

Heart Failure Awareness Week

Lunch & Learn

Monday, February 14th, 2022

Preventing Heart Failure Among the
Expanding Population of Older Adults



American
Heart
Association.

Preventing HF Among the Expanding Population Of Older Adults

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Associate Director for Clinical Translation and Director of Emerging Therapeutics, Aging Institute, University of Pittsburgh

Director, Transitional Care (Cardiac Rehabilitation, GeroFit, C-TraC, COMPASS), VA Pittsburgh Healthcare System

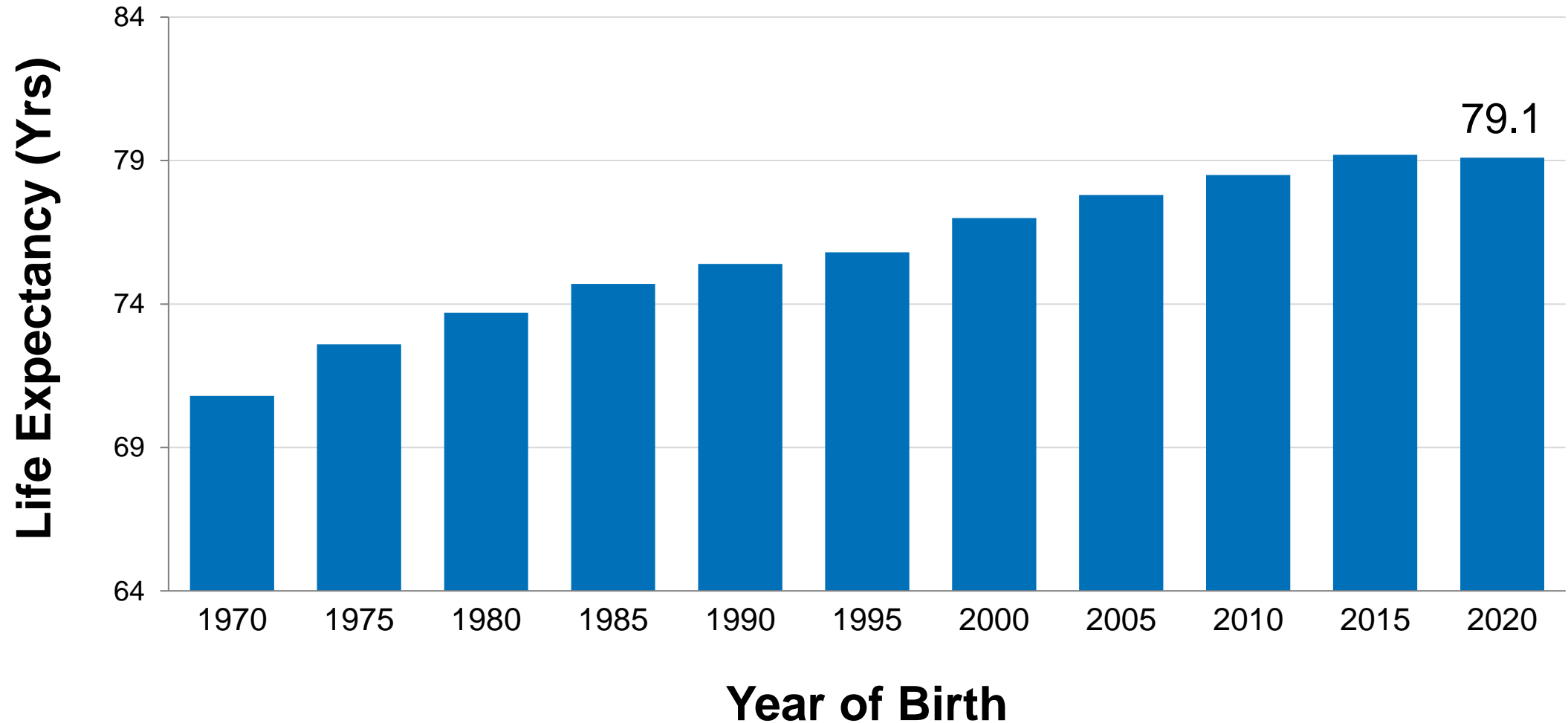


- No disclosures

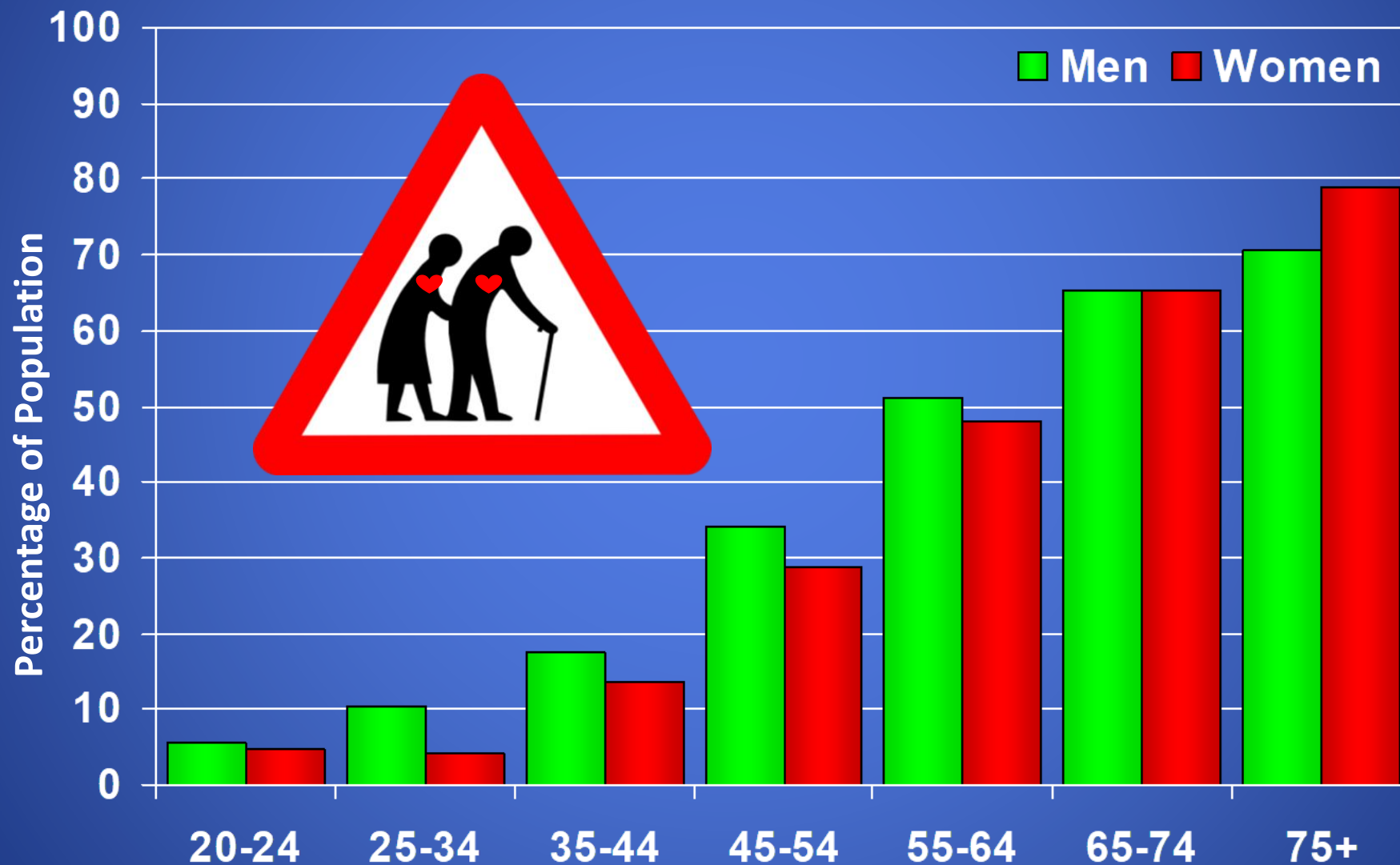
- As the population is getting older, the concept of risk factors for heart failure is undergoing changes

Average US Life Expectancy at Birth

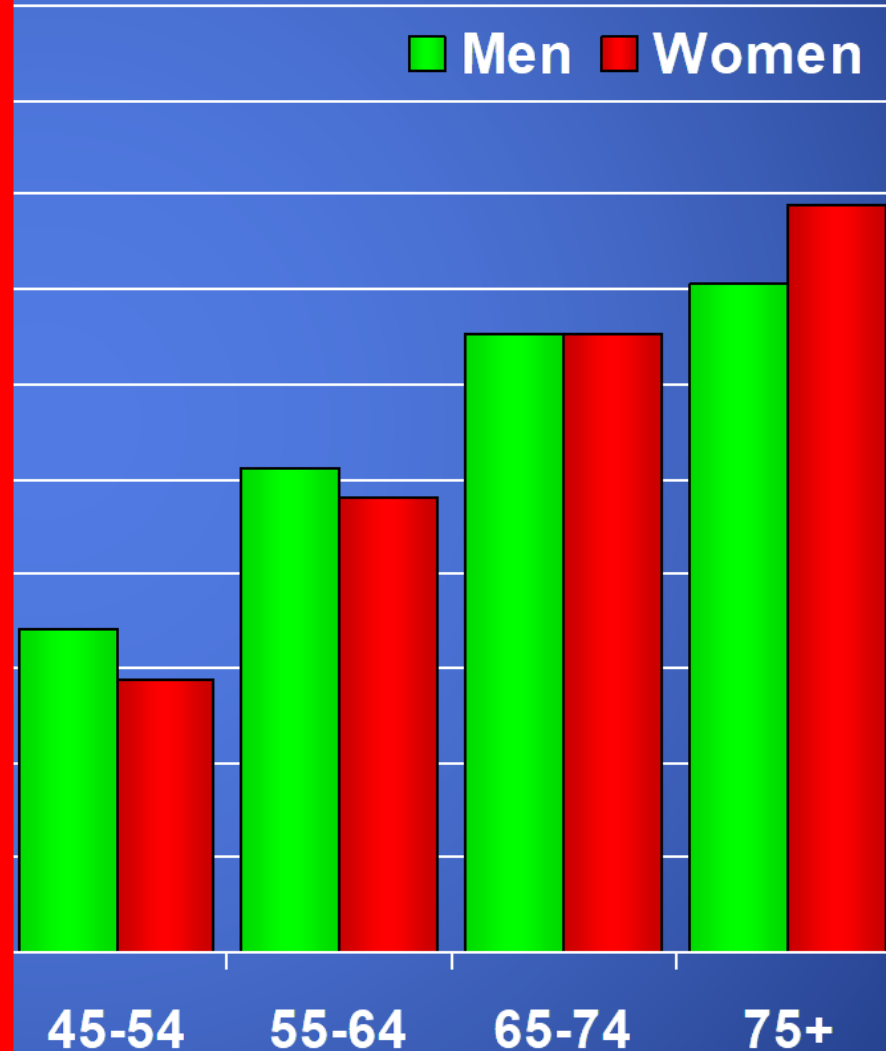
US Trends in Life Expectancy at Birth (1970-2020)

