

Frailty and Cardiac Rehabilitation

Daniel E. Forman, M.D.

Professor of Medicine, University of Pittsburgh

Chair, Section of Geriatric Cardiology, Divisions of Geriatrics and Cardiology, University of Pittsburgh Medical Center

Director of Emerging Therapeutics, Aging Institute, University of Pittsburgh

Director, Cardiac Rehabilitation and Coordinated Transitional Care (C-TraC), VA Pittsburgh Healthcare System

Director of Translational Research, GRECC, and Director of Whole Health Research, VA Pittsburgh Healthcare System



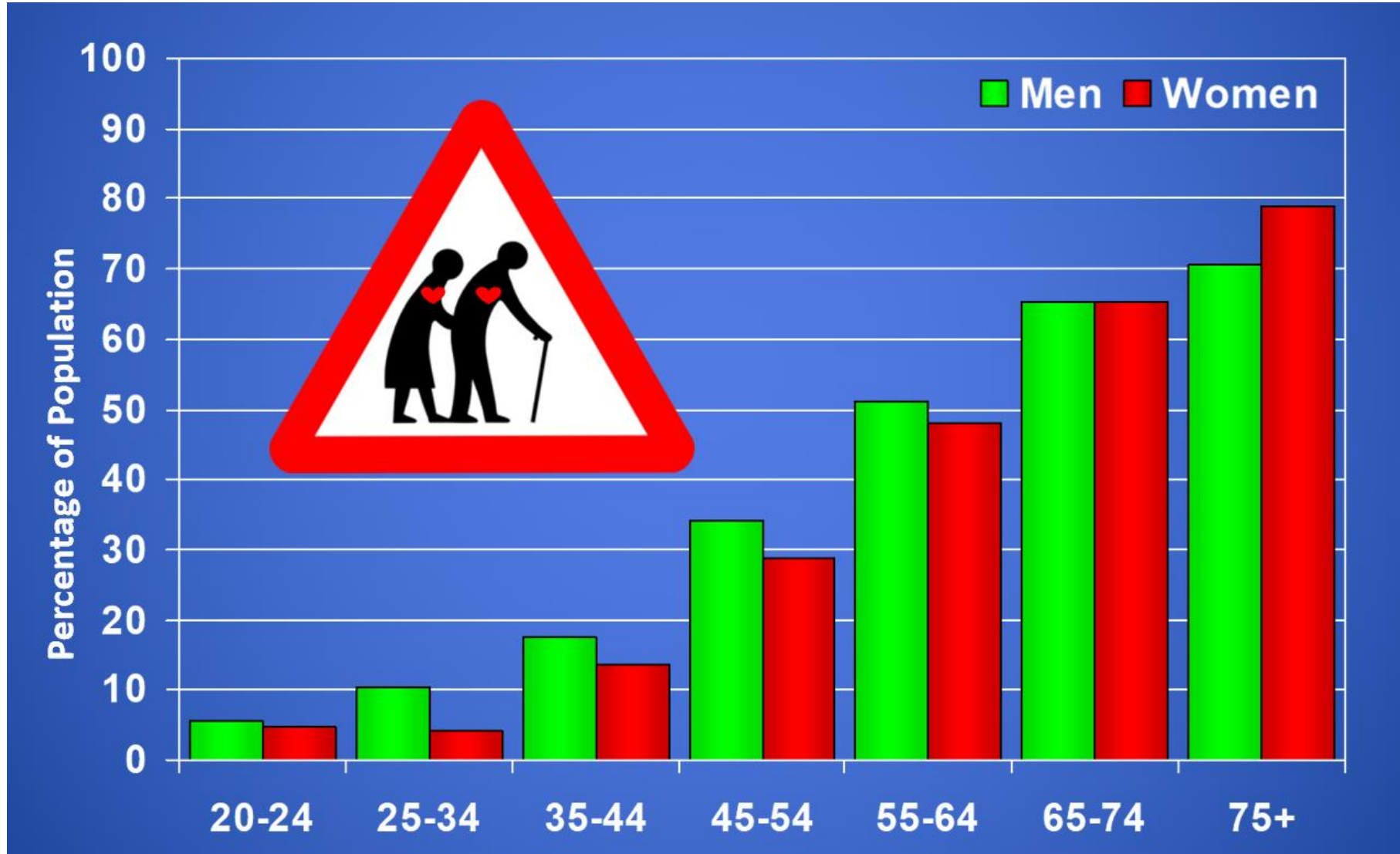
Disclosures

Grant/research support:

- NIA R01AG060499, R01AG058883, U19AG065188, R01AG073633, R01AG077179, and P30AG024827
- VA RR&D 1I21RX004409 and HSR&D1 I01 HX003518
- PCORI IHS-2021C3-24147



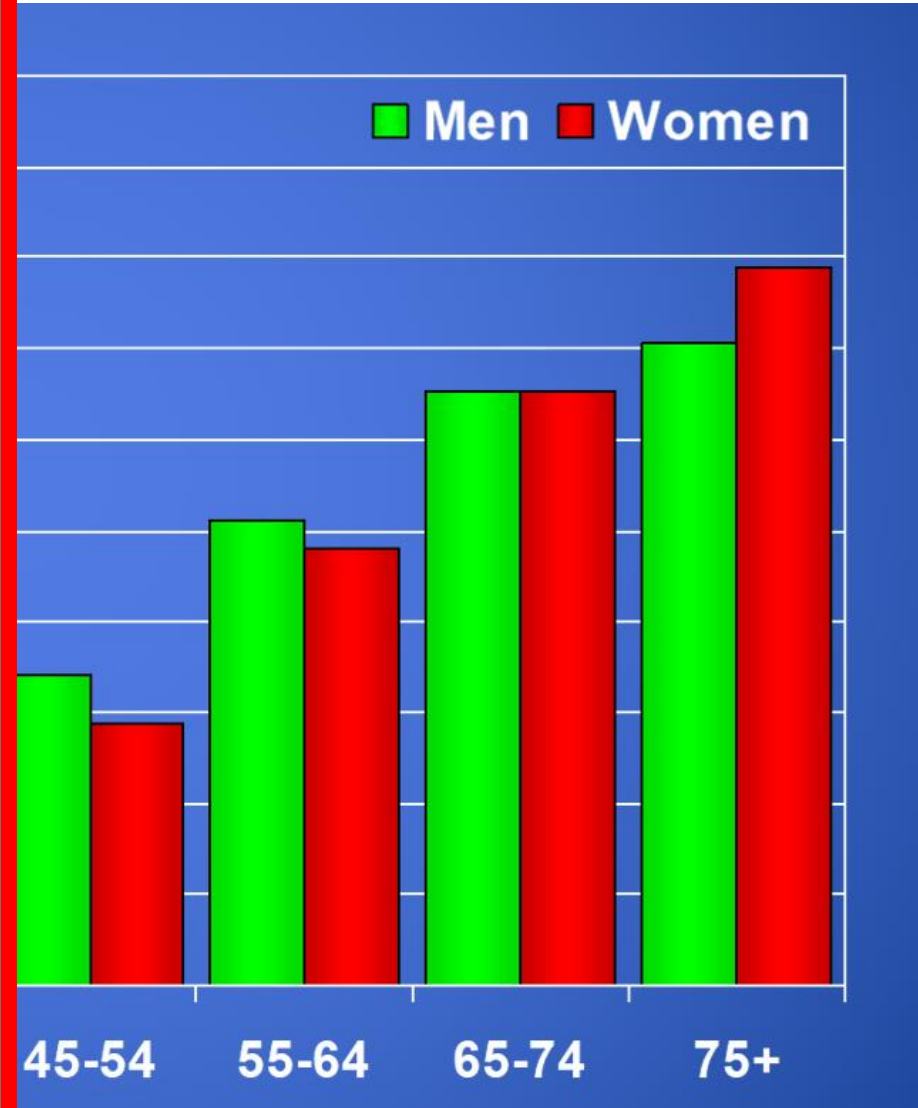
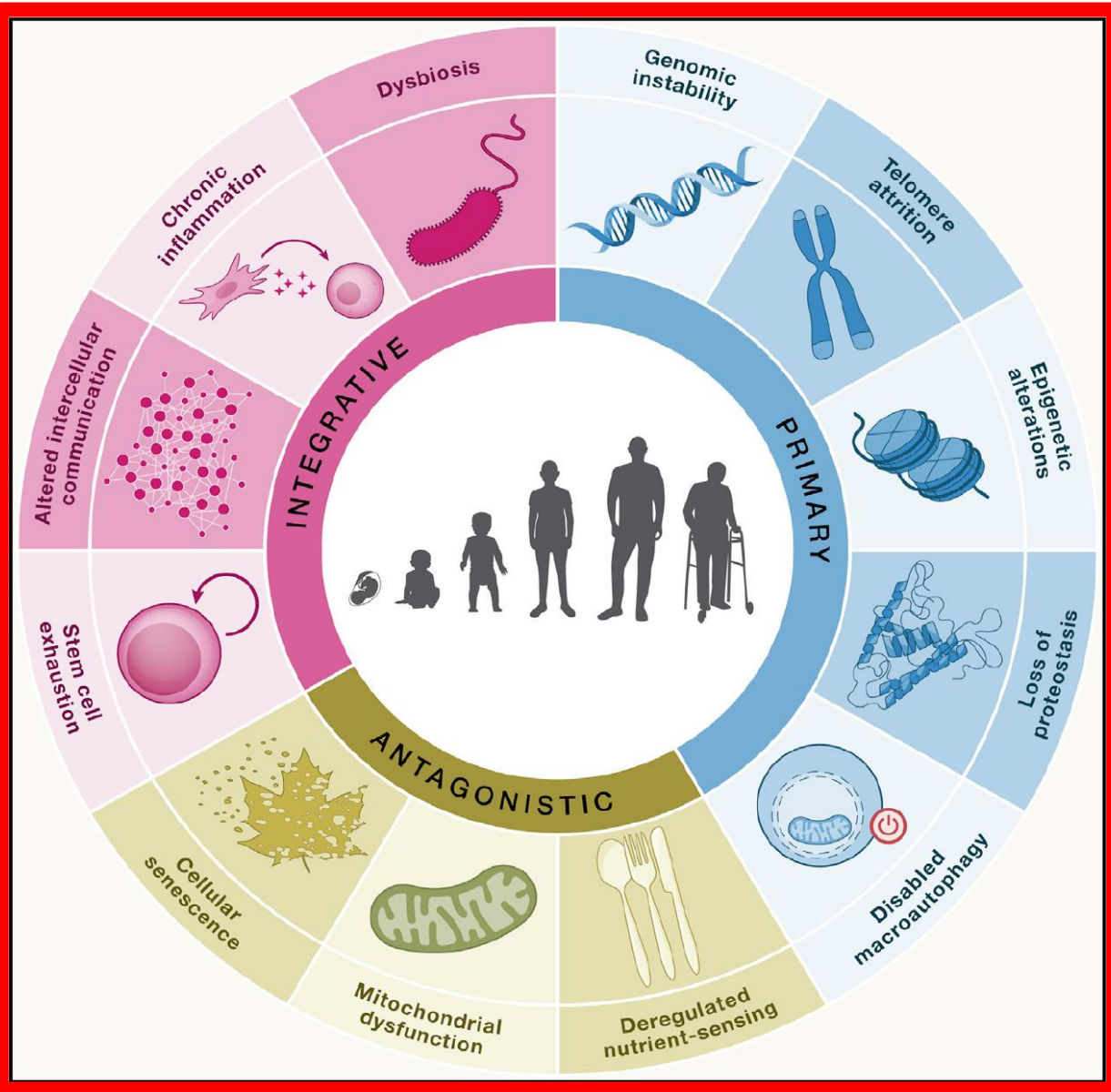
CVD and Aging



