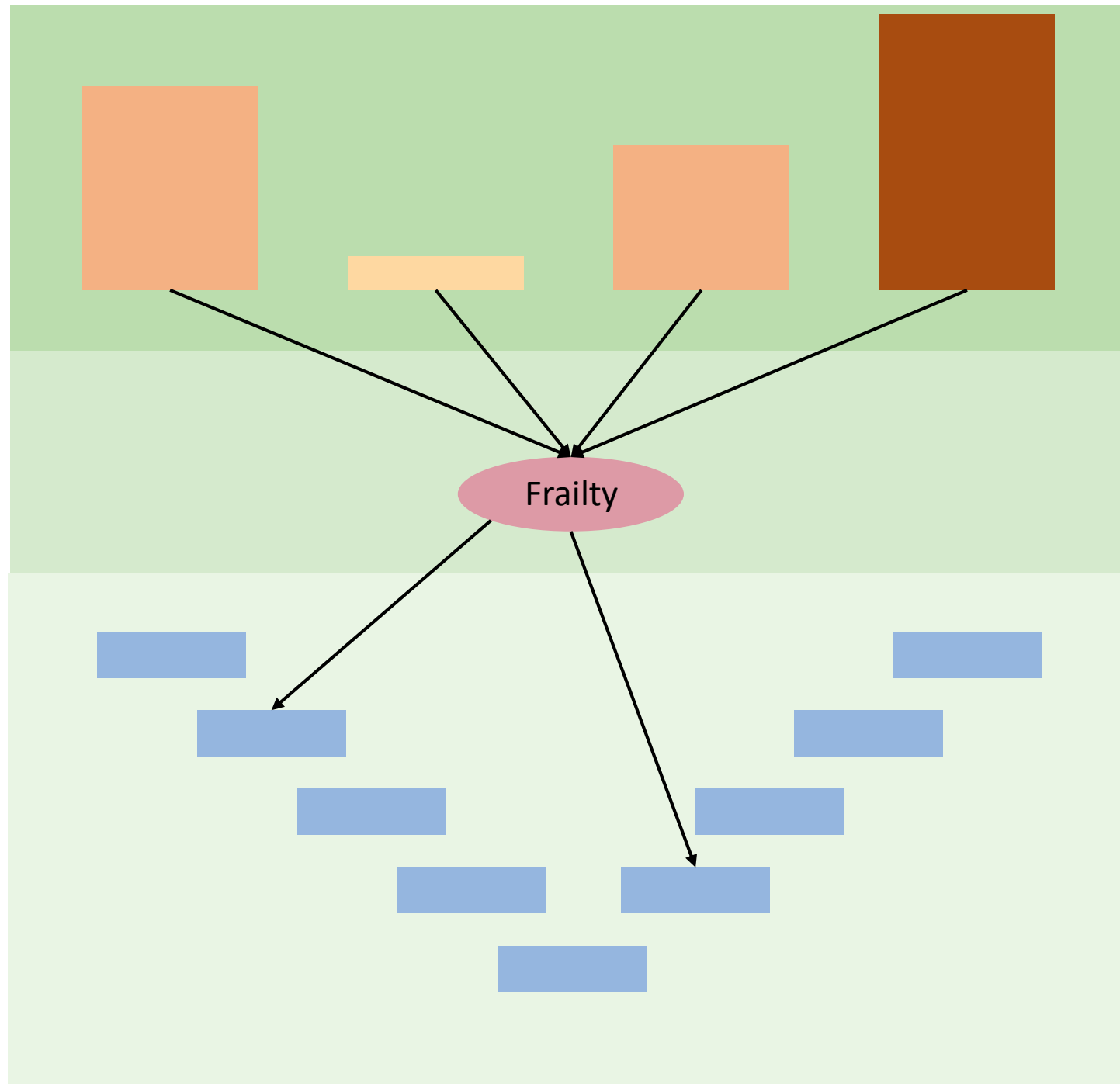
Accelerated aging

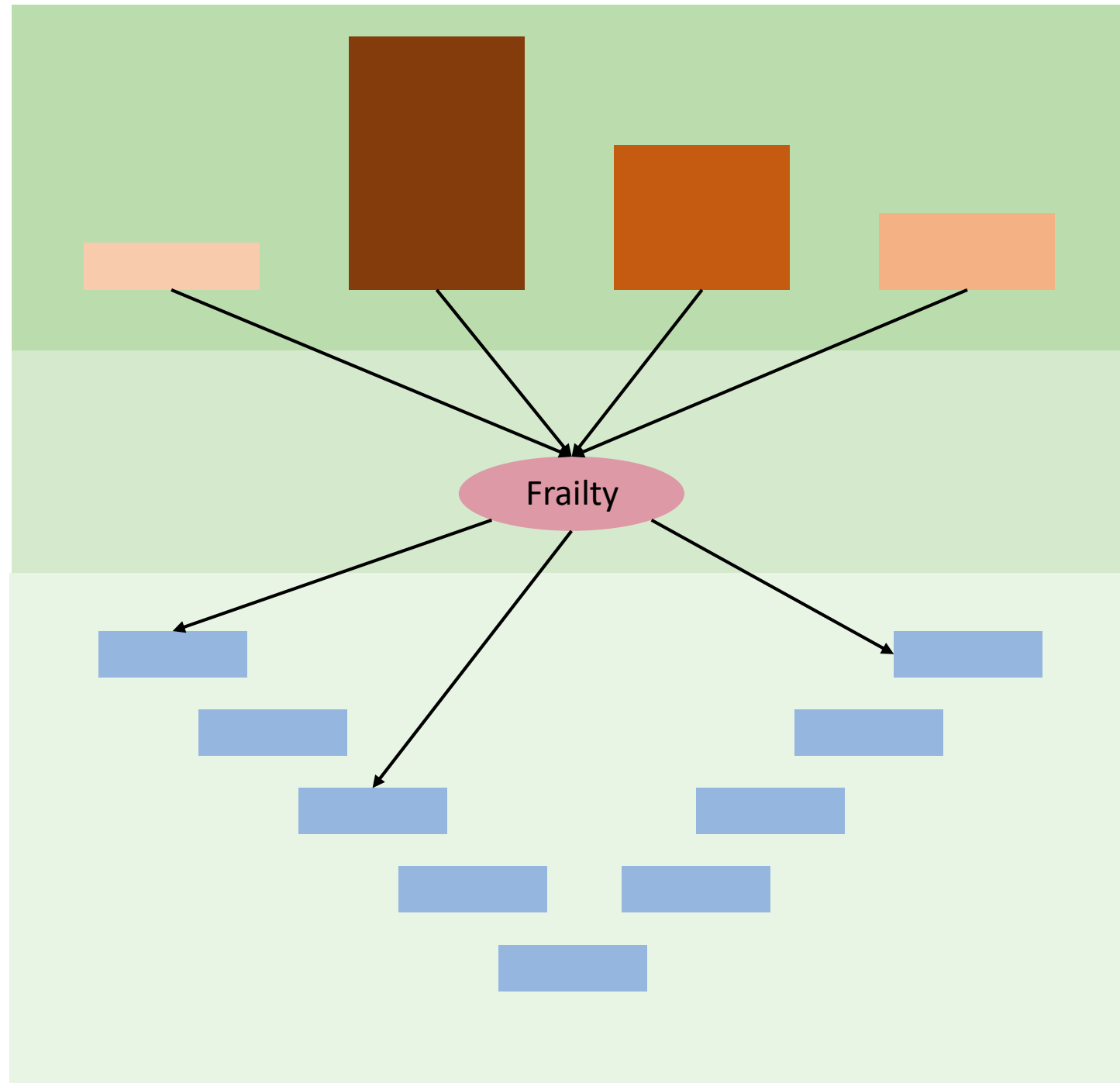


Aging phenotype

Frailty

Geriatric syndromes





Frailty
screening
tools

Phenotype model



Cumulative deficit model (FI)