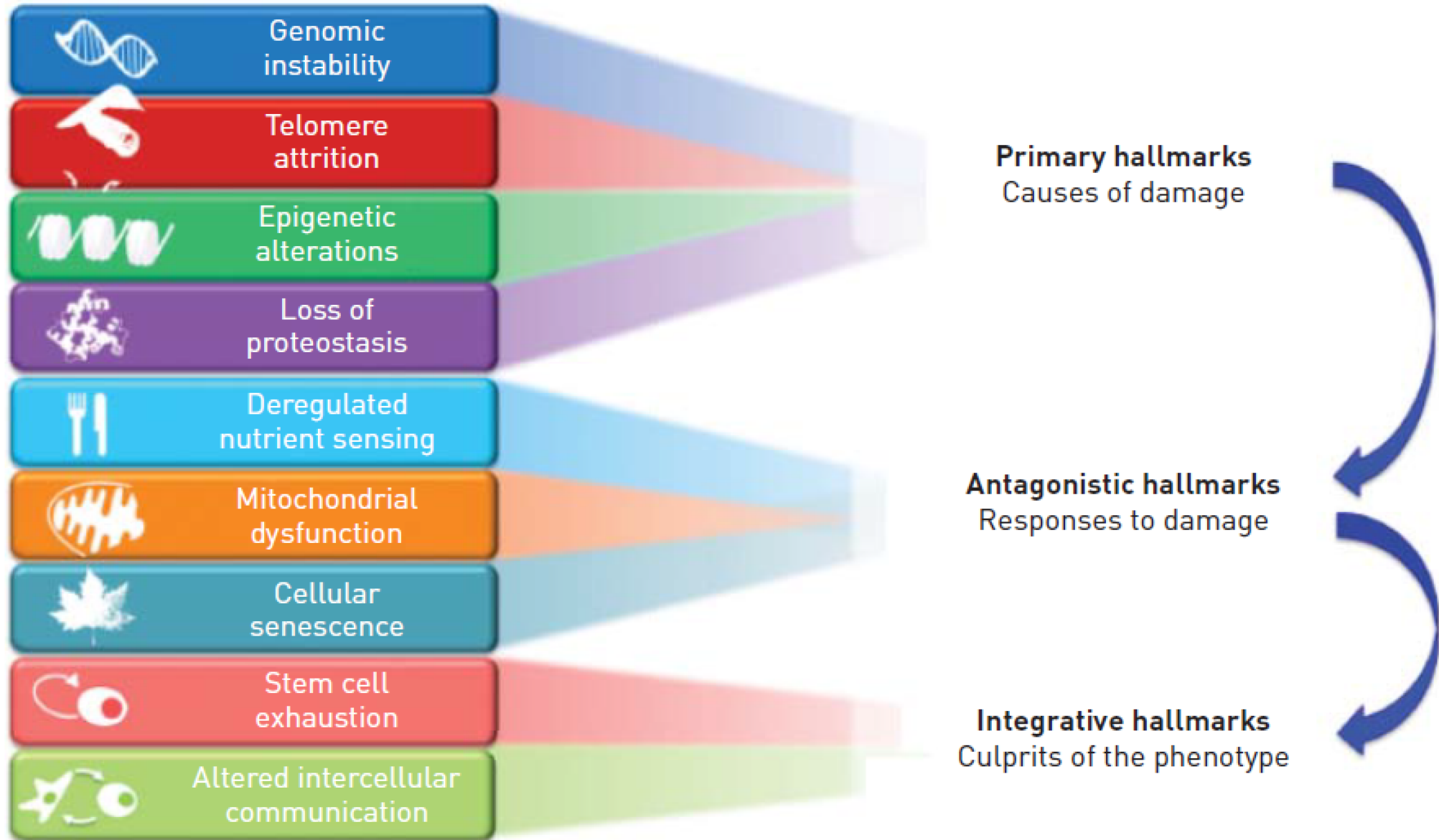


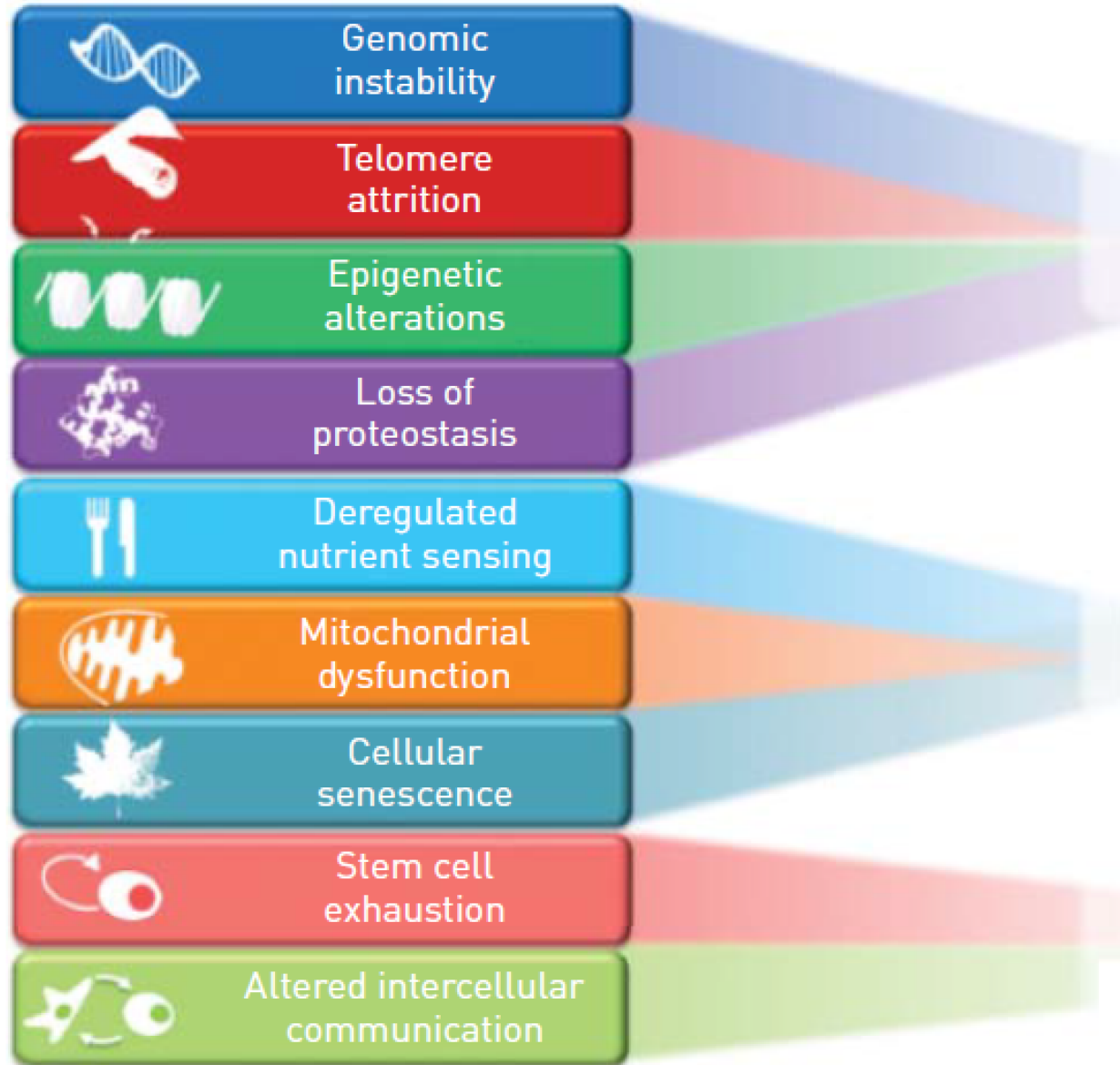
↑ CVD with Aging



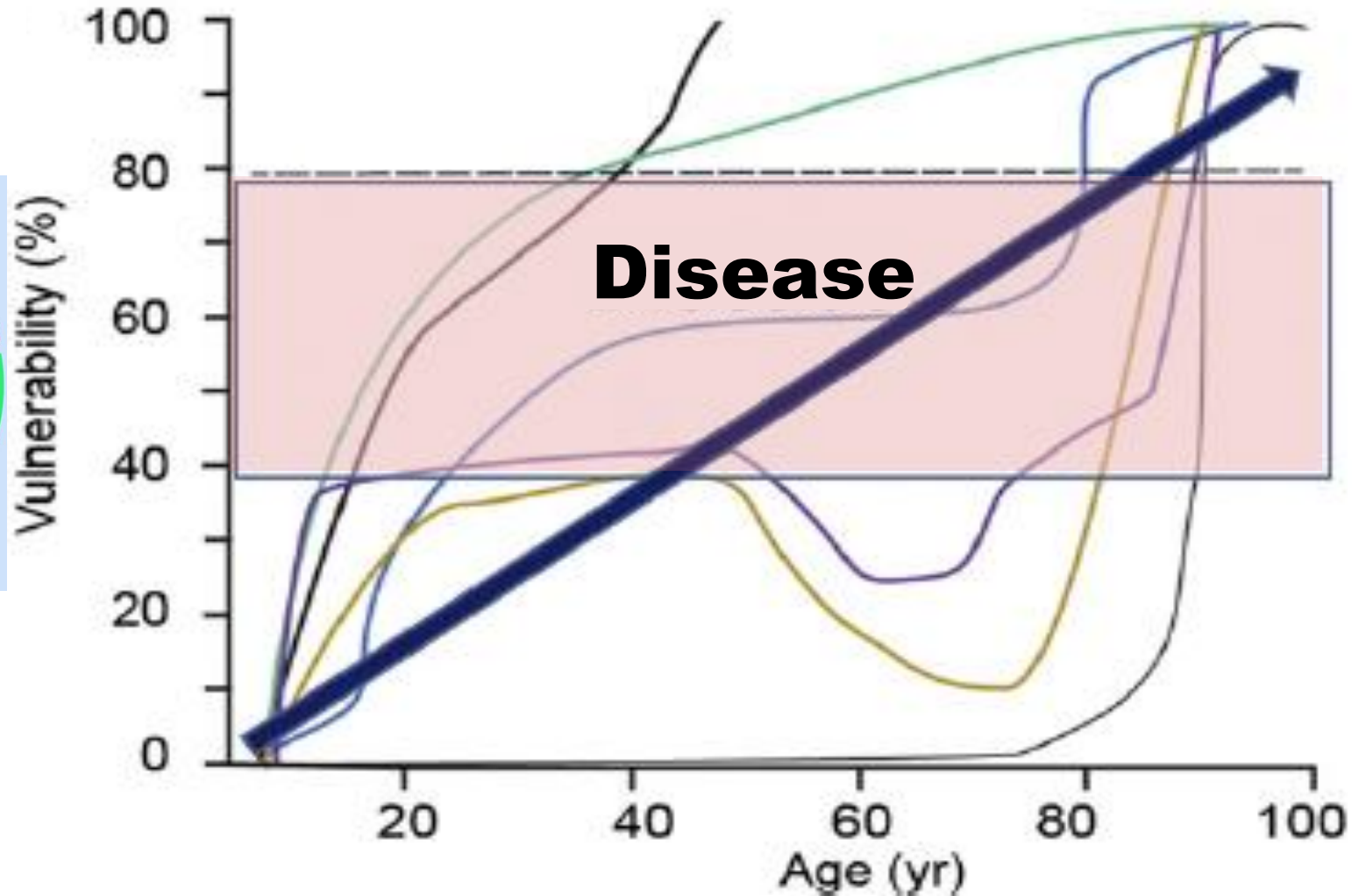
↑ CVD with Age: Driven by Biological Changes