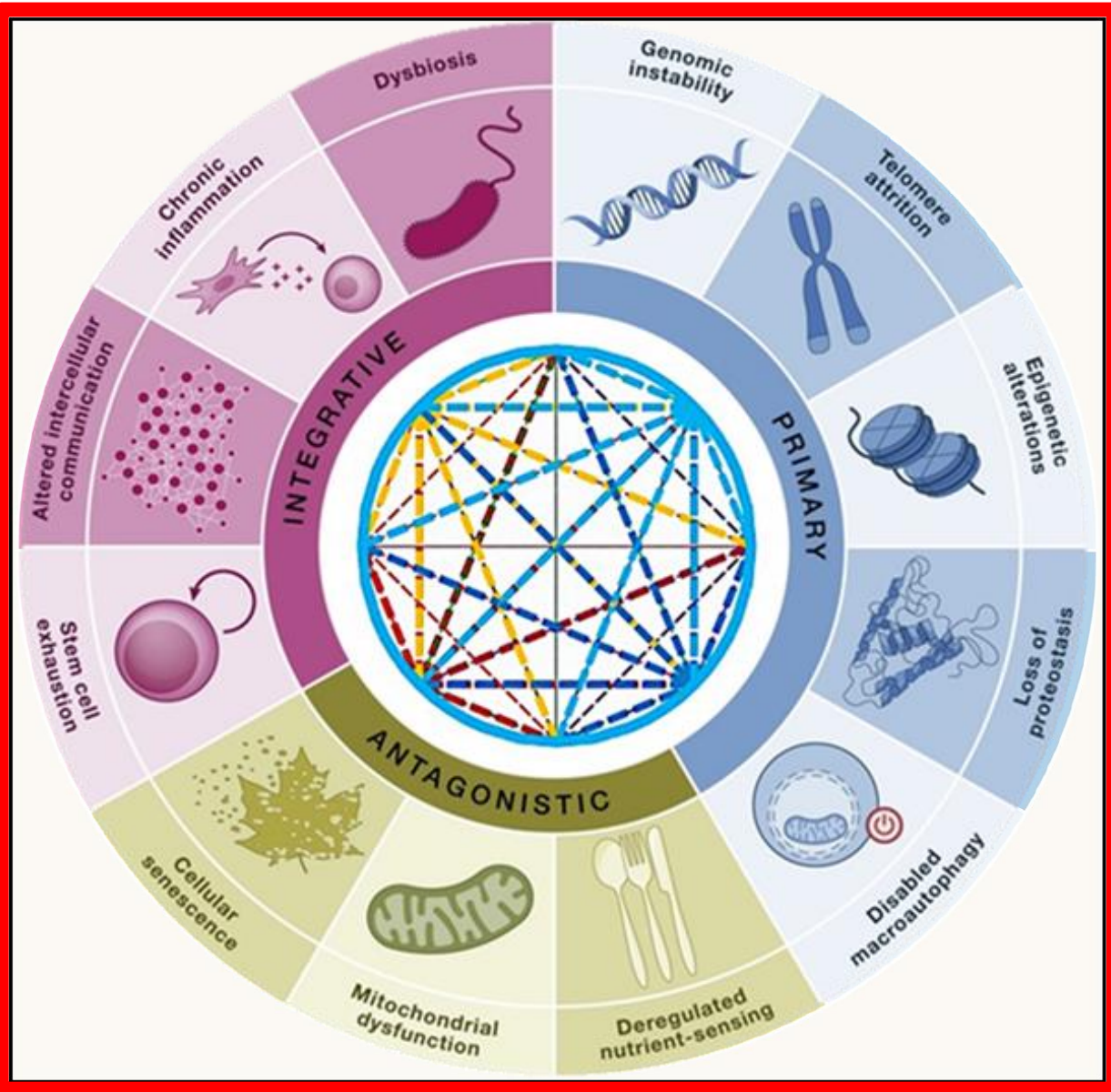
CVD and Aging



CVD and Aging



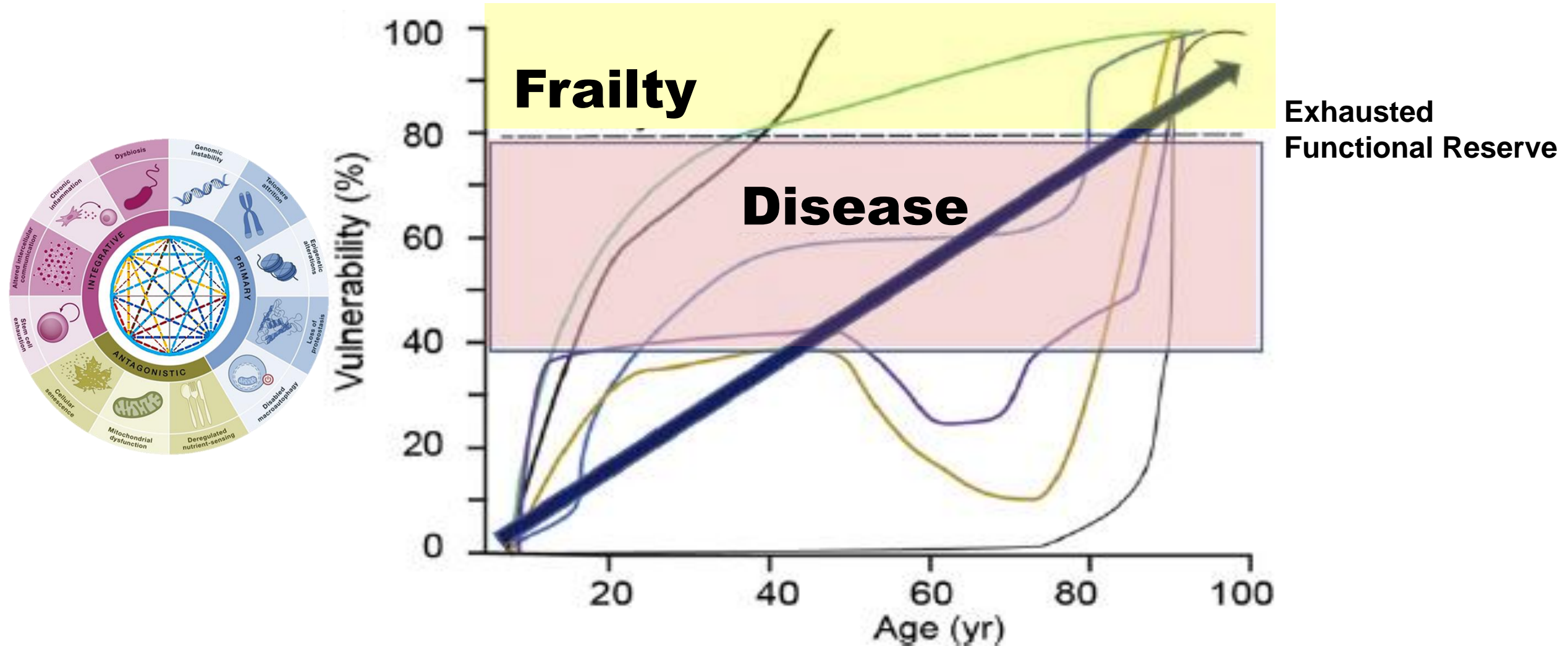
CVD and Aging



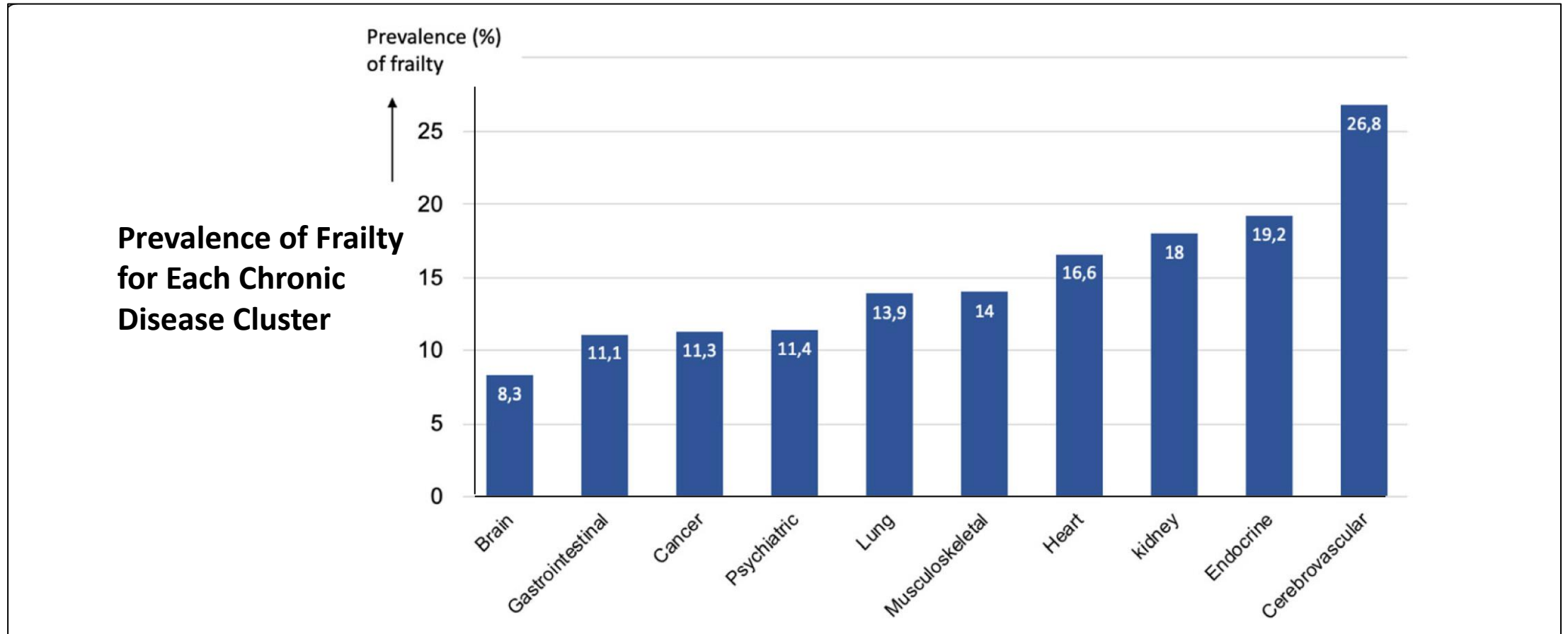
Typical Patients with CVD Have Changed Over Time



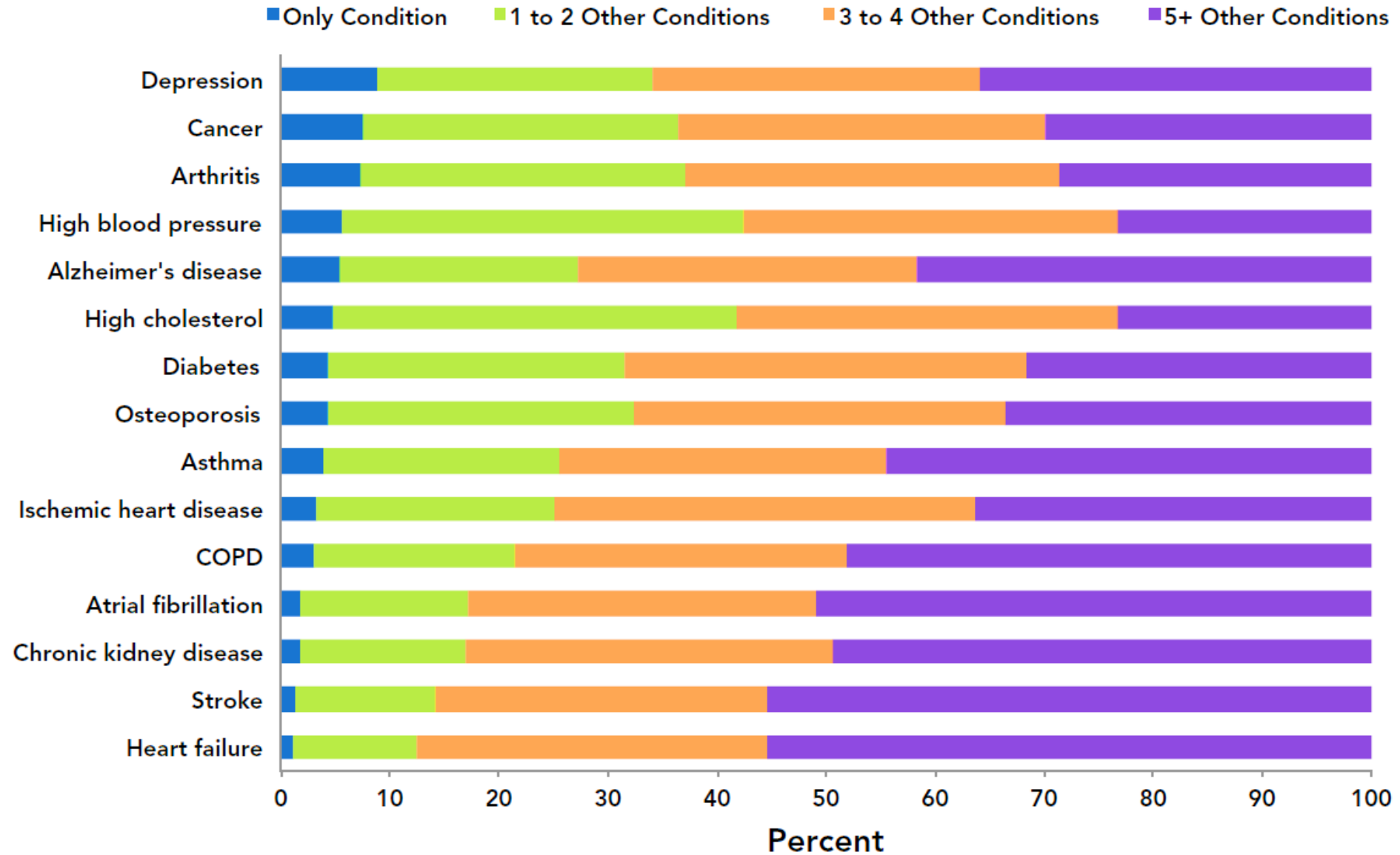
Multimorbidity and Frailty Are Biologically Linked