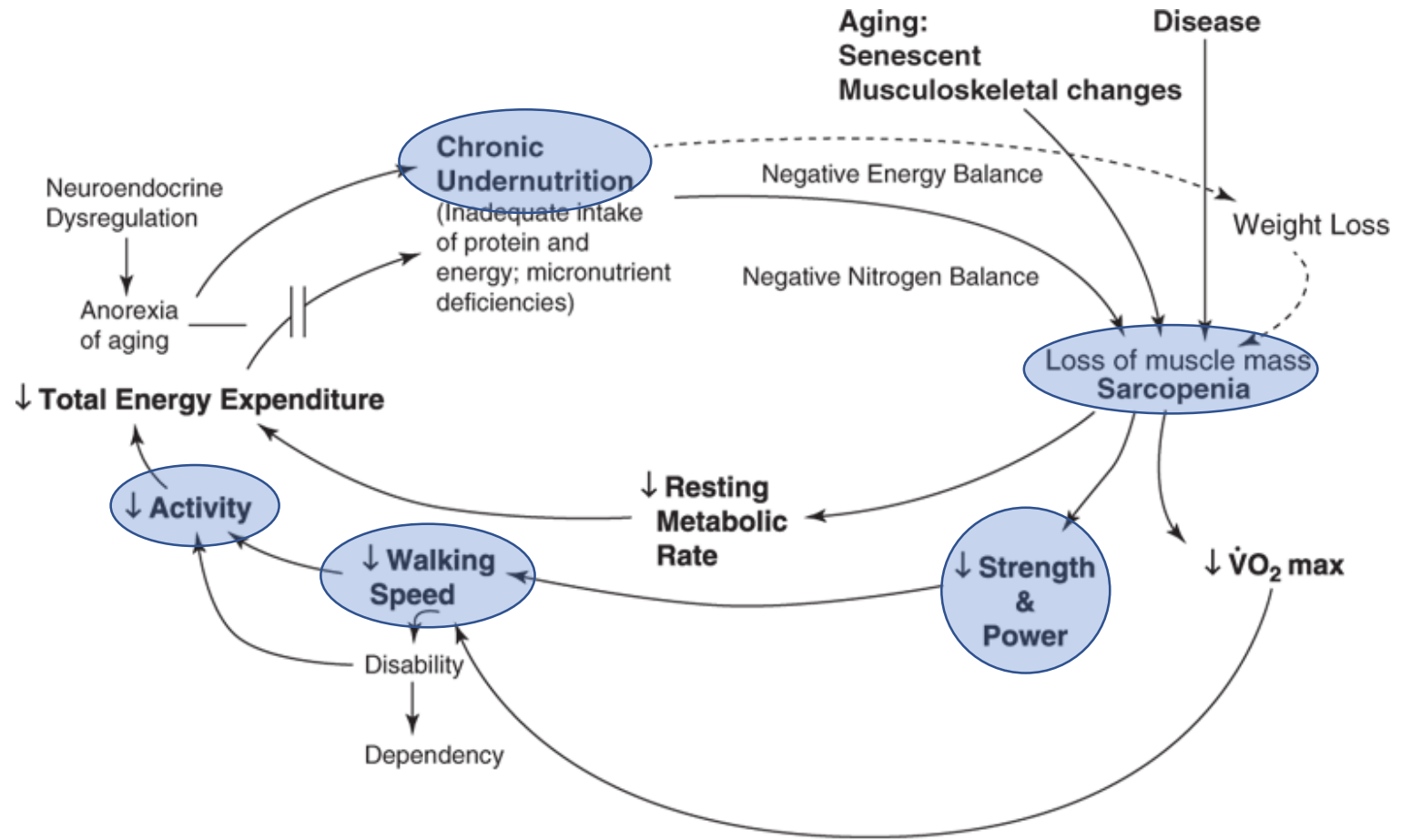
Frailty scale



Phenotypic model

Fried L. et al. Frailty in older adults: evidence for a phenotype. *J Gerontol A* 2001;56:M146–156

Phenotypic model



Source: J.B. Halter, J.G. Ouslander, S. Studenski, K.P. High, S. Asthana, M.A. Supiano, C. Ritchie, W.R. Hazzard, N.F. Woolard: Hazzard's Geriatric Medicine and Gerontology, Seventh Edition, www.accessmedicine.com Copyright © McGraw-Hill Education. All rights reserved.