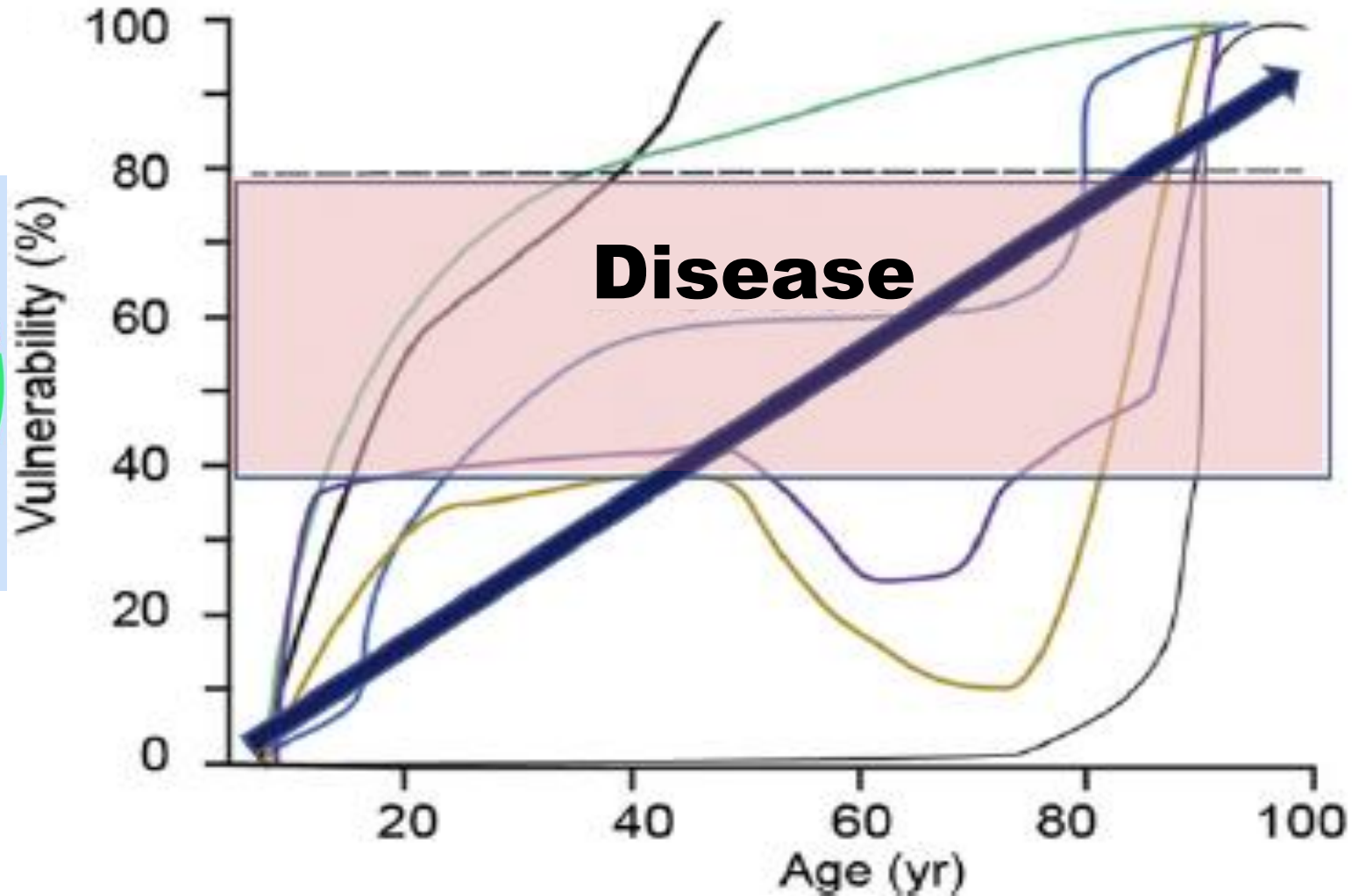




Age: CVD with Cumulative Disease and Vulnerability

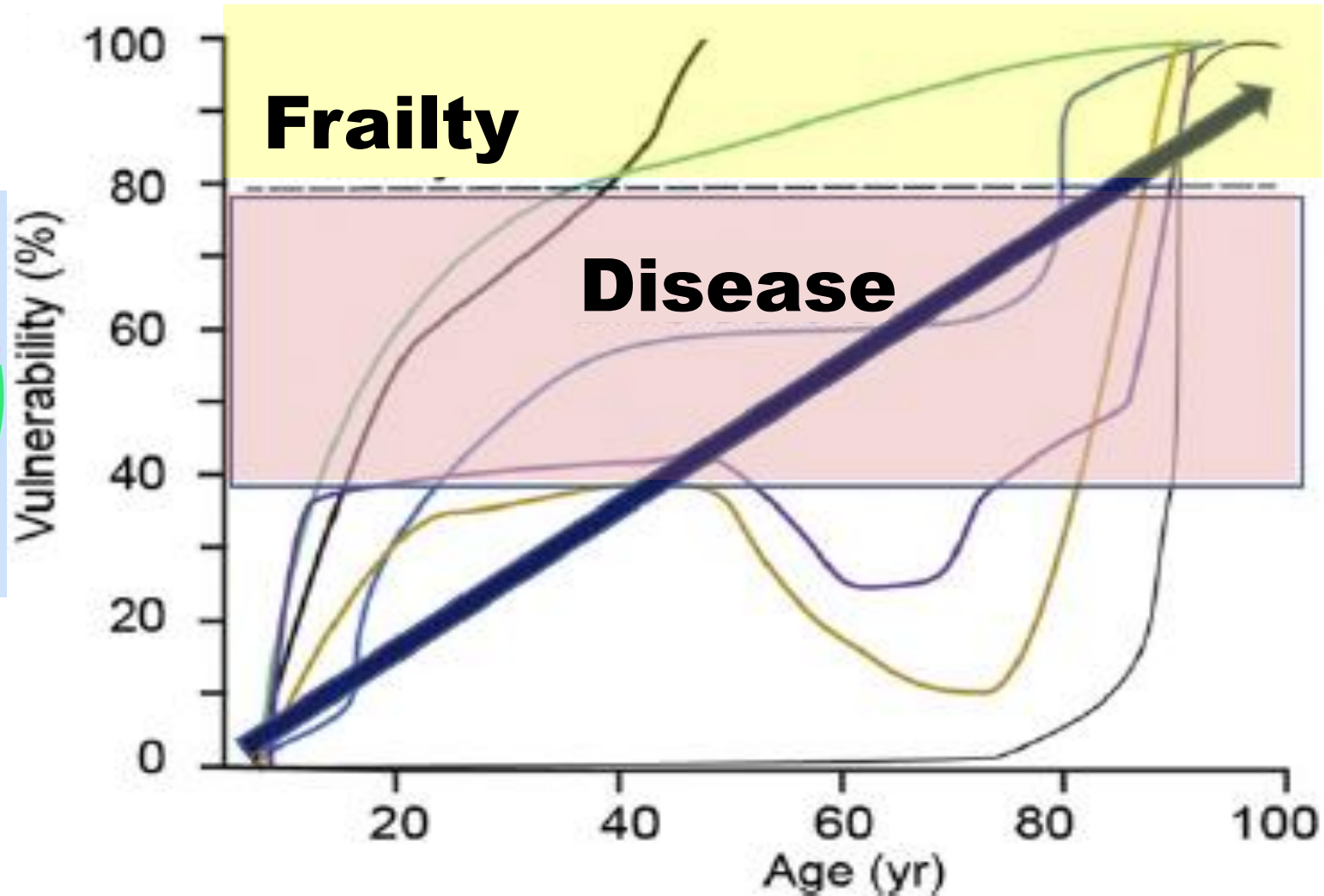


Age: CVD with Cumulative Disease and Vulnerability



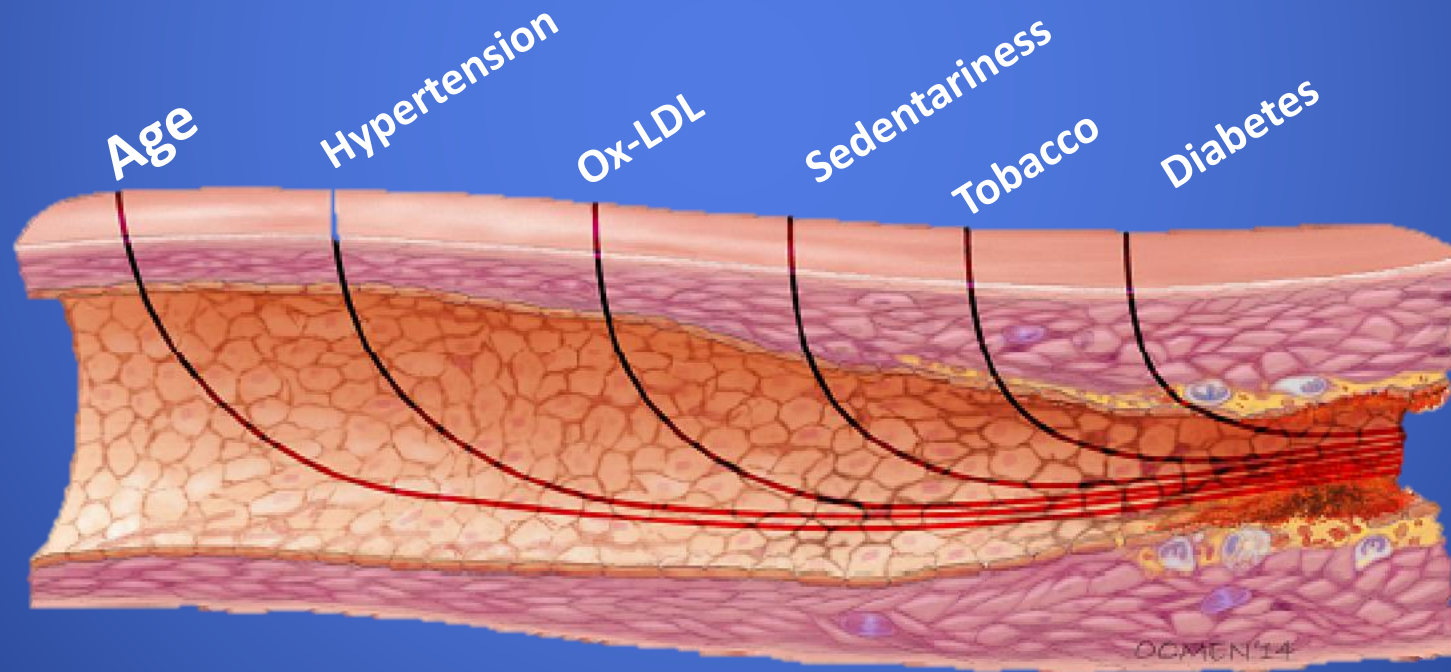