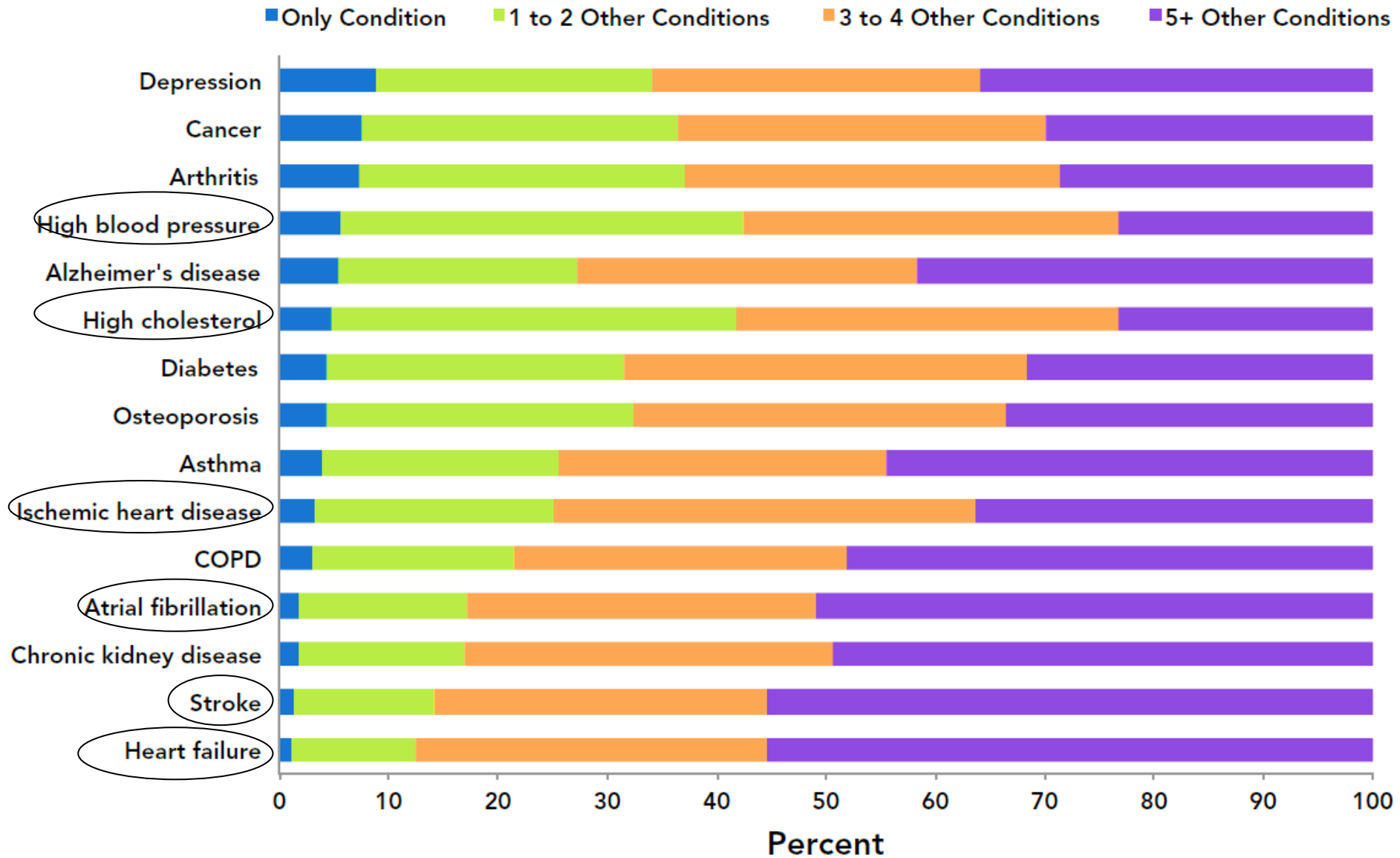
Frailty as a Final Pathway of Multimorbidity



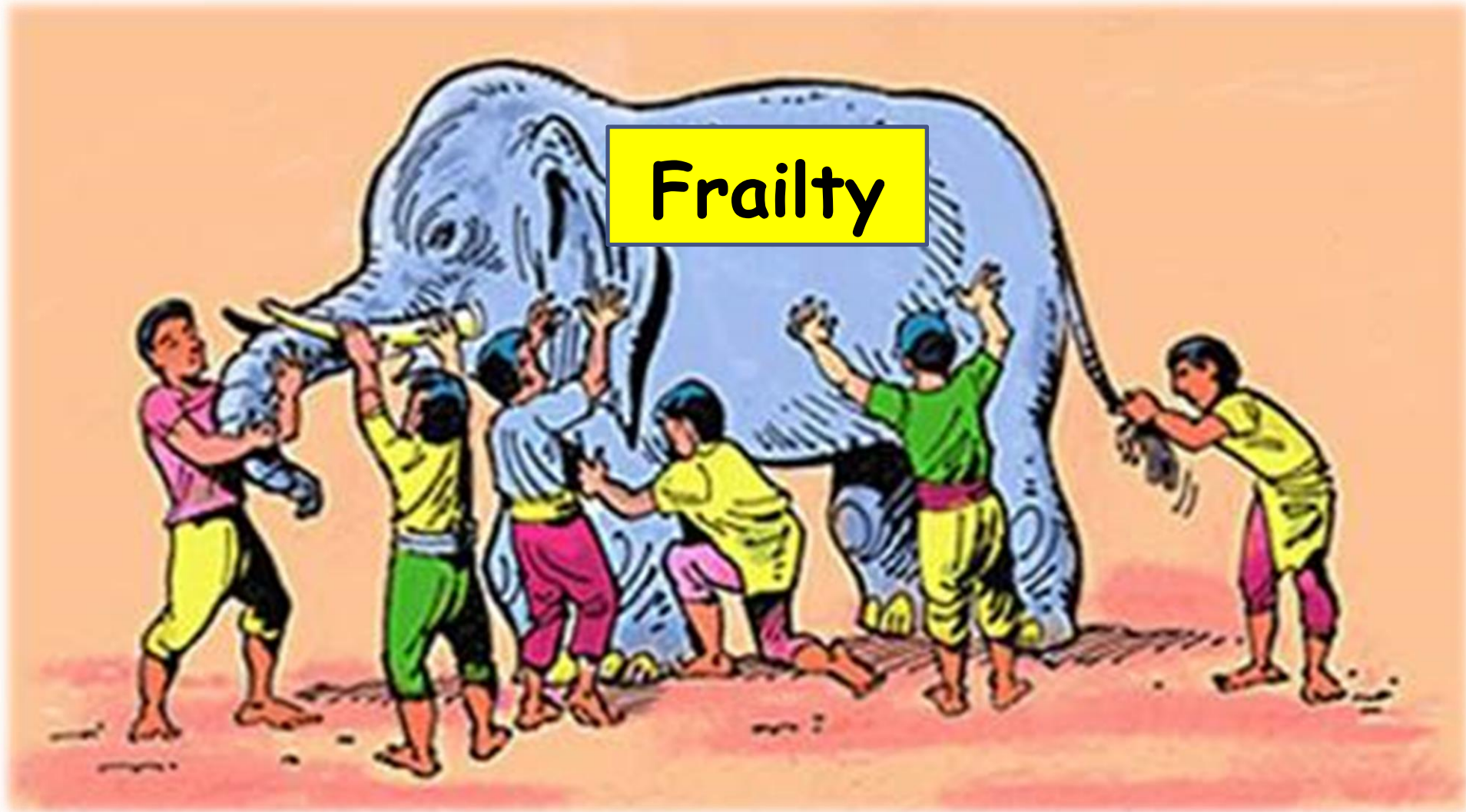
Multimorbidity Among Medicare Patients



Multimorbidity Among Medicare Patients



Diagnosing Frailty



I know frailty when I see it...



Ed Whitlock, Age 81
Toronto Marathon
3 hr 15 min

I know frailty when I see it...



Frailty: Cumulative declines across multiple physiologic systems

Physical Frailty Phenotype

Unintentional weight loss: >5% body weight unintentionally in last year, or BMI < 18.5kg/m²

Exhaustion: felt unusually tired or unusually weak 'all of the time' or 'most of the time' or reported energy level was ≤3

Low Activity: < 128 kcal (men) or <90 kcal (women) of energy expenditure based on 6 self-reported questions

Slowness: Average walking speed over 4-meter course:
Men ≤ 0.65m/s for height ≤173 cm or ≤0.76m/s for height >173cm.
Women: ≤0.65m/s for height ≤159cm or ≤0.76m/s for height > 159cm

Weakness: Maximal grip strength:
Men: ≤29kg for BMI ≤24; ≤30kg for BMI 24.1-28; ≤32kg for BMI >28.
Women: ≤17kg for BMI ≤23; ≤17.3kg for BMI 23.1-26; ≤18kg for BMI 26.1-29; ≤21 kg for BMI > 29.

Scoring: Frail = 3+ criteria met; prefrail = 1-2 criteria met; non-frail if 0 criteria met.

Deficit Accumulation Index

30-40 deficits - defined as symptoms, signs, disabilities and diseases.

Each deficit is scored as binary (0 or 1) or can be graded (e.g., 0, 0.5, 1)

Examples of deficits include: disability; cognitive or physical impairments, co-morbidities, self-rated health, depression/mood.

Scoring: the ratio of deficits present over the total number of deficits included (e.g., if 10 out of 40 deficits total, the index score = 0.25).

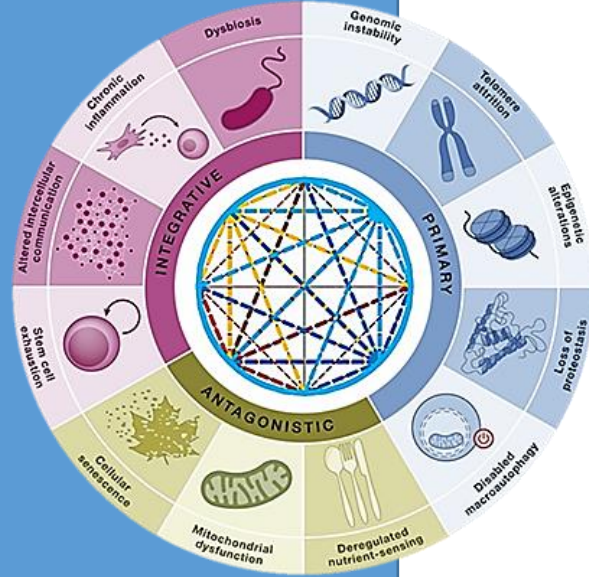
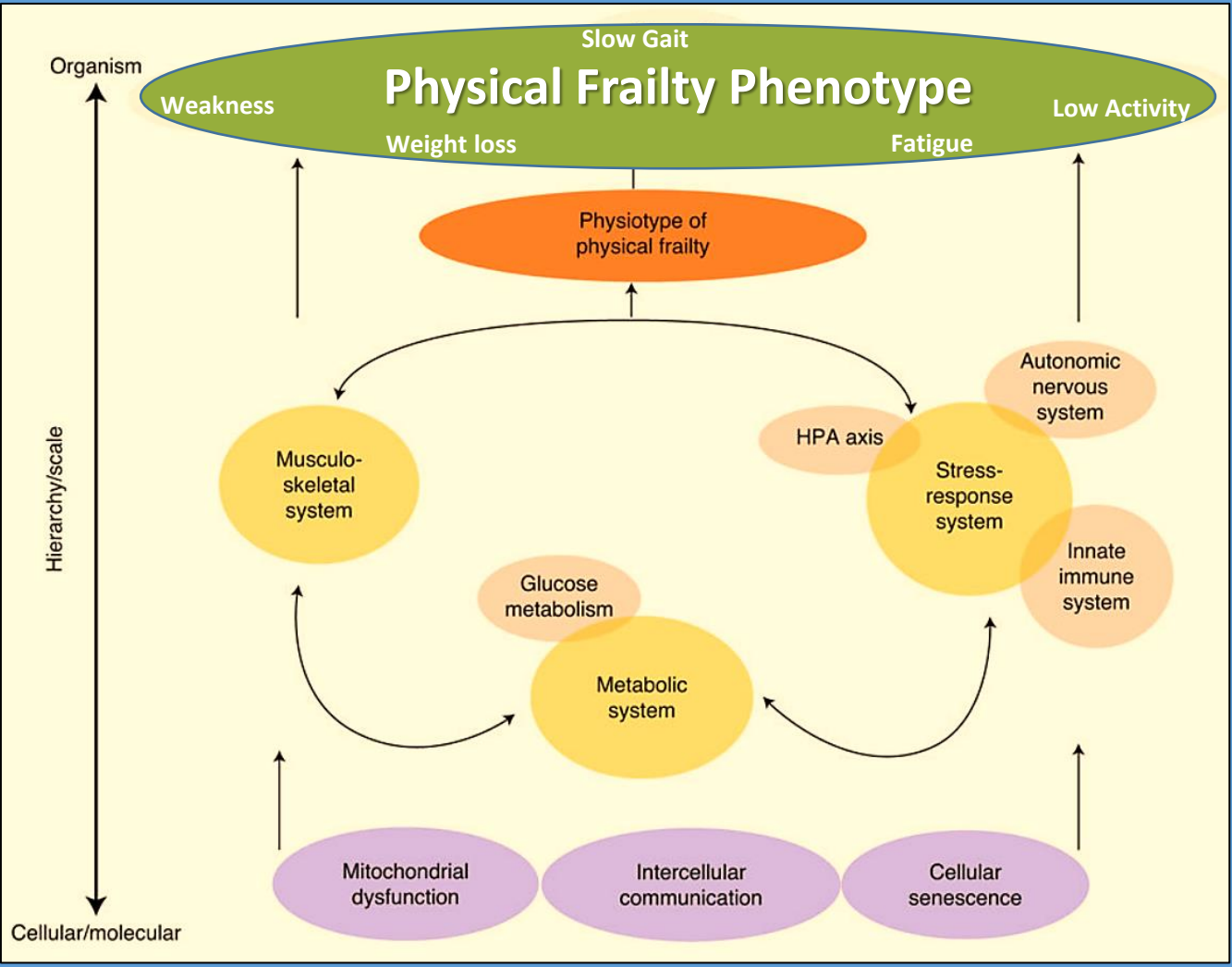
Scoring: A person with frailty index score of ≥0.2 is deemed frail.