CHARACTERISTICS OF FRAILTY

CARDIOVASCULAR HEALTH STUDY MEASURE

Weight loss (unintentional)/sarcopenia (loss of muscle mass)

> 10 lb (4.5Kg) lost unintentionally in prior year

Weakness

Grip strength: lowest 20% (by gender, body mass index)

Exhaustion/poor endurance

Exhaustion" (self-report)

Slowness

Walking time/15 ft: slowest 20% (by gender, height)

Low activity

kcal/wk: lowest 20% males: <383 kcal/wk; females: <270 kcal/wk

Fried's Frailty criteria

Non frail

0-1*

Pre-Frail

2

Frail

≥ 3

* higher risk, 1 defined pre-frail earlier

Phenotypic model scoring system



A frailty index from common laboratory predicted mortality using data from the National Health and Nutrition Examination

Kenneth Rockwood¹, Joanna Blodgett², Susan Howlett¹, Olga T

¹Dalhousie University, NS, Canada ²University College London, London, UK

Cumulative deficits model

Mitnitski A, Song X, Rockwood K. The estimation of relative fitness and frailty in community-dwelling older adults using self-report data. *J Gerontol A* 2004;59:M627-632

Background

- As people age, they accumulate health deficits.
- Health deficit accumulation occurs at subcellular levels and scales up to become clinically visible.
- In animals, frailty can be measured across the life course as a frailty index consisting of deficits.
- A 2014 report suggests that this holds in older adults.

Objective 1:

Does deficit accumulation based on laboratory and vital sign

Objective 2:

Are FI-LAB scores associated with mortality?

Objective 3:

How does the FI-LAB compare with a typical frailty index based on self-reported deficits?



Table 1. Descriptive characteristics of the Full Sample (N = 8888)

| |
|-------------------------------|
| Gender [n (%)]* |
| Men |
| Women |
| Education group [n (%)]* |
| Less than high school |
| High school |
| Some college/associate degree |
| College graduate or more |
| Marital status (n = 65,000) |

Frailty Index

Mitnitski A, Song X, Rockwood K. The estimation of relative fitness and frailty in community-dwelling older adults using self-report data. J Gerontol A Biol Sci Med Sci 2004;59:M627–632

- Data driven quantitative measurement
 - Clinical
 - Functional
 - Cognitive

$$\frac{\text{Positive variables}}{\text{Total variables}} = 0\dots 1$$

Frailty index - cutoffs



Non frail $FI \leq 0.08$



Pre frail $0.08 < FI < 0.25$



Frail $FI \geq 0.25$

Frailty index items

Function (10)

MS and neuro (17)

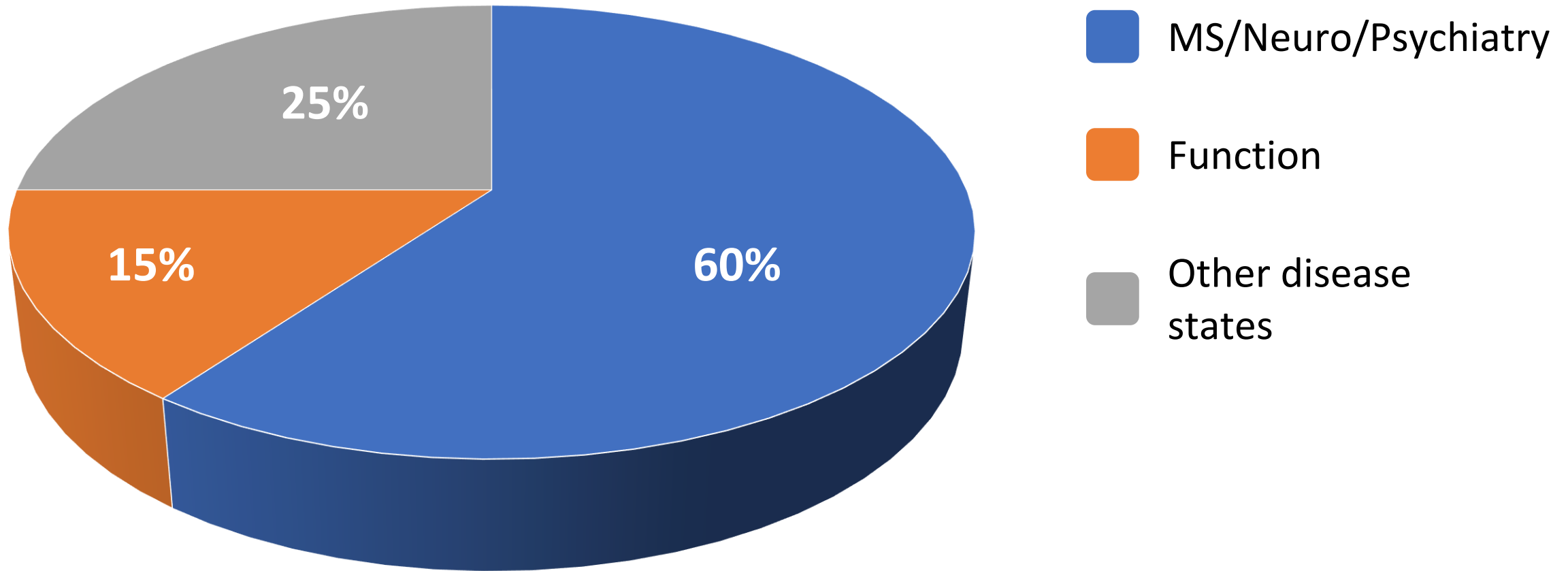
Mood and cognition (13)