CVD in a context of multimorbidity

Age: CVD with Cumulative Disease and Vulnerability

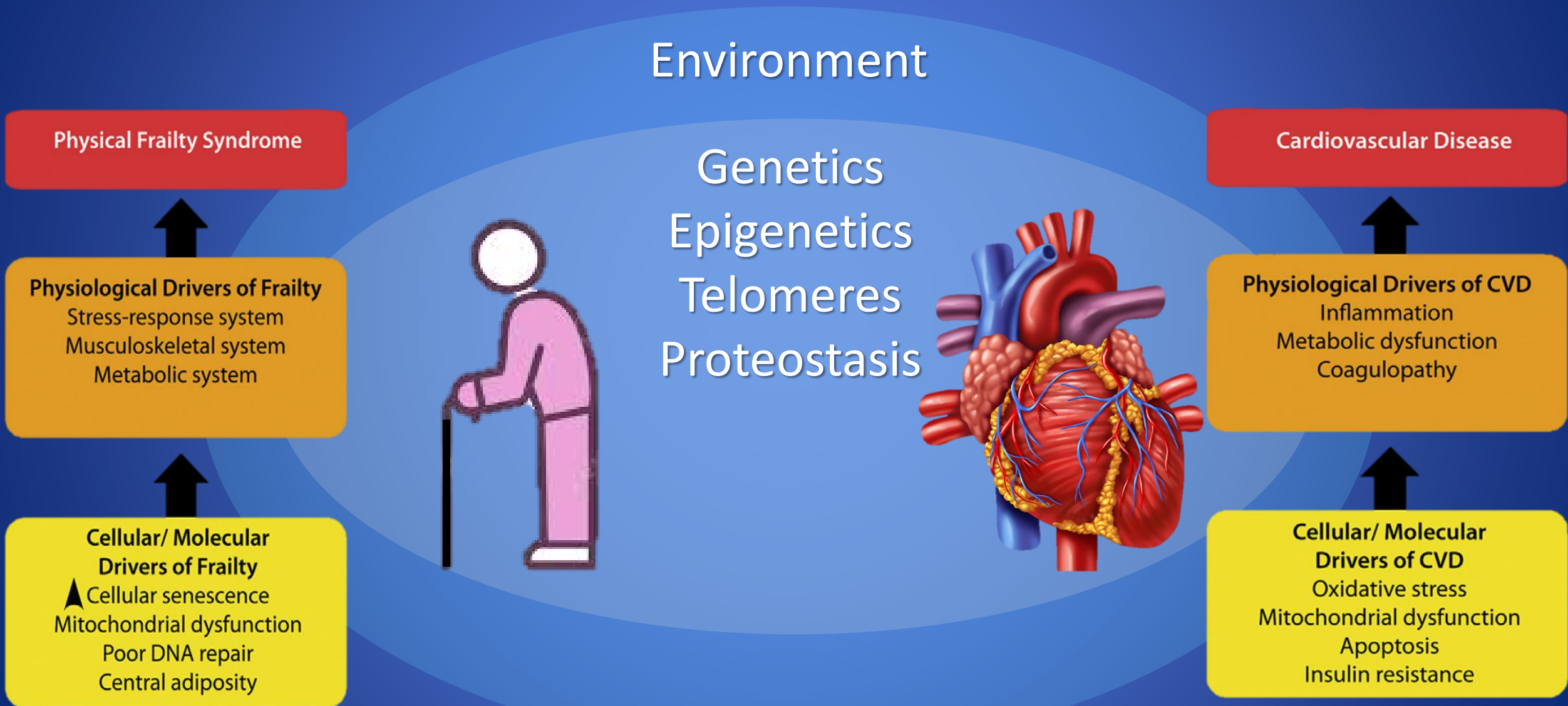


CVD in a context of multimorbidity and frailty

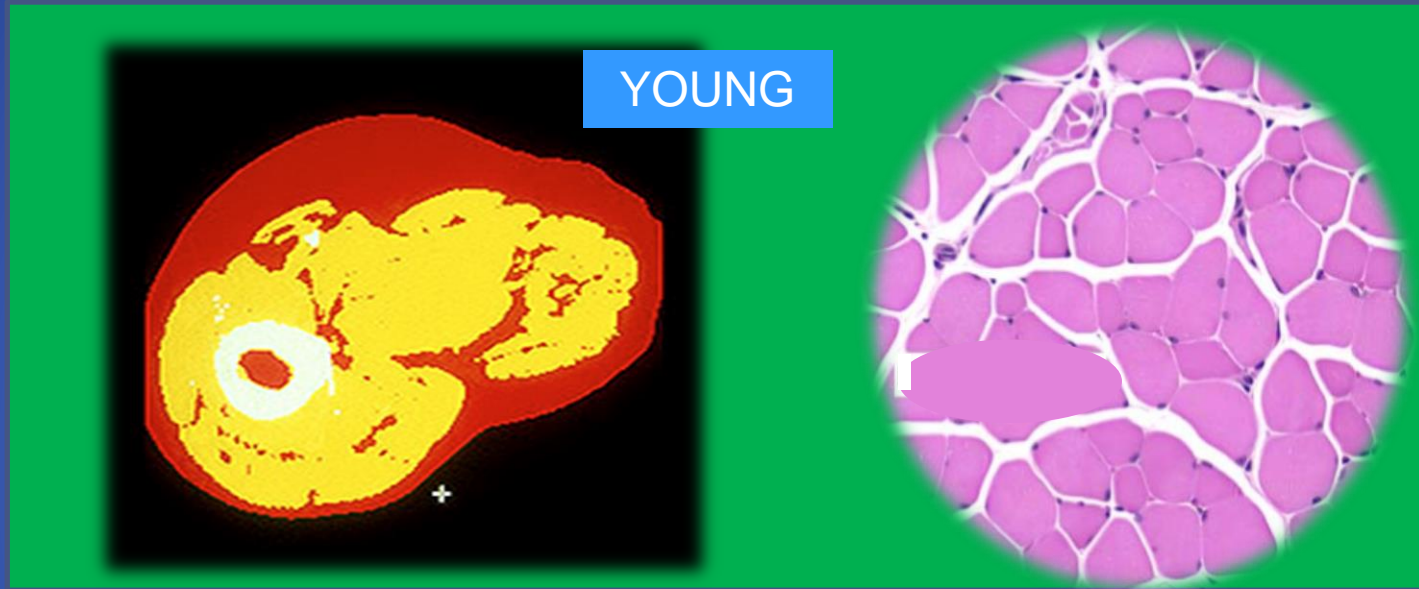
CVD risks and typical aging...