© 2021 JHU/AAM

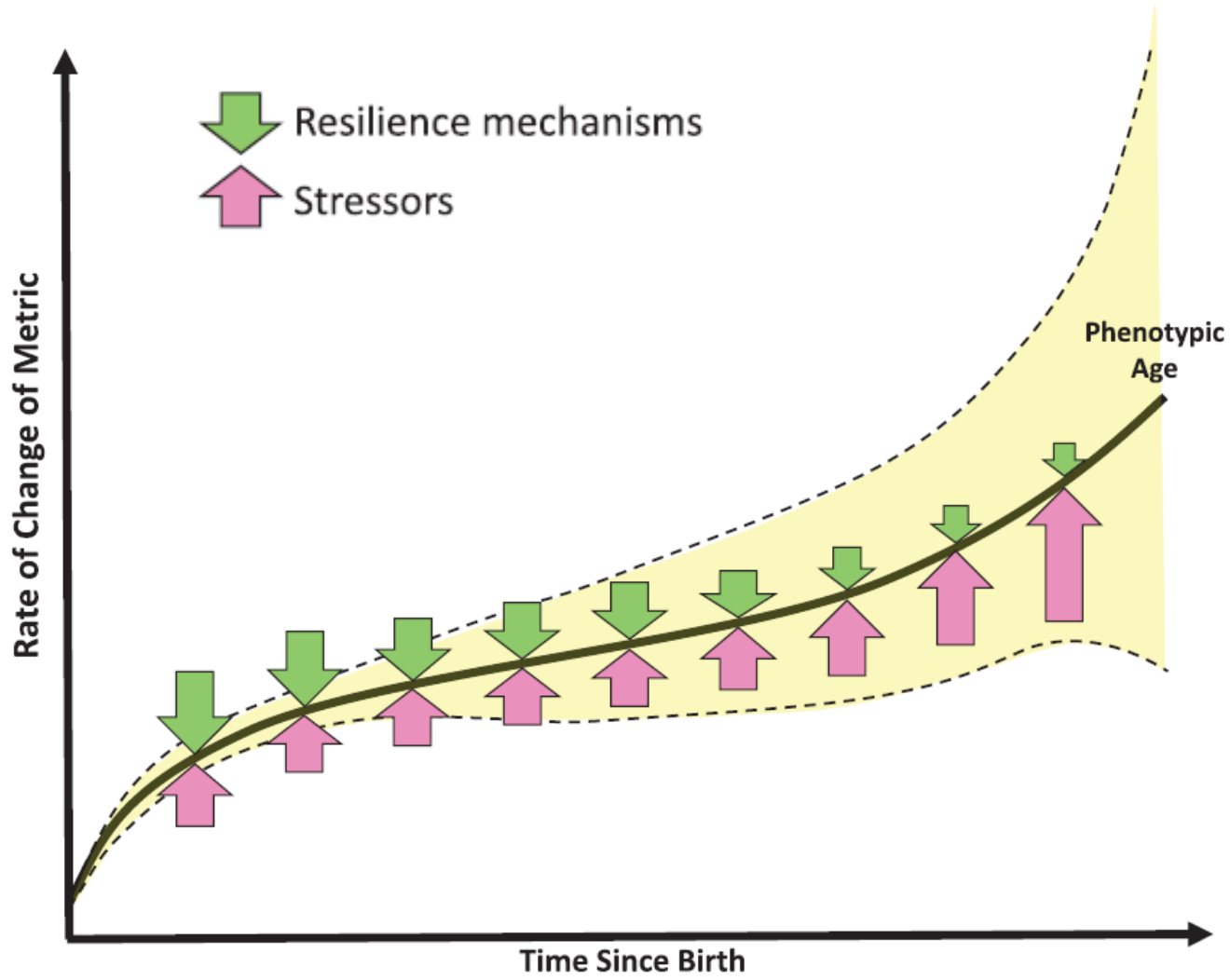
Candidate frailty measures

- Gait speed
- Sit-to-Stand (STS)
- Timed up and Go (TUG)
- Grip strength
- Short Physical Performance Battery (SPPB)
- Inflammation (IL-6, TNF α , CRP)
- Senescence
- Mitochondrial respiration
- Autophagy
- Muscle quantity, Muscle quality
- Cognition
- Administrative Data

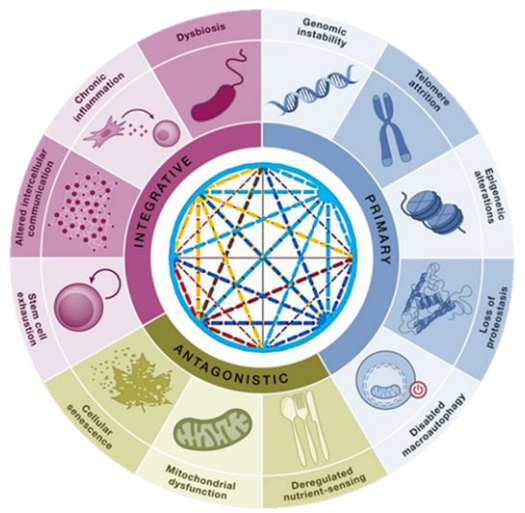
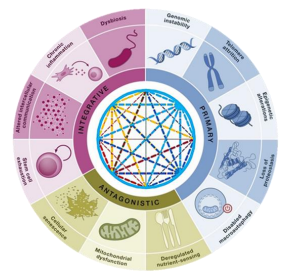
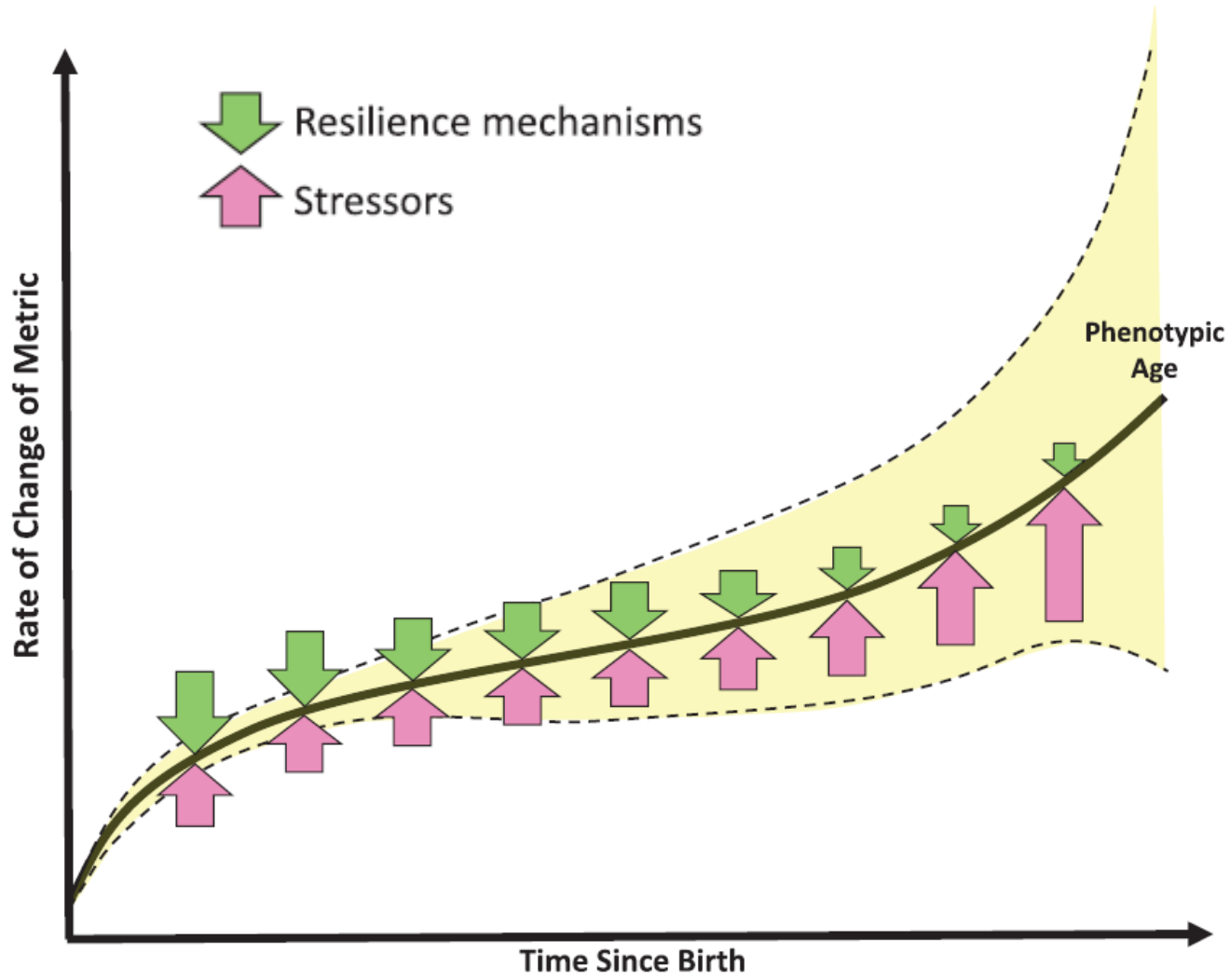
Biologic Underpinnings to of Frailty