Disease states (30)

Appendix 1: List of variables used by the Canadian Study of Health and Aging to construct the 70-item CSHA Frailty Index

- Changes in everyday activities
- Head and neck problems
- Poor muscle tone in neck
- Bradykinesia, facial
- Problems getting dressed
- Problems with bathing
- Problems carrying out personal grooming
- Urinary incontinence
- Toileting problems
- Bulk difficulties
- Rectal problems
- Gastrointestinal problems
- Problems cooking
- Sucking problems
- Problems going out alone
- Impaired mobility
- Musculoskeletal problems
- Bradykinesia of the limbs
- Poor muscle tone in limbs
- Poor limb coordination
- Poor coordination, trunk
- Poor standing posture
- Irregular gait pattern
- Falls
- Mood problems
- Feeling sad, blue, depressed
- History of depressed mood
- Tiredness all the time
- Depression (clinical impression)
- Sleep changes
- Restlessness
- Memory changes
- Short-term memory impairment
- Long-term memory impairment
- Changes in general mental functioning
- Onset of cognitive symptoms
- Clouding or delirium
- Paranoid features
- History relevant to cognitive impairment or loss
- Family history relevant to cognitive impairment or loss
- Impaired vibration
- Tremor at rest
- Postural tremor
- Intention tremor
- History of Parkinson's disease
- Family history of degenerative disease
- Seizures, partial complex
- Seizures, generalized
- Syncope or blackouts
- Headache
- Cerebrovascular problems
- History of stroke
- History of diabetes mellitus
- Arterial hypertension
- Peripheral pulses
- Cardiac problems
- Myocardial infarction
- Arrhythmia
- Congestive heart failure
- Lung problems
- Respiratory problems
- History of thyroid disease
- Thyroid problems
- Skin problems
- Malignant disease
- Breast problems
- Abdominal problems
- Presence of snout reflex
- Presence of the palmomental reflex
- Other medical history

Frailty index variables distribution



A black and white photograph of three elderly men sitting around a table, focused on a chess game. The man on the left is wearing a textured sweater and a flat cap. The man in the middle is wearing a light-colored jacket and a baseball cap. The man on the right is wearing a dark jacket and a flat cap, and is in the process of moving a chess piece. The background is slightly blurred, suggesting an outdoor setting like a park or a community center.