CVD Risk: *Drivers of Frailty and CVD Overlap*



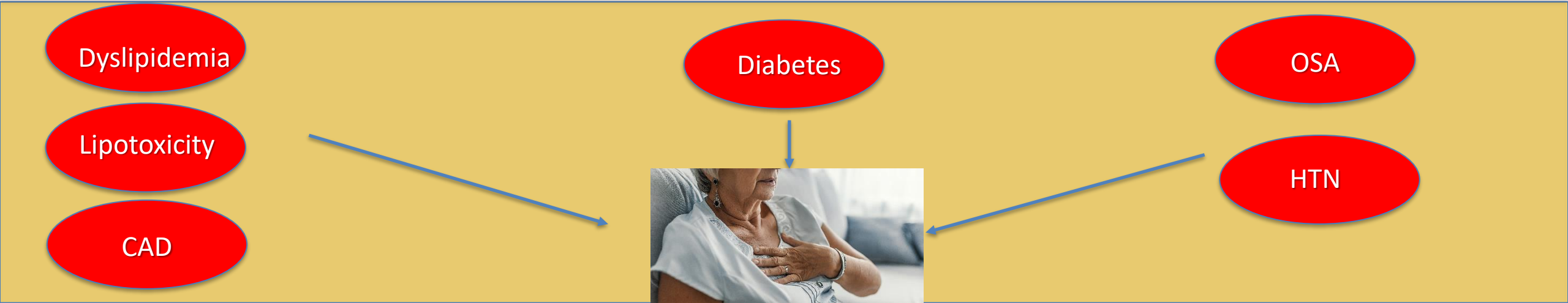
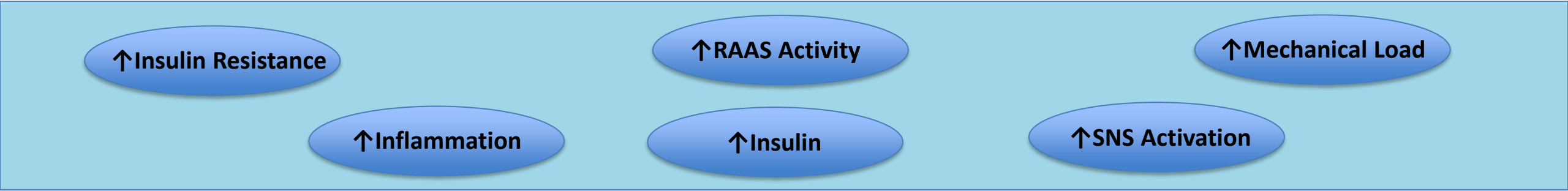
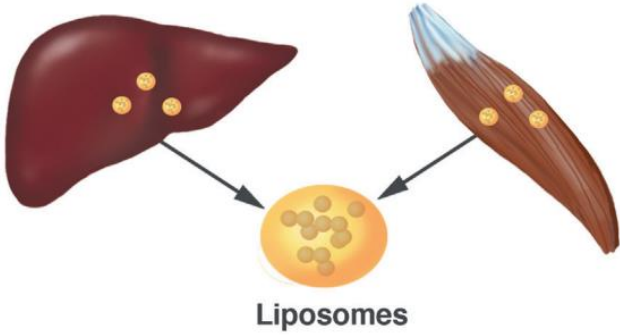
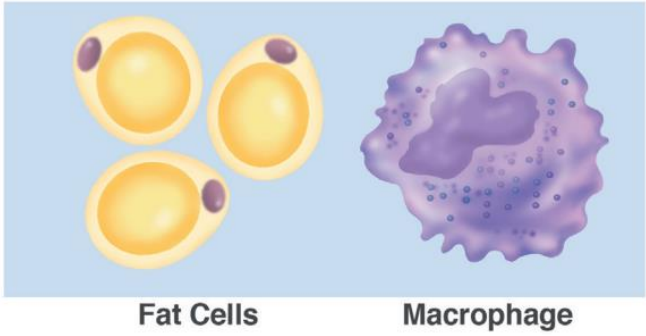
Sarcopenia: Skeletal Muscle Weakening and Atrophy



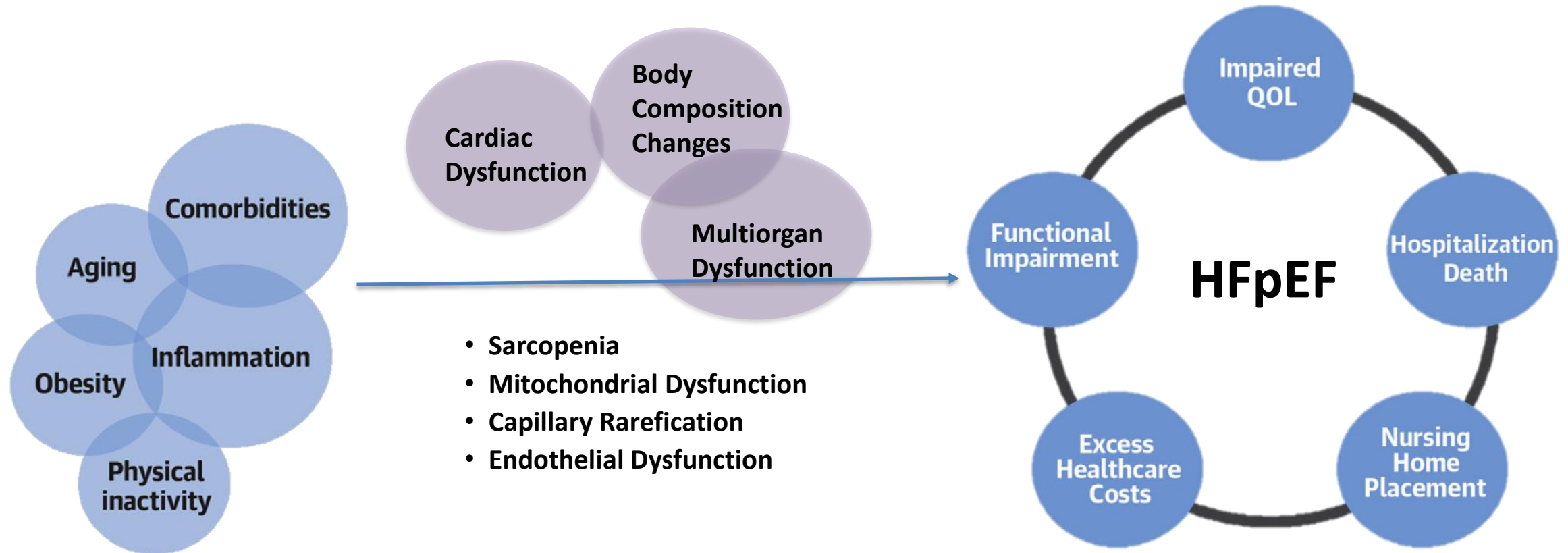
Inflammation

- ↑infiltrating adipose
- ↓type 2 fibers
- ↓Microvascular perfusion
- ↑Mitochondrial dysfunction
- ↑Apoptosis
- ↑Motor neuron loss

Adipose Tissue **Ectopic Lipids**



Distinctive Age-Related Vulnerabilities to HF Pathophysiology

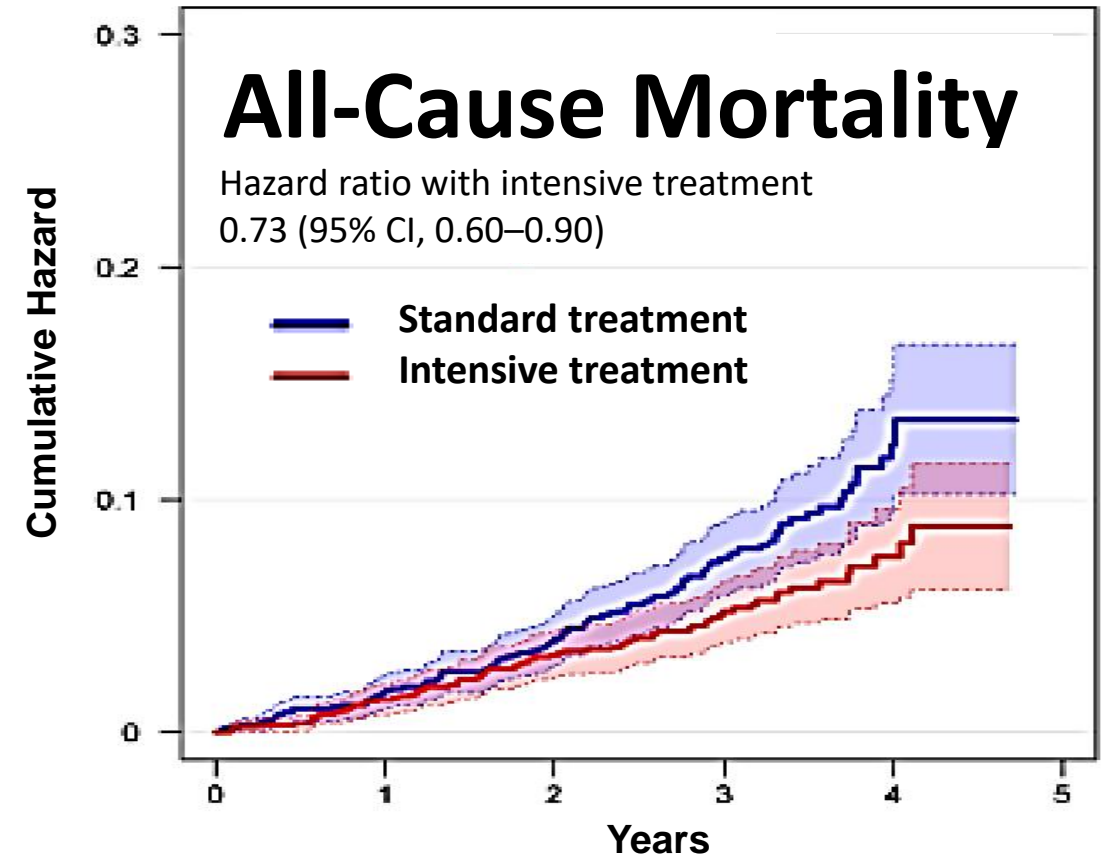
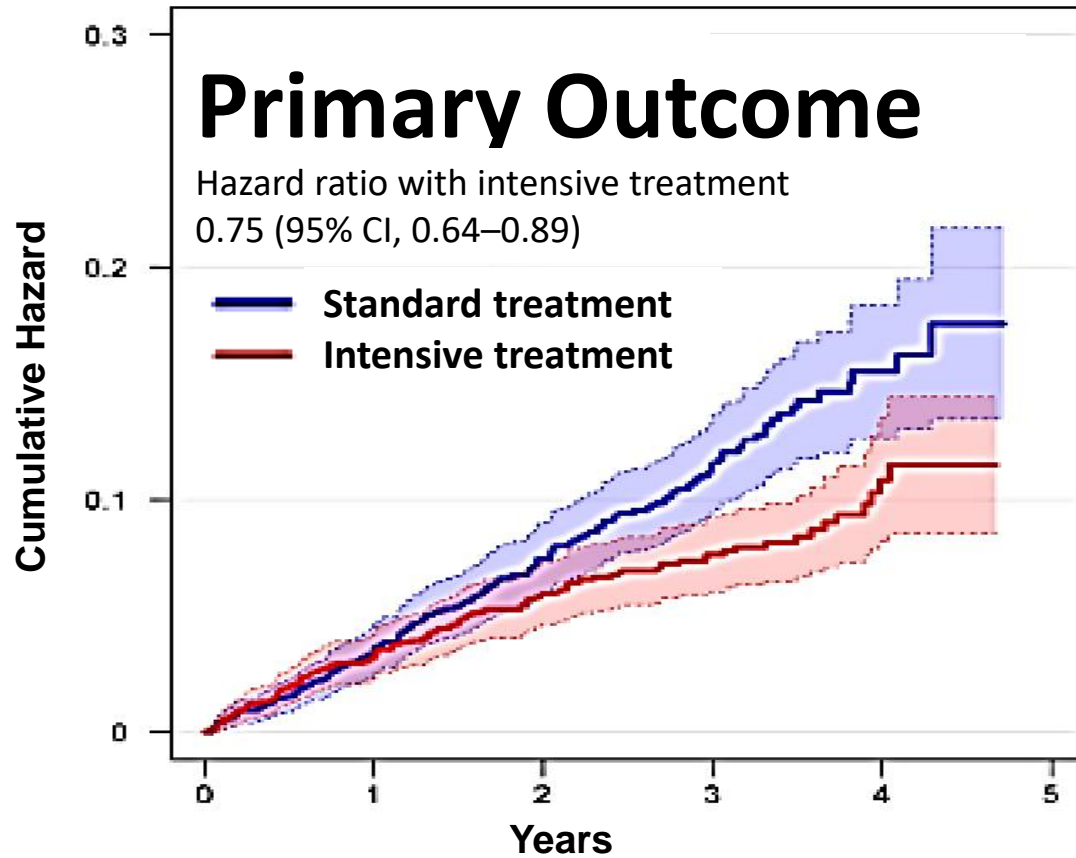