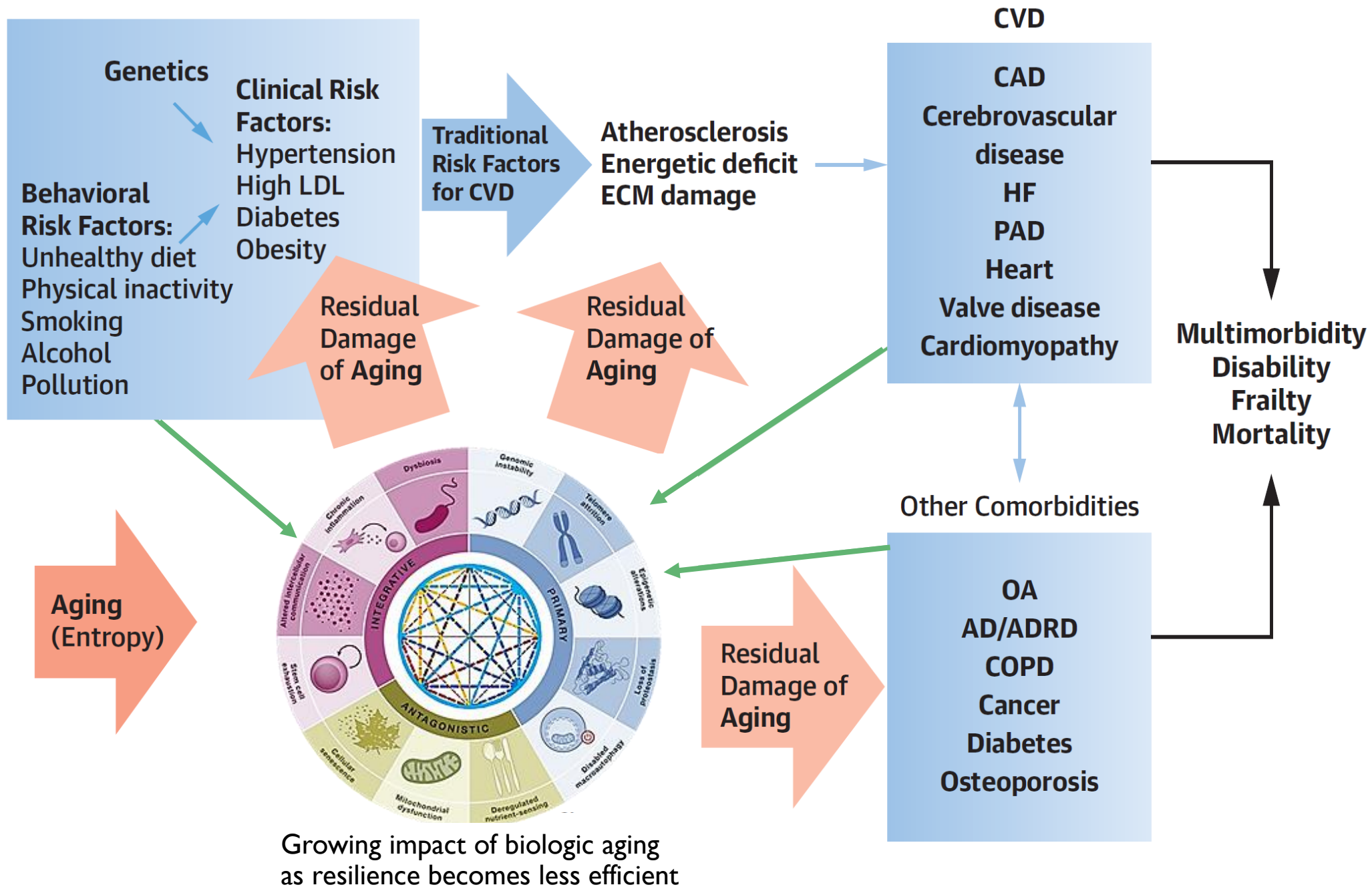


Resilience: *Intrinsic Capacity to Withstand Biological Aging*

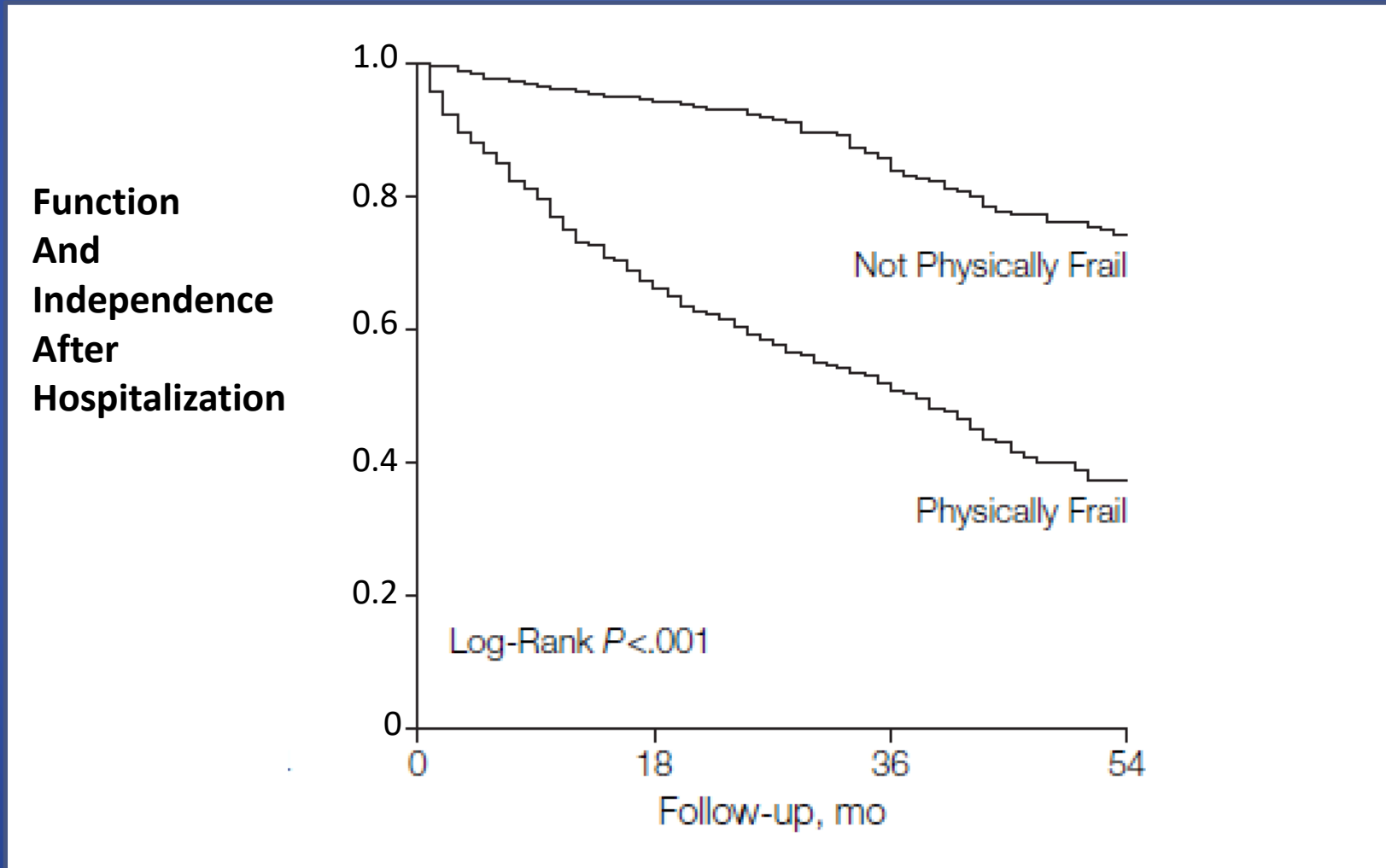


Resilience: *Intrinsic Capacity to Withstand Biological Aging*

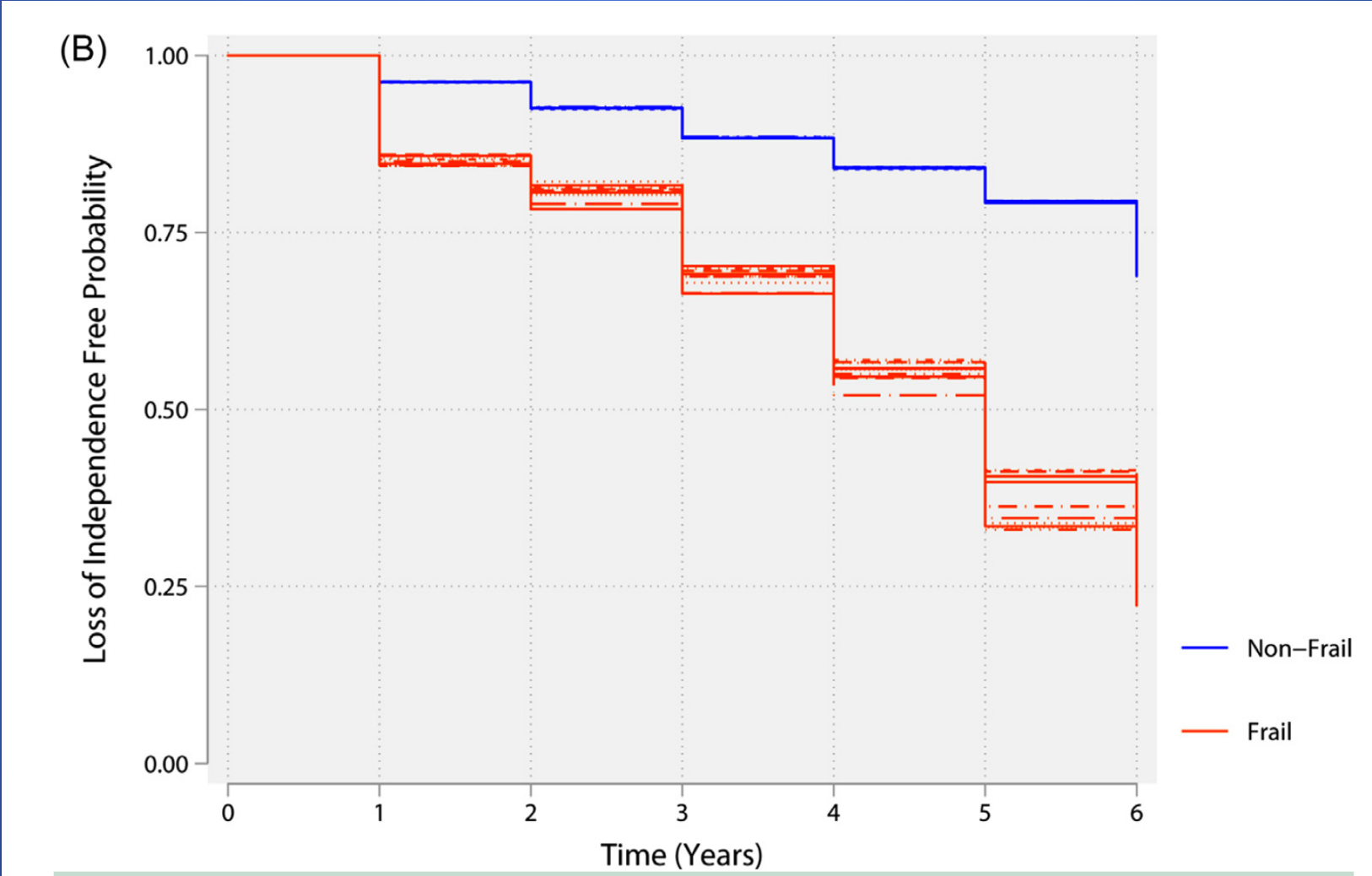




Hospitalization and Frailty

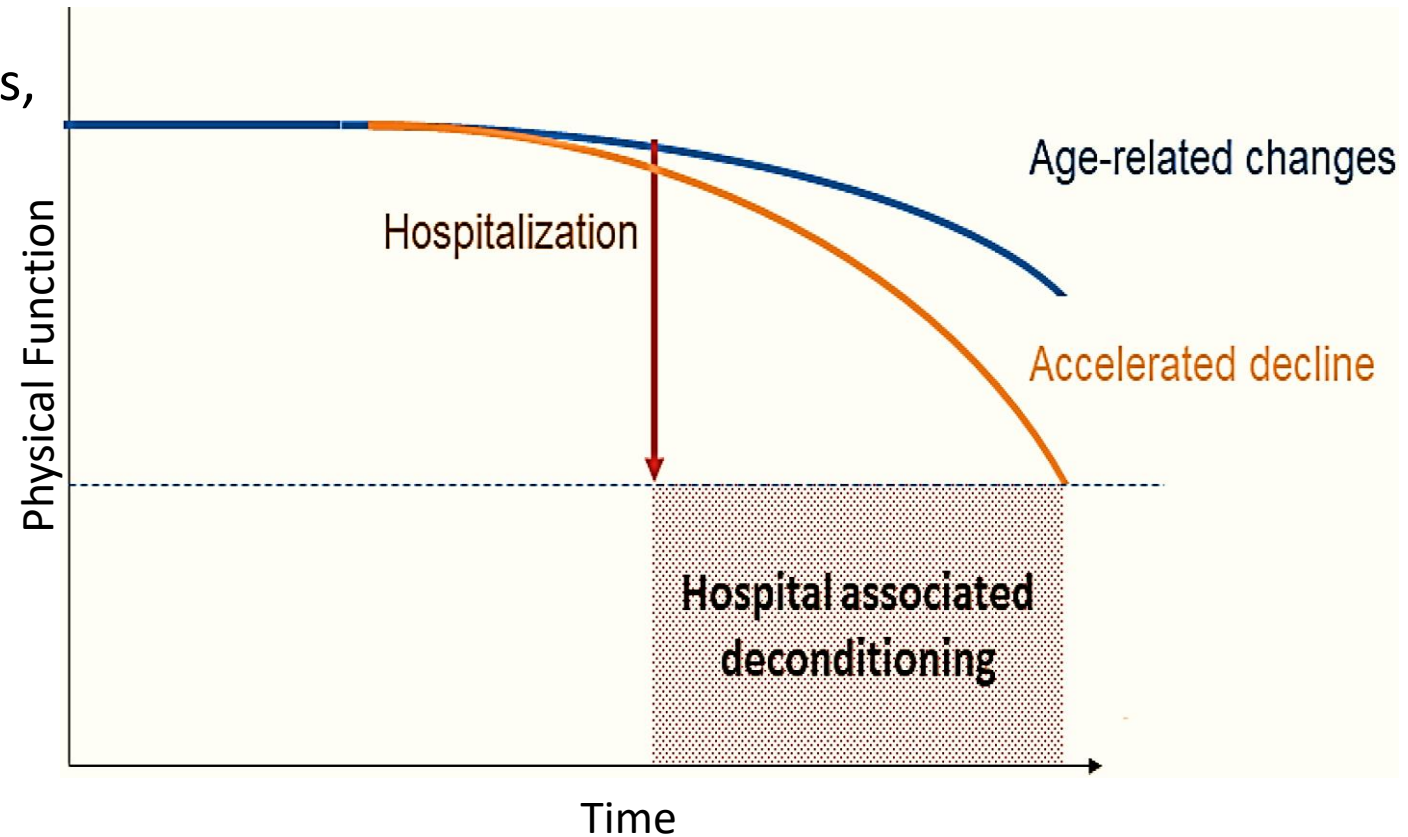


Broader Prognostic Implications of Frailty

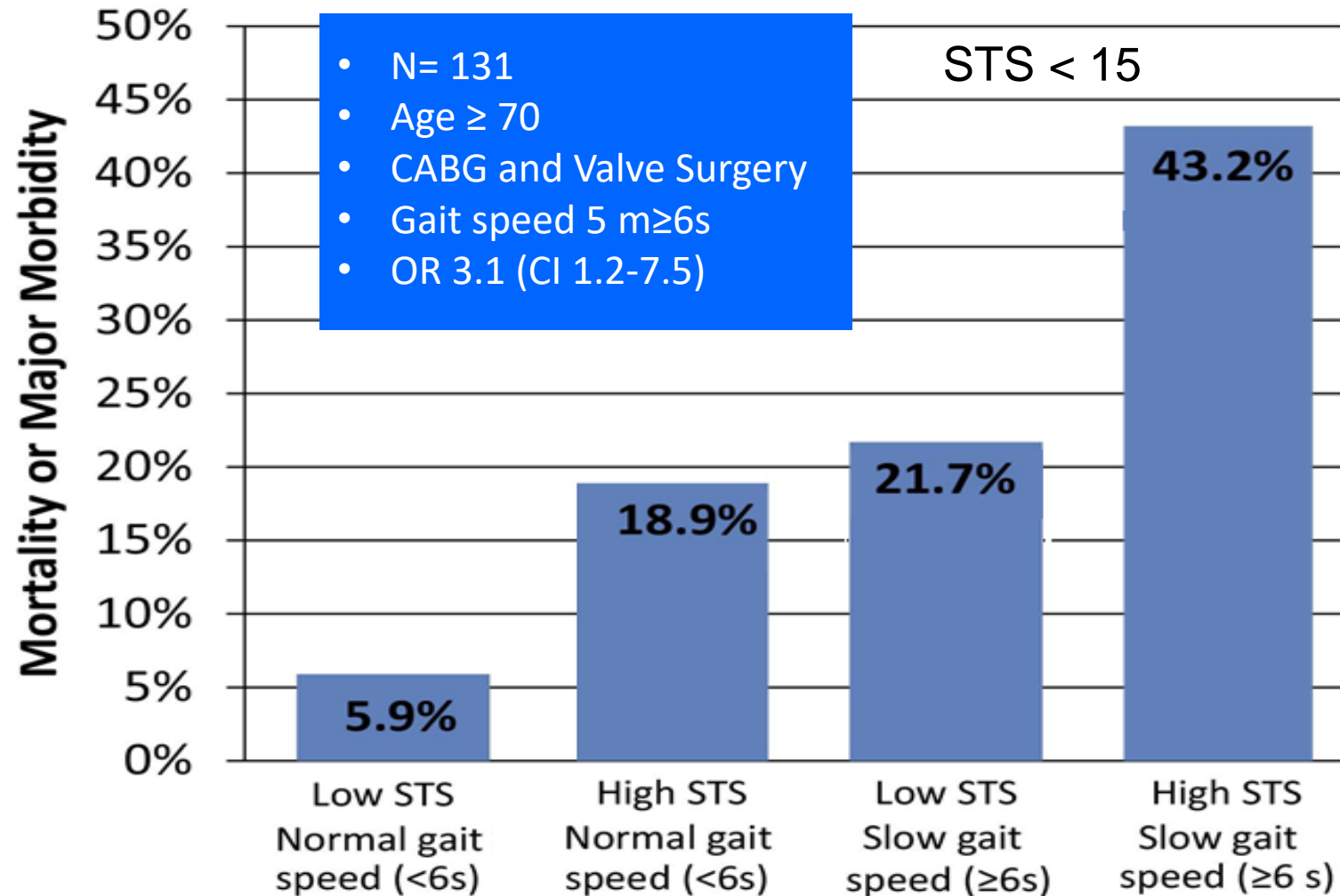


Hospital-related disability ~30% of acute care hospitalizations

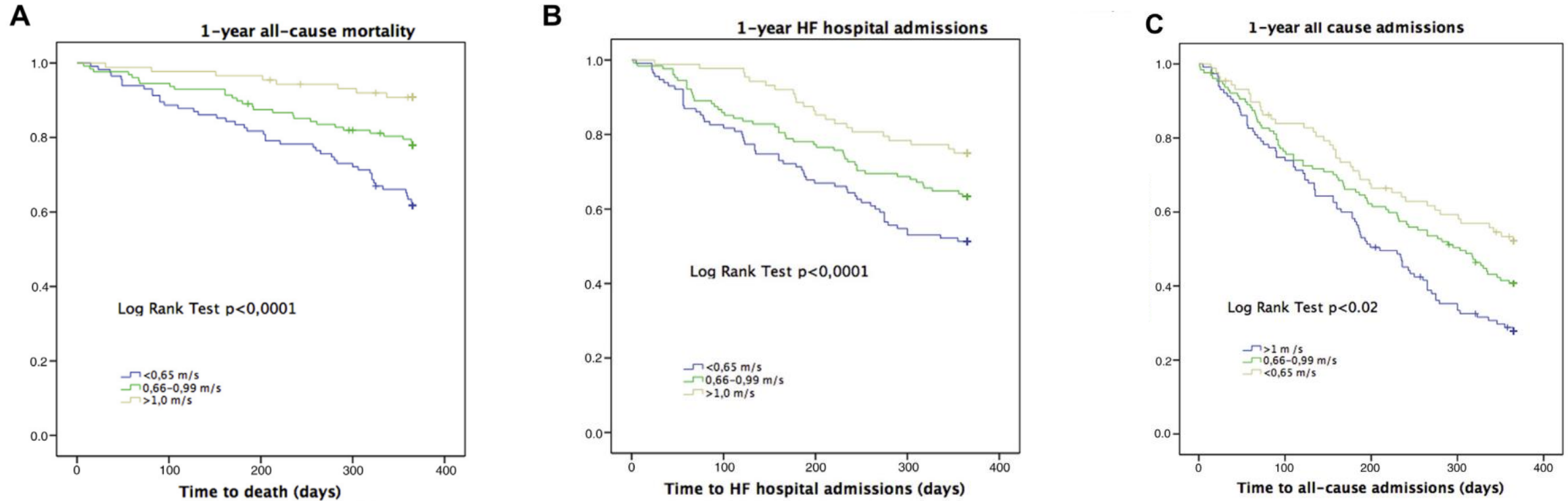