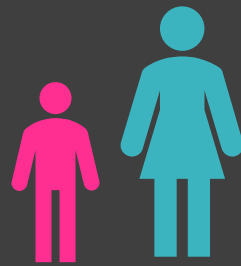
Epidemiology of frailty

Epidemiology of frailty

- The main challenge - **Definition**

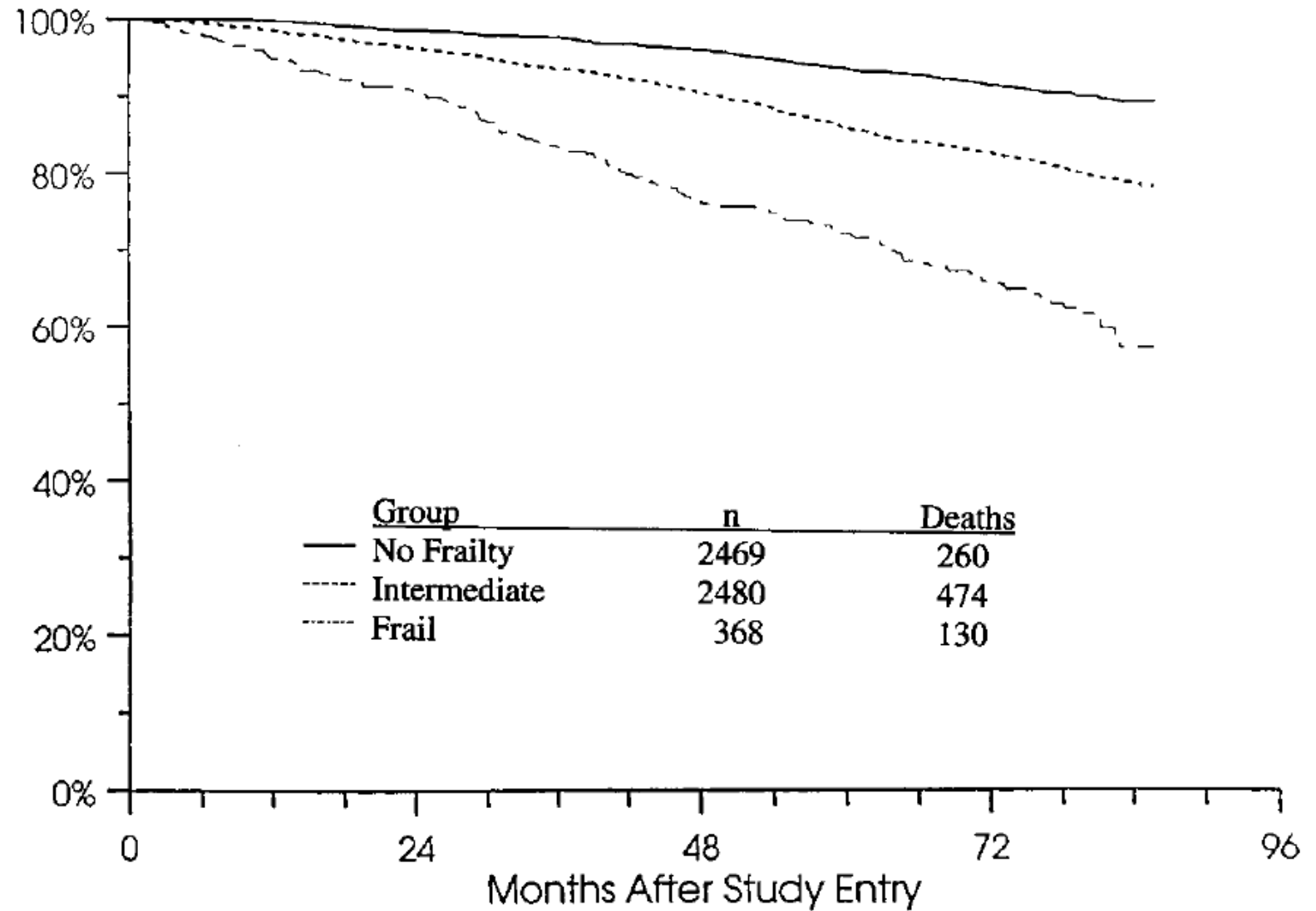


10-12%



...25%

Survival curves
(Phenotypic
model)



Surgery and
subspecialties

Cardiology

Nephrology

ORIGINAL RESEARCH ARTICLE

Original Investigation

FREE

RESEARCH ARTICLE

Open Access

Original Investigation | SURGICAL CARE OF THE AGING POPULATION

Multidimensional Frailty Score for the Prediction of Postoperative Mortality Risk

Sun-wook Kim, MD; Ho-Seong Han, MD, PhD; Hee-won Jung, MD; Kwang-il Kim, MD, PhD;
Dae Wook Hwang, MD, PhD; Sung-Bum Kang, MD, PhD; Cheol-Ho Kim, MD, PhD

JAMA Surg. 2014: 149(7) 633-640

Frailty in the context of specific
medical conditions

Implementation of **Frailty** for non-geriatricians



Screening tools

No standard tools
available



Usage

- * Inpatient – improved geriatric care
- * Prognostication
- * Patient selection for intervention
- * Referral for CGA



The first senior moment.