Modifying Risk Factors to Incident HF

- Traditional CVD risk factors:
 - ↓Hypertension
 - ↓Cholesterol
 - ↓Sedentariness
- New Risk factors
 - Caloric Restriction
 - Caloric Restriction Mimetics

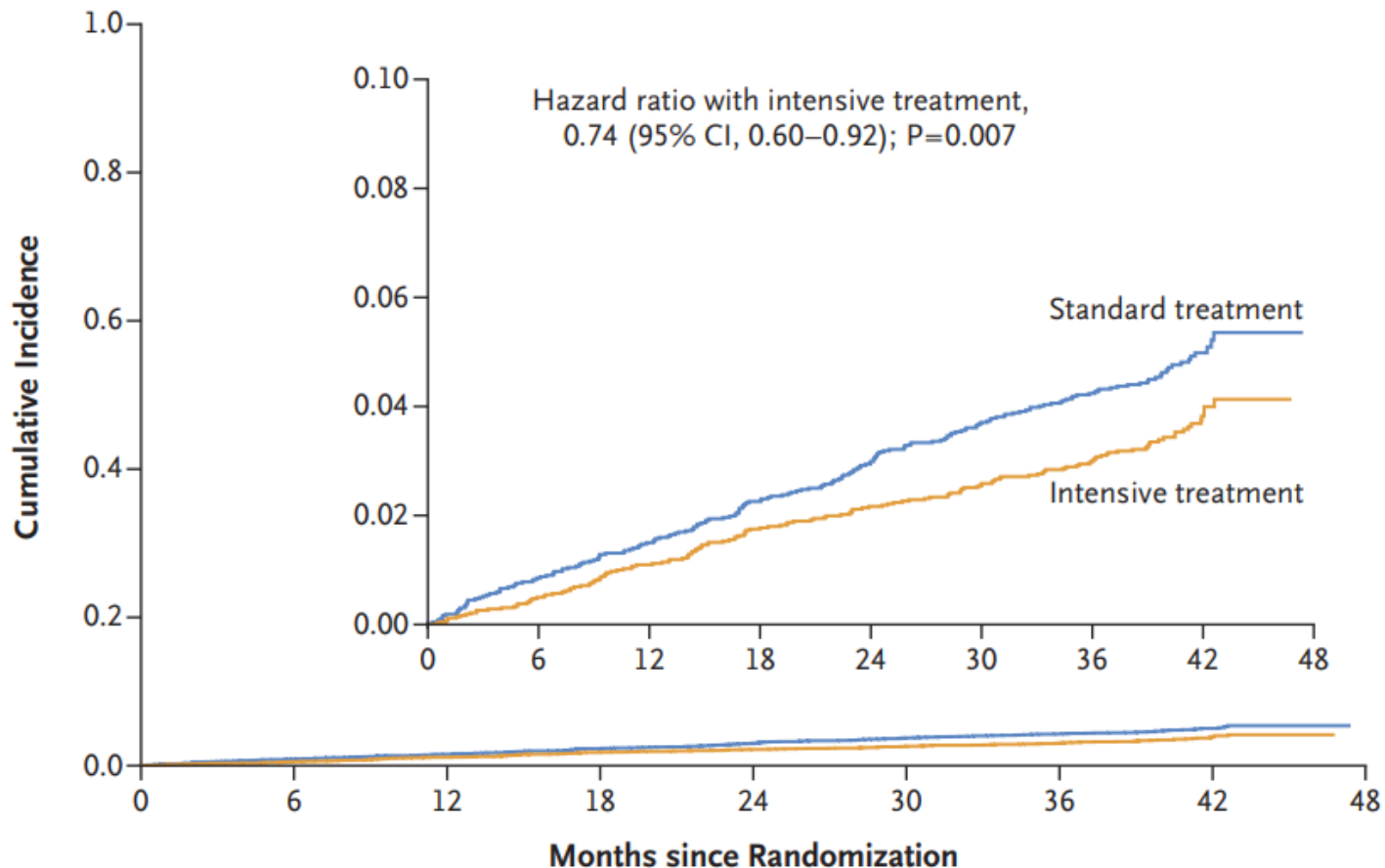


Systolic Blood Pressure Intervention Trial (SPRINT) : Lower is better...



Composite of MI, ACS, stroke, HF, or death from cardiovascular causes

Strategy of Blood Pressure Intervention in the Elderly Hypertensive Patients (STEP)



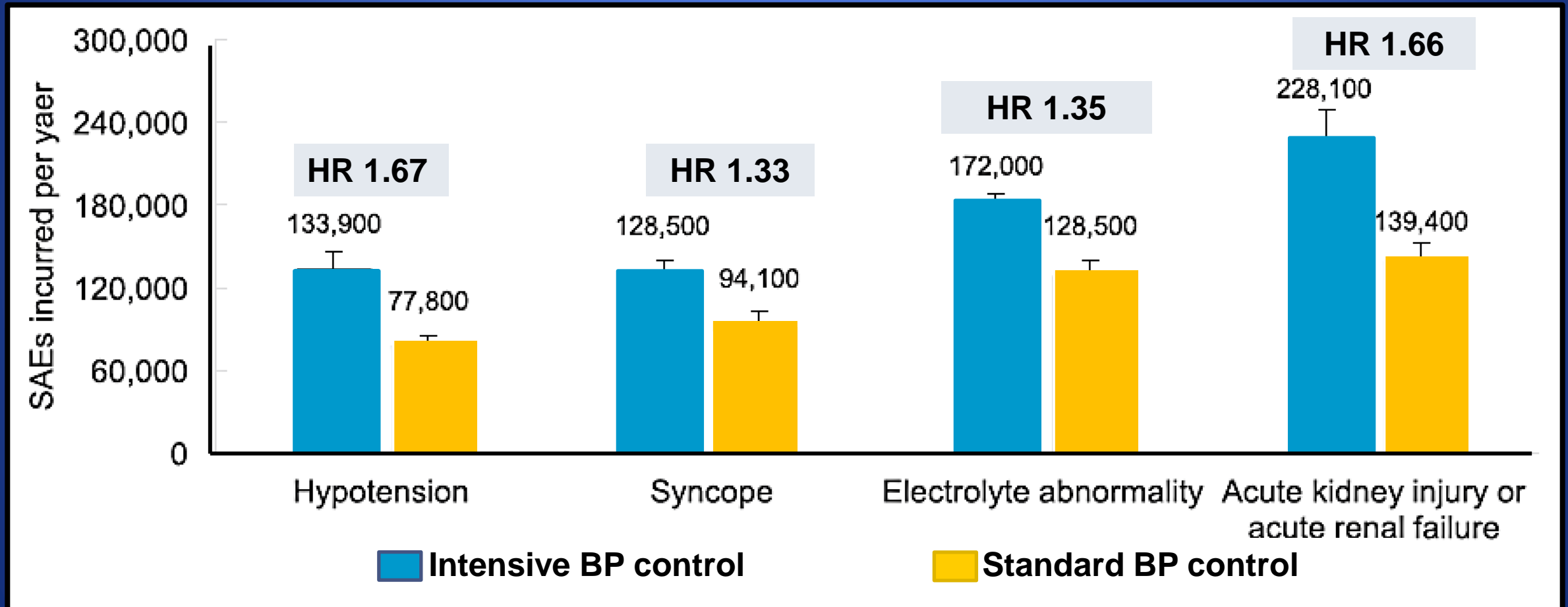
- 60-80 yo
- N=8511
- olmesartan, amlodipine, and HCTZ
- BP systolic target: 110-130 mmHg