- Post-Hospital Syndrome
 - Acute Illness, Pathophysiology, Procedures, Sedation
 - Deconditioning, Delirium, ↓Sleep
 - ↓Nutrition, Dehydration
 - Pain, Anxiety, Depression
- ↑Sarcopenia, ↑ Frailty,
- ↓Self-care
- ↑Re-hospitalization, ↑Disability
- ↑Mortality



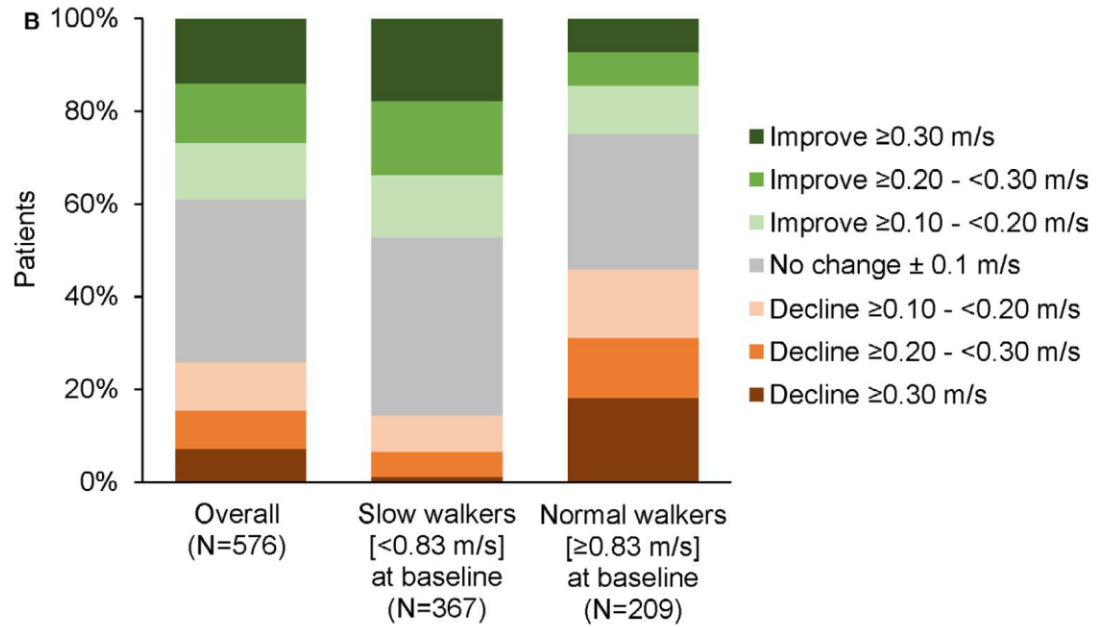
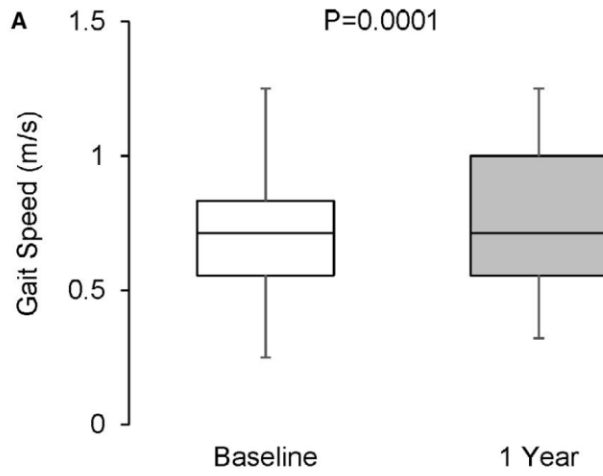
Gait Speed (Frailty) in Predicting Outcomes in CVD



Gait Speed Predicting Outcomes in HF



Do Gait Speeds Improve After Transcatheter Aortic Valve Replacement (TAVR)



Aging



Disease (CVD)



Multimorbidity, Frailty

Aging



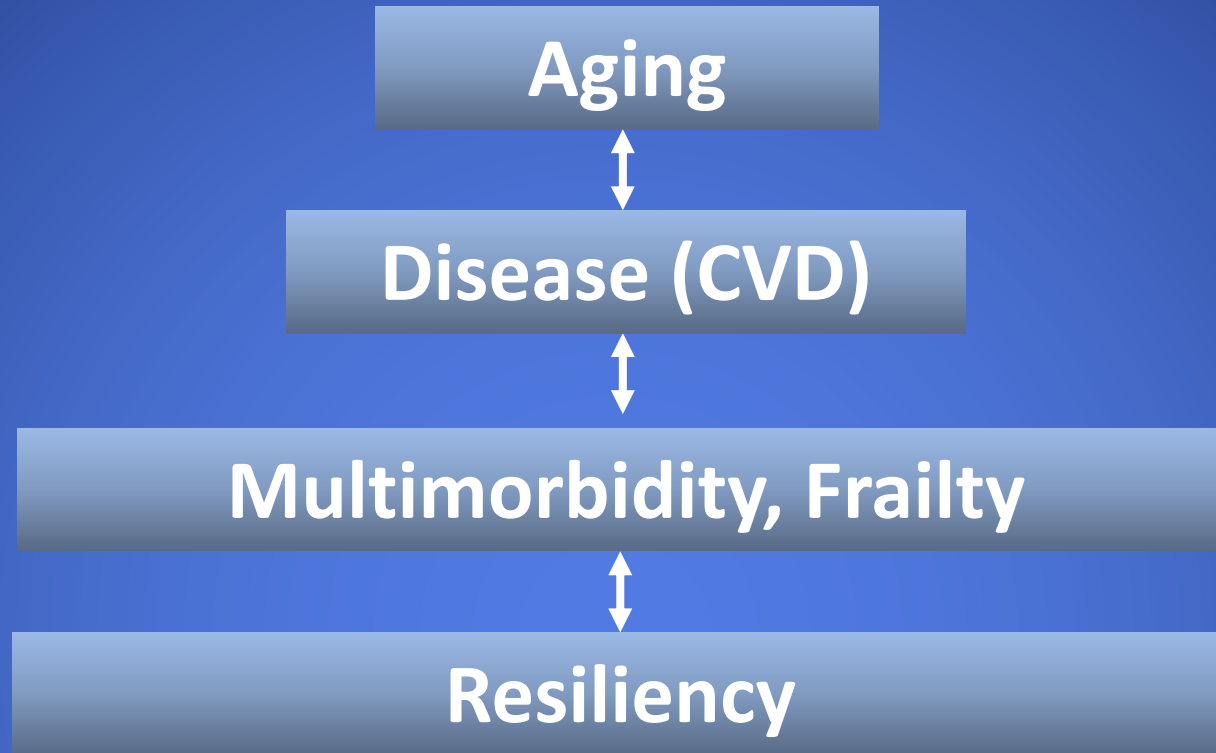
Disease (CVD)