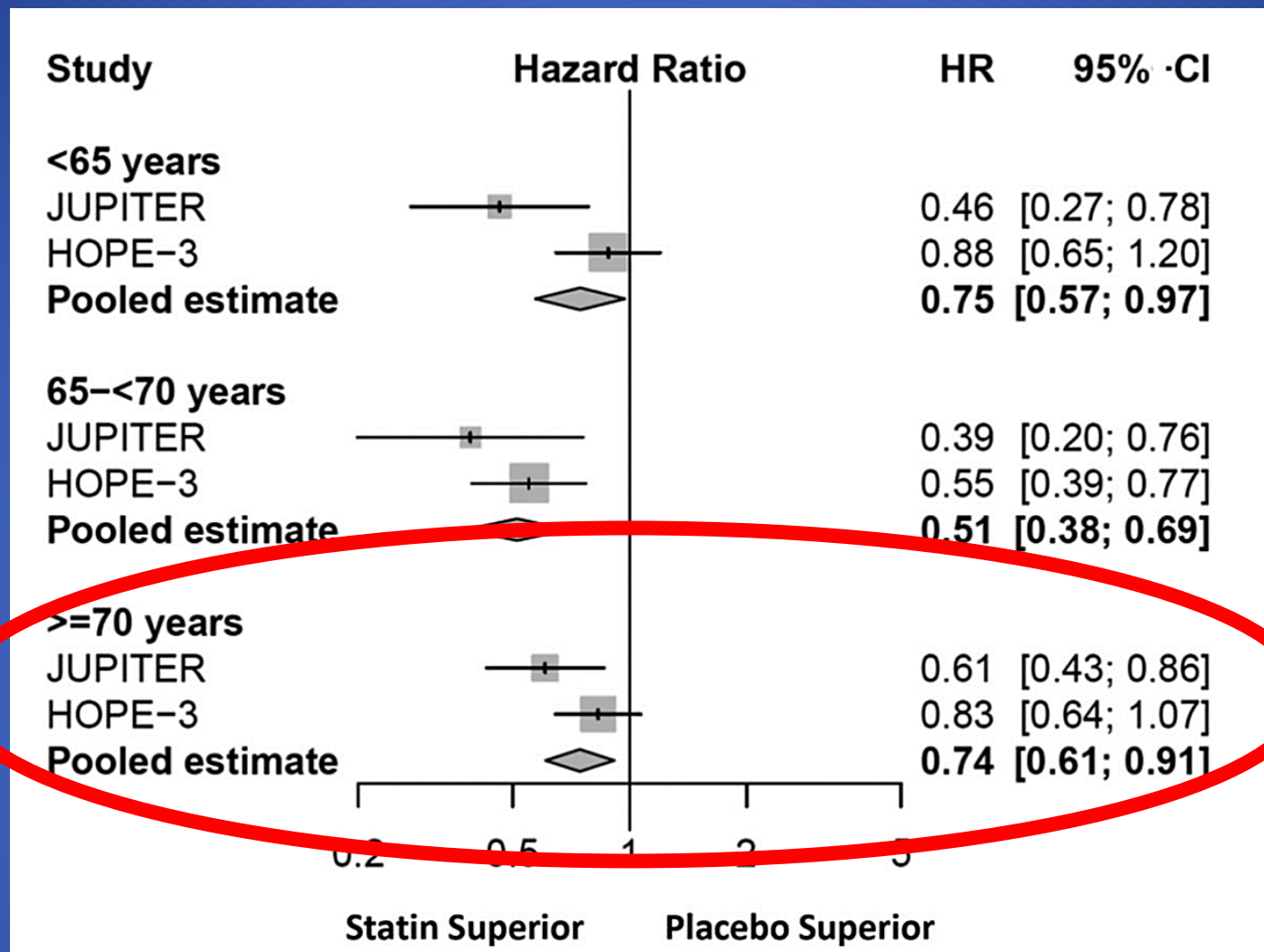
1^o Outcome:

Composite of stroke, acute coronary syndrome (MI and UA), acute decompensated heart failure, coronary revascularization, atrial fibrillation, or CVD death

HF declines 28%

Increased adverse events





Trial	N
JUPITER	7,458
HOPE-3	6,059
<hr/>	
JUPITER	4,649
HOPE-3	3,559
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JUPITER	5,695
HOPE-3	3,086

Data combined from Jupiter and HOPE-3:

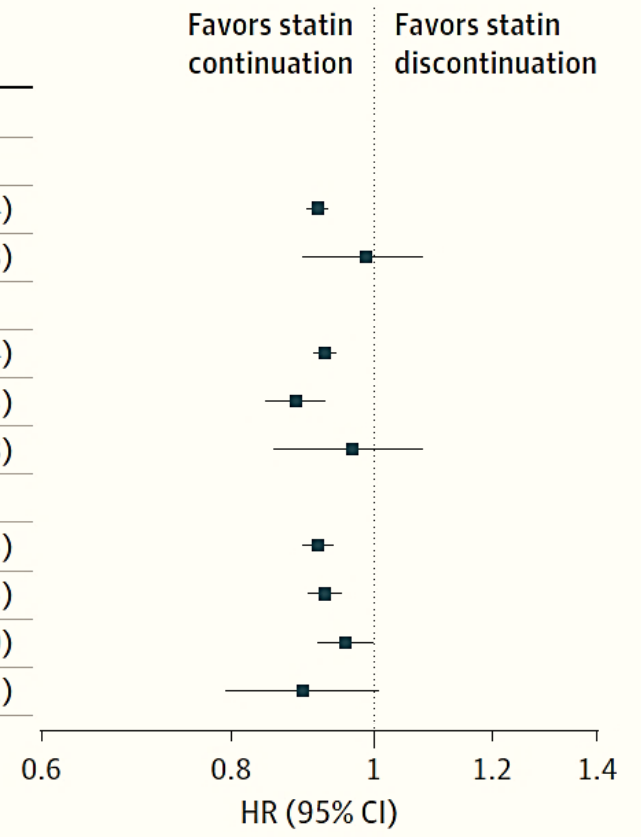
- Adults ≥70 years: 26% relative risk reduction for the endpoint nonfatal MI, nonfatal stroke, or CV death

New Statin Use in US Veterans Over Age 75

Outcome	Crude rate/1000 person-years		Weighted incidence rate difference/1000 person-years (95% CI) ^a	HR (95% CI)	P value
	Statin user (N = 57 178)	Statin nonuser (N = 269 803)			
Primary outcomes					
All-cause mortality (n = 206 902)	78.7	98.2	-19.45 (-20.38 to -18.52)	0.75 (0.74 to 0.76)	<.001
All CV death (n = 53 296)	22.6	25.7	-3.09 (-3.63 to -2.55)	0.80 (0.78 to 0.81)	<.001
Secondary outcomes					
ASCVD composite (n = 123 379) ^b	66.3	70.4	-4.05 (-5.09 to -3.02)	0.92 (0.91 to 0.94)	<.001