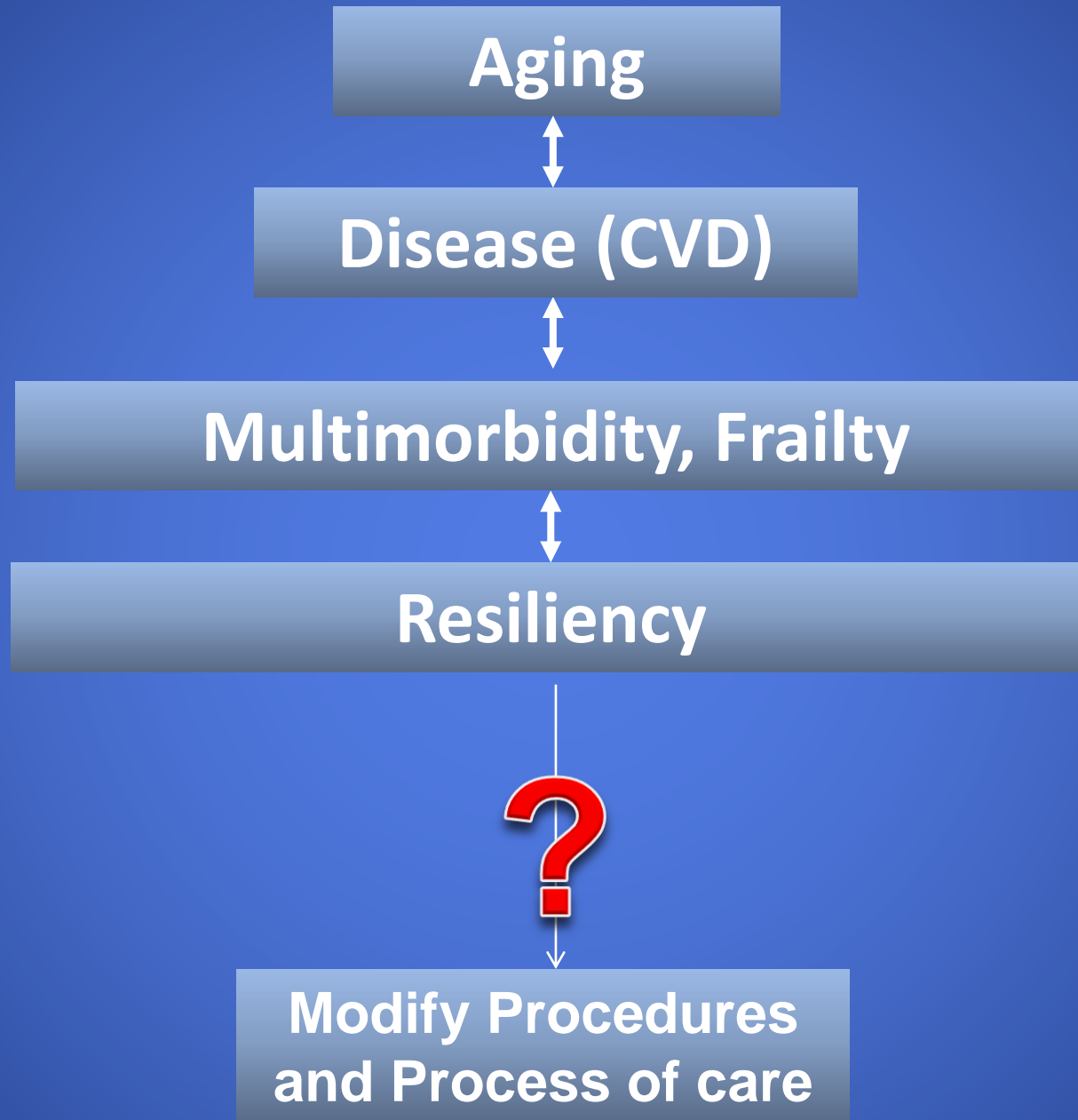


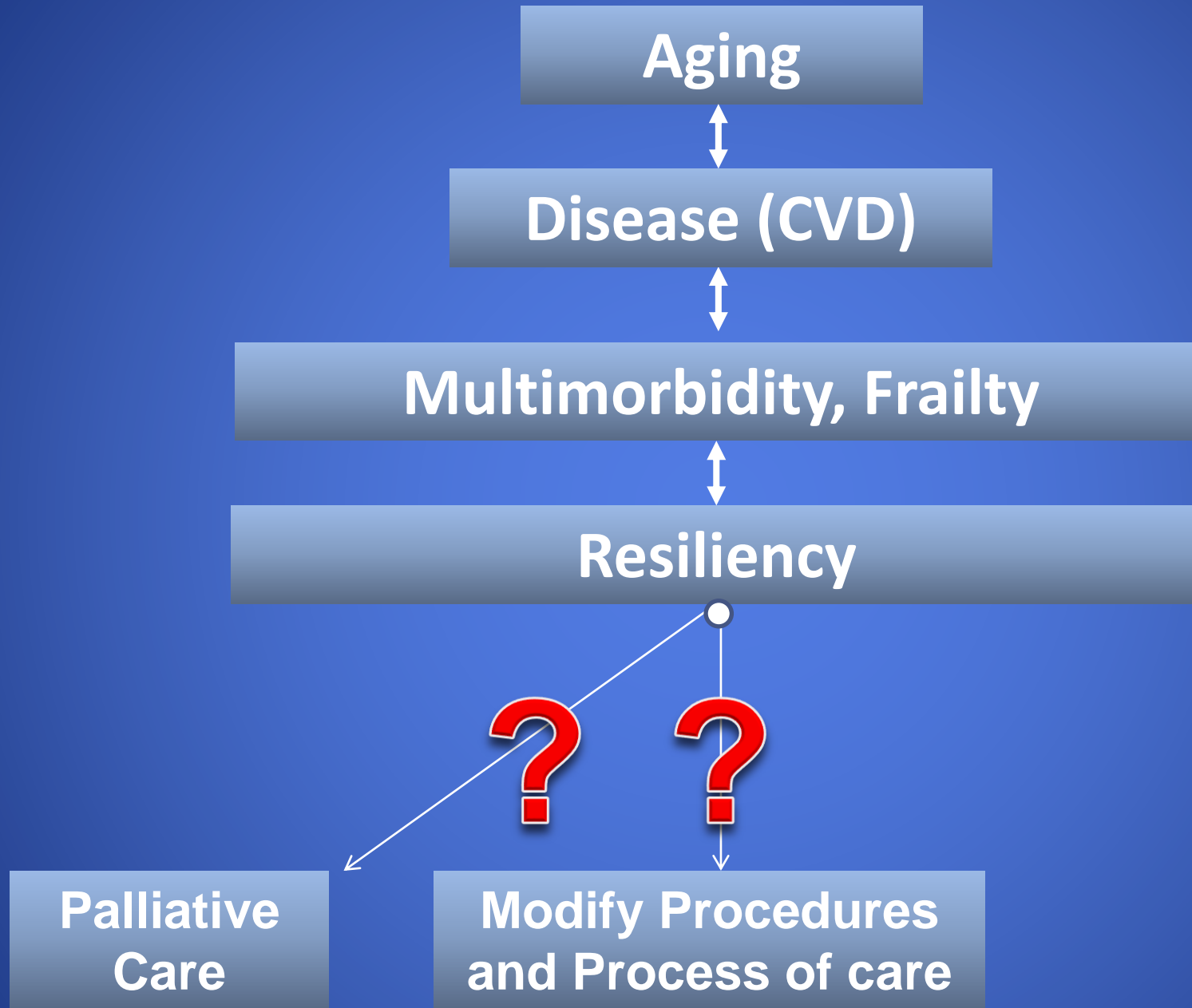
Multimorbidity, Frailty

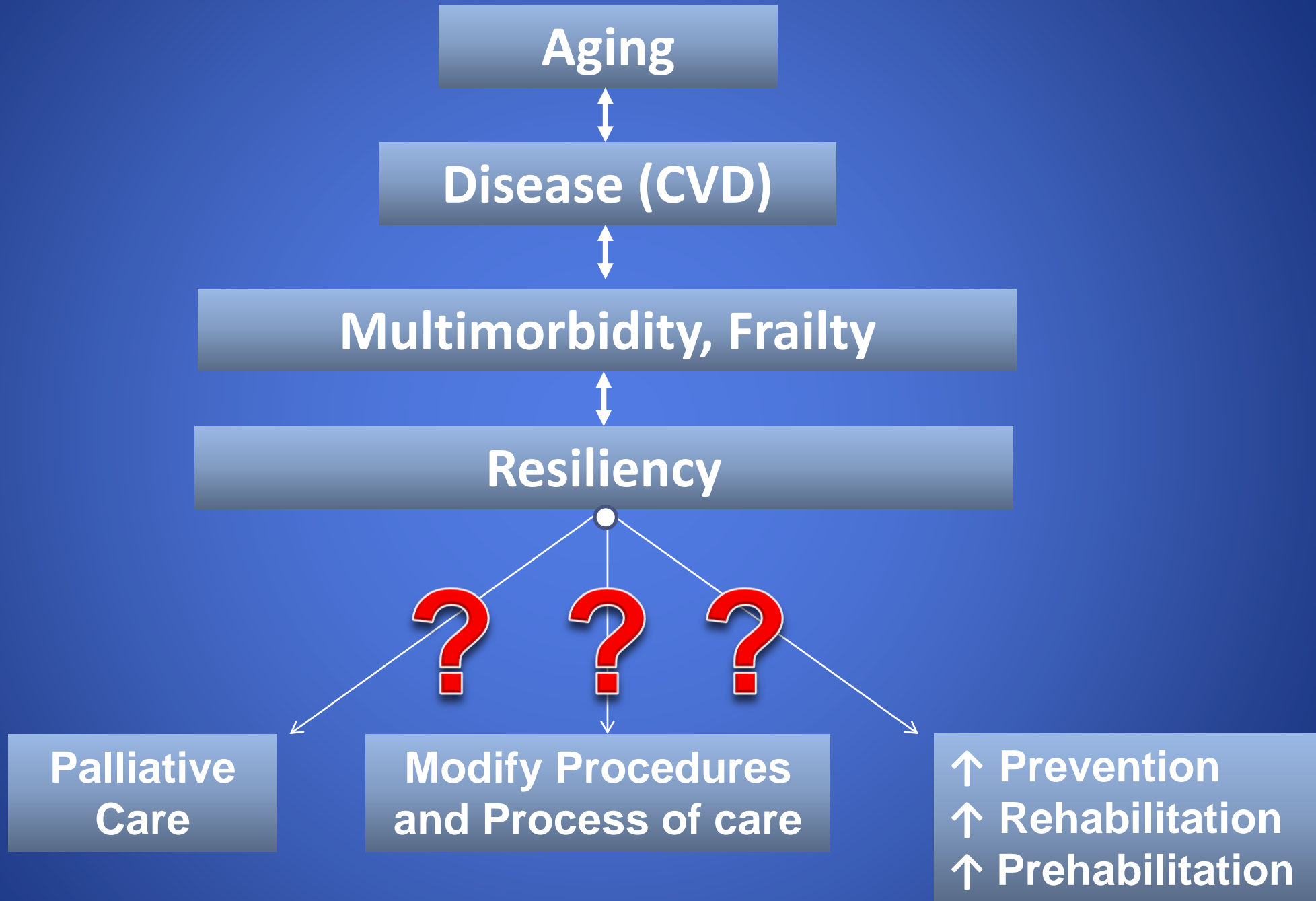


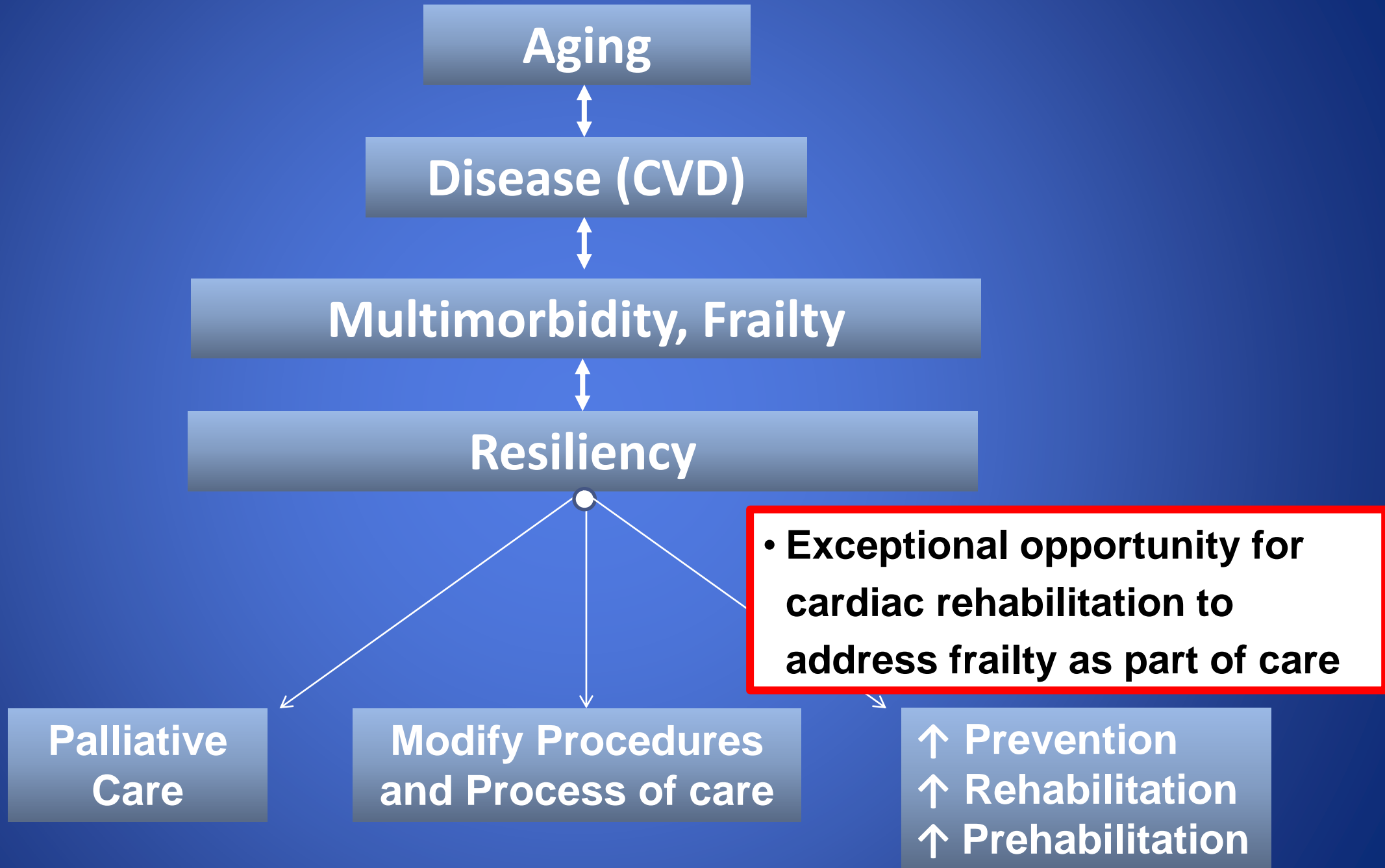
Resiliency

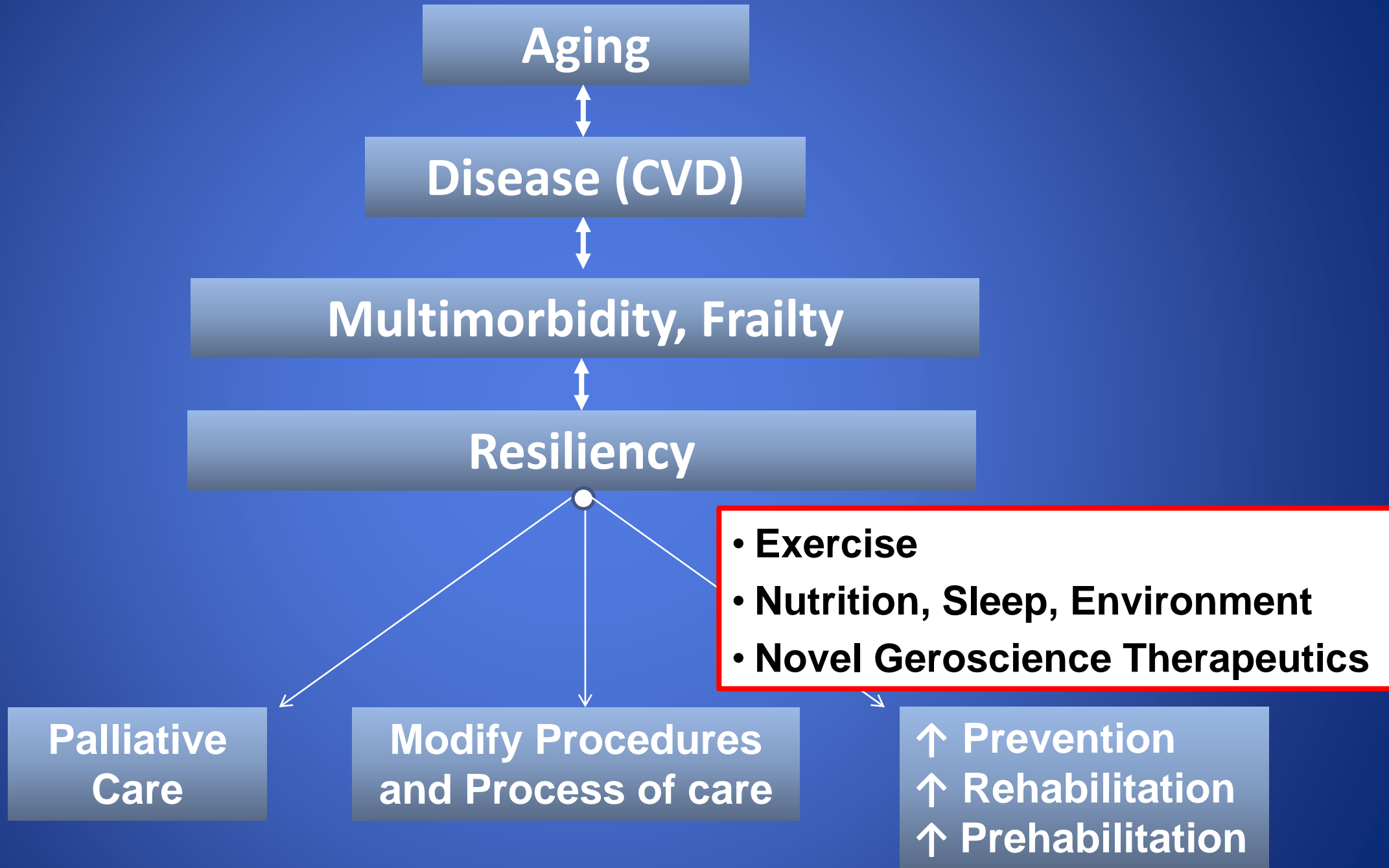


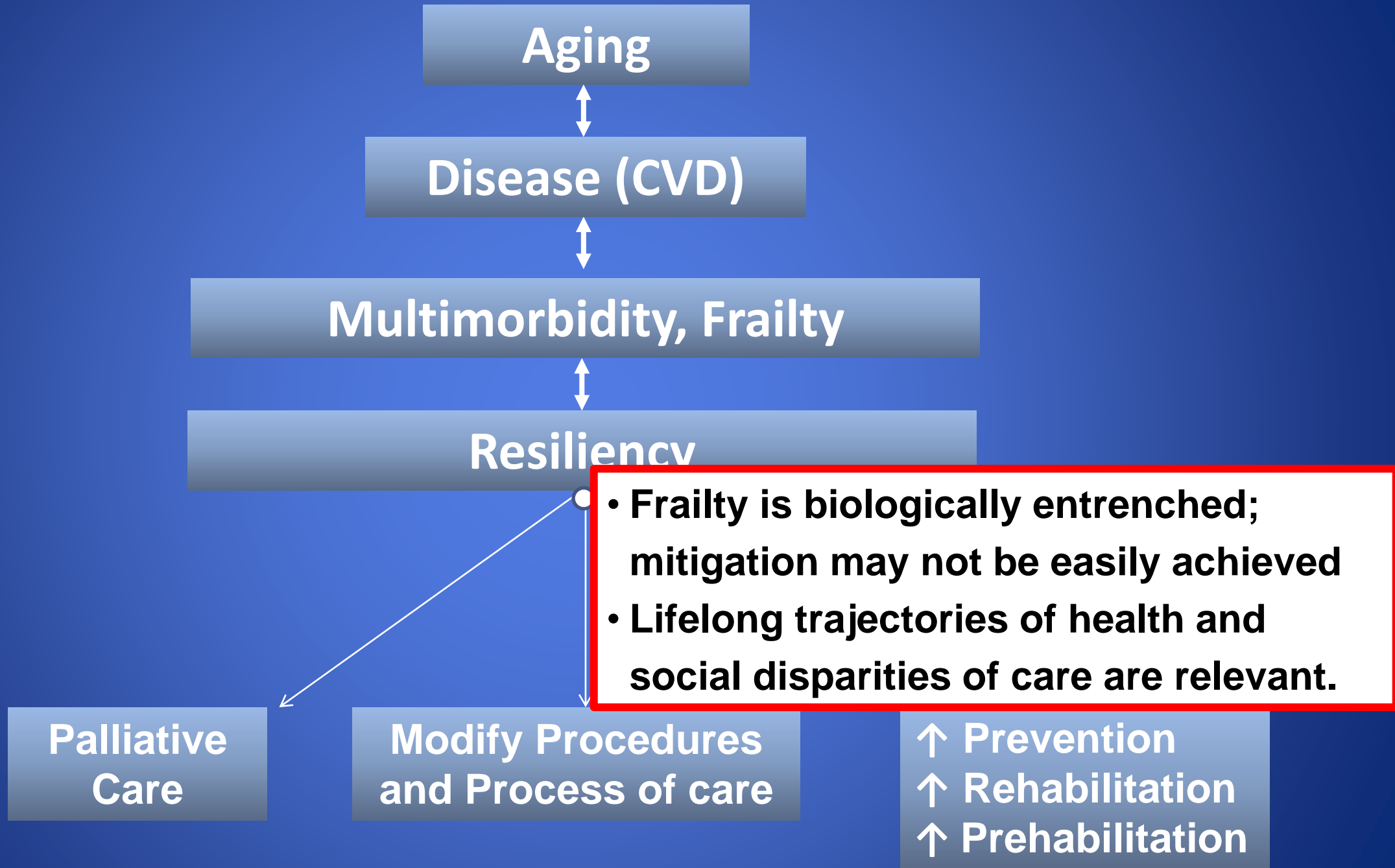












Summary

- Frailty: Biologically associated with CVD in older adults
- Broad clinical implications
- Cardiac rehabilitation provides an opportunity to address frailty as part of comprehensive cardiovascular risk reduction
- Modifying frailty is rarely simple as it entails fundamental metabolism, cellular energetics, and sufficient resilience in adults also contending with CVD and associated declines in cardiovascular reserves.