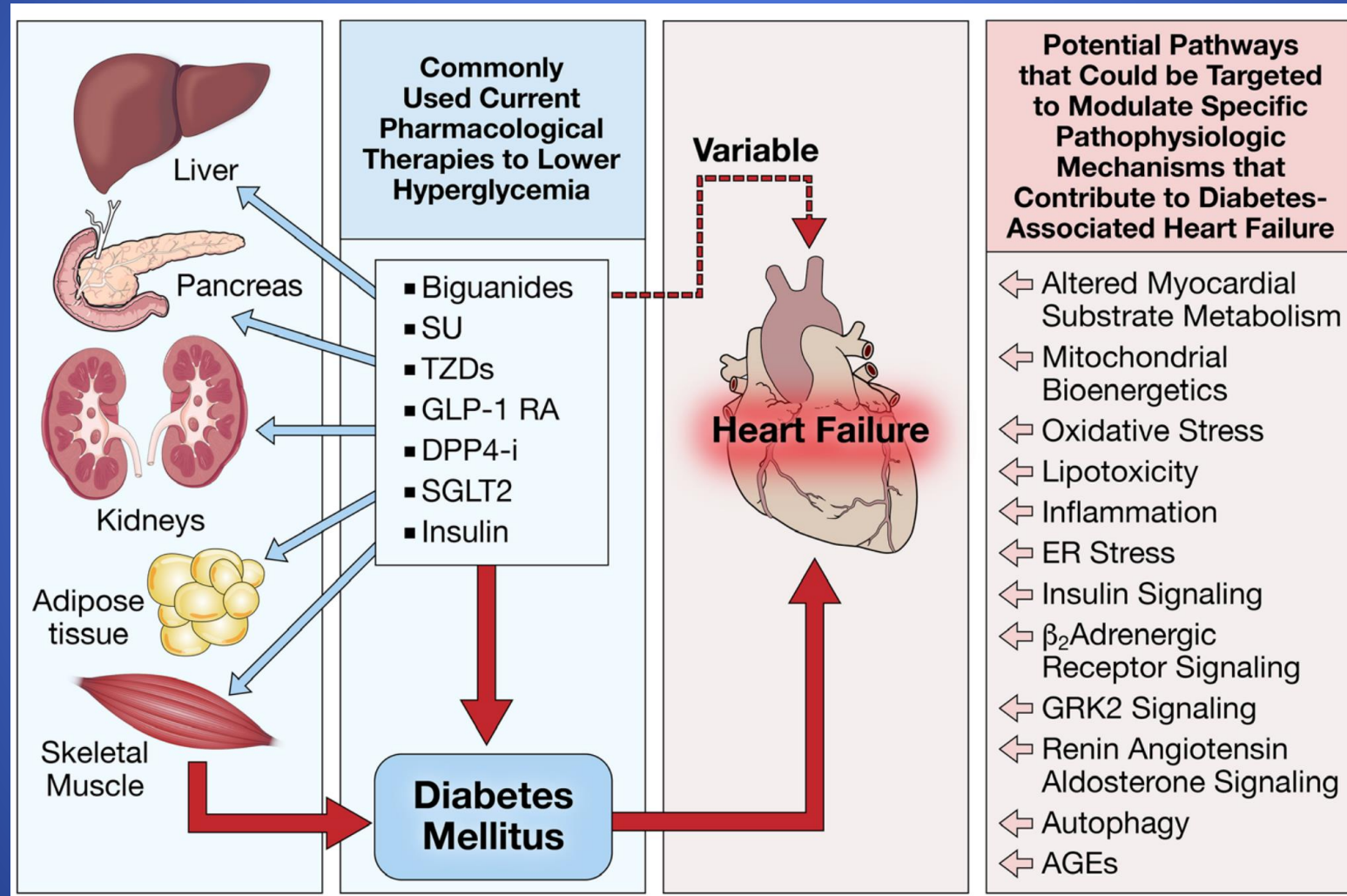
N=57,178,
Mean age 81.4 yrs

Outcome	No. of events/No. at risk		Weighted incidence rate difference/1000 person-years (95% CI)	HR (95% CI)
	Statin user	Statin nonuser		
Atherosclerotic cardiovascular disease composite				
Sex				
Men	21 111/55 622	99 098/318 244	-4.20 (-5.25 to -3.15)	0.92 (0.91-0.94)
Women	593/1556	2584/8737	1.49 (-4.57 to 7.56)	0.99 (0.90-1.08)
Race				
White	18 961/51 570	88 680/296 617	-3.63 (-4.69 to -2.56)	0.93 (0.91-0.94)
Black	2341 /4530	11 320/24 641	-10.88 (-15.49 to -6.27)	0.89 (0.85-0.93)
Other	402/1078	1567/4645	1.44 (-5.62 to 8.51)	0.97 (0.86-1.08)
Age group, y				
75-79	9161 /24 092	50 538/163 178	-2.95 (-4.31 to -1.59)	0.92 (0.90-0.95)
80-84	9279/24 295	36 084/115 062	-4.94 (-6.68 to -3.20)	0.93 (0.90-0.95)
85-89	2901/7826	12 269/40 186	-3.40 (-7.16 to 0.36)	0.96 (0.92-1.00)
≥90	363/965	2791/8555	-12.99 (-26.36 to 0.39)	0.90 (0.80-1.01)

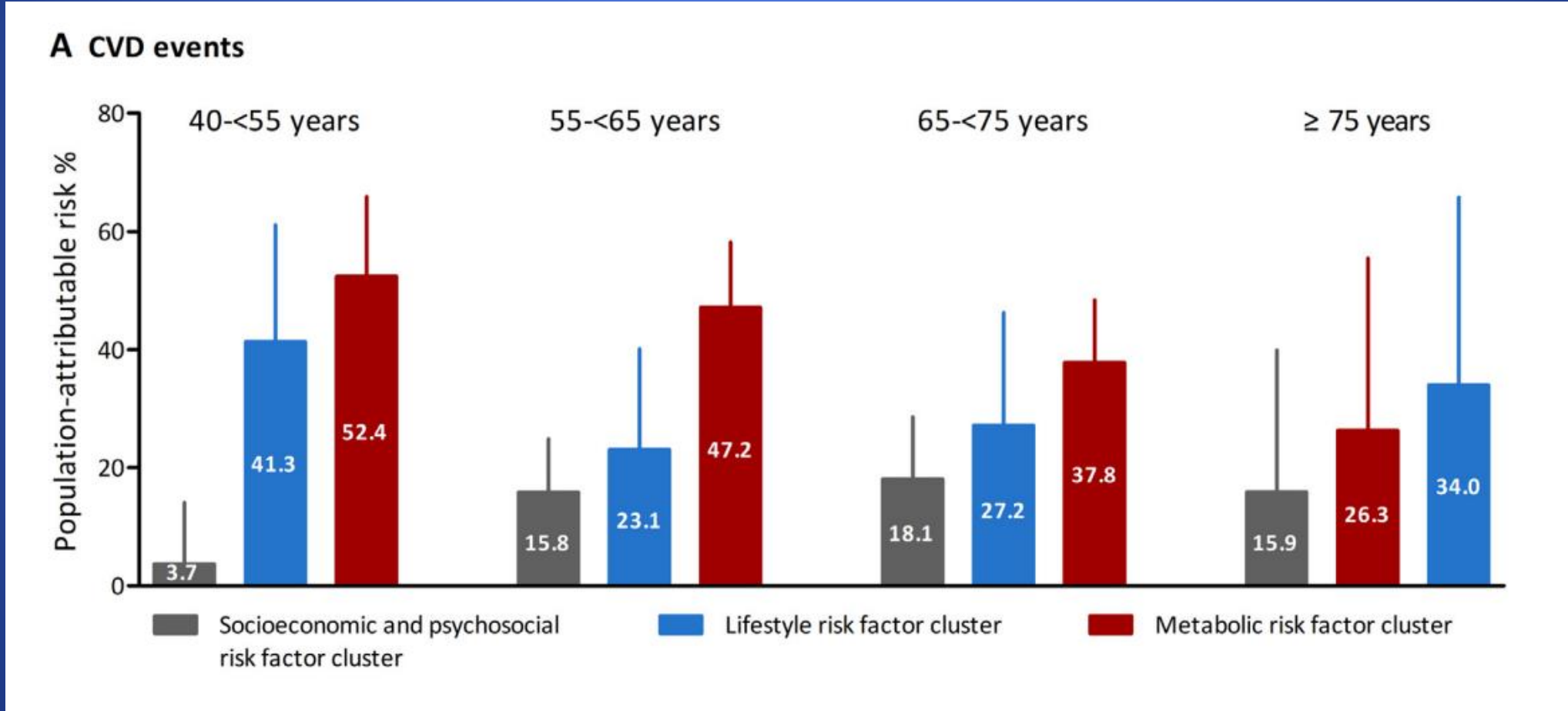


N=57,178,
Mean age 81.4 yrs

DM and HF: *More than glucose control*



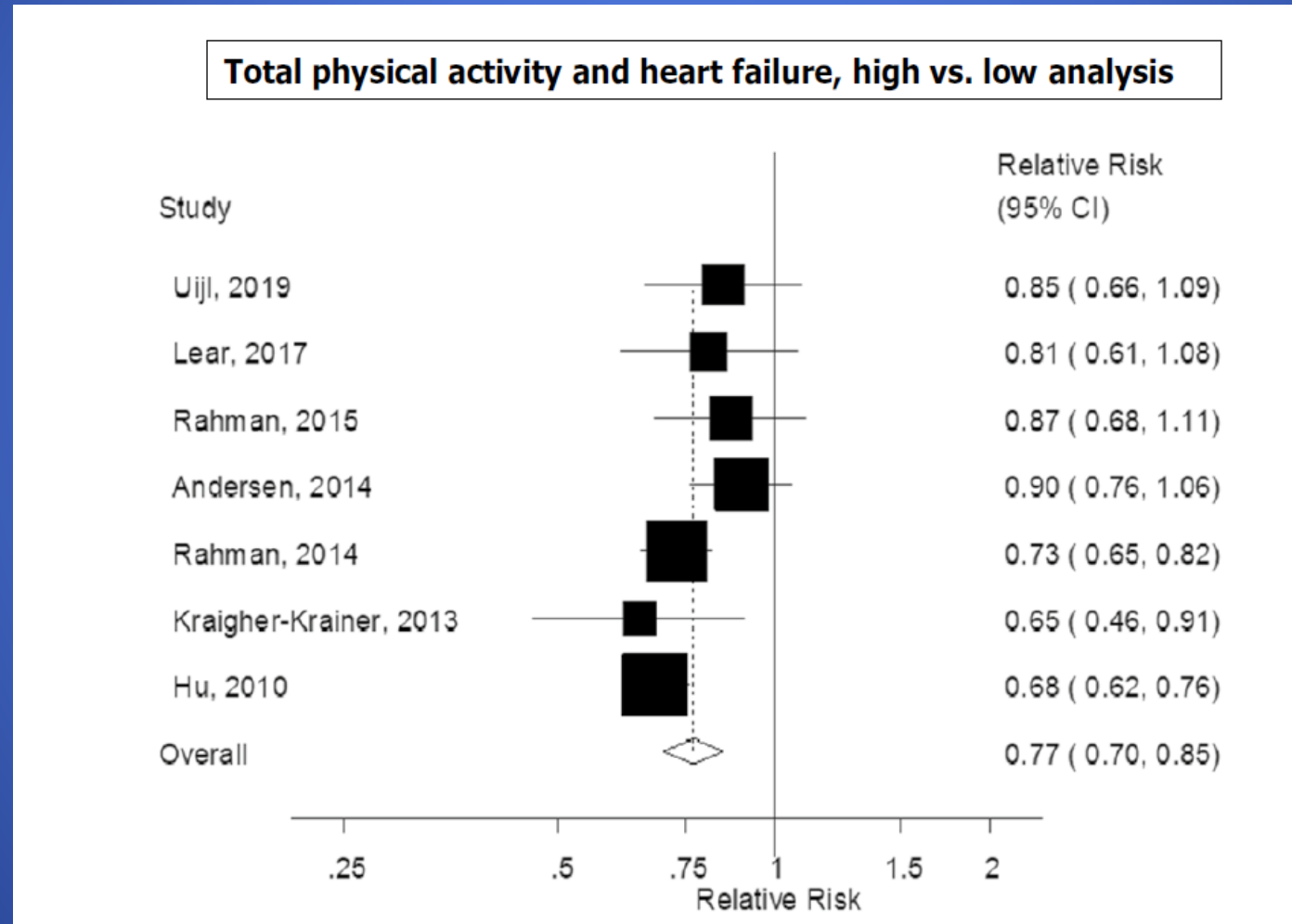
Age-Specific Shifts in CVD Risk Factors






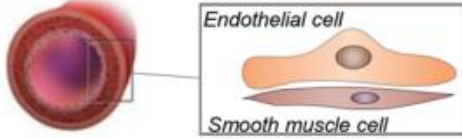


↑ Implications of Lifestyle Risk Factors in Older Adults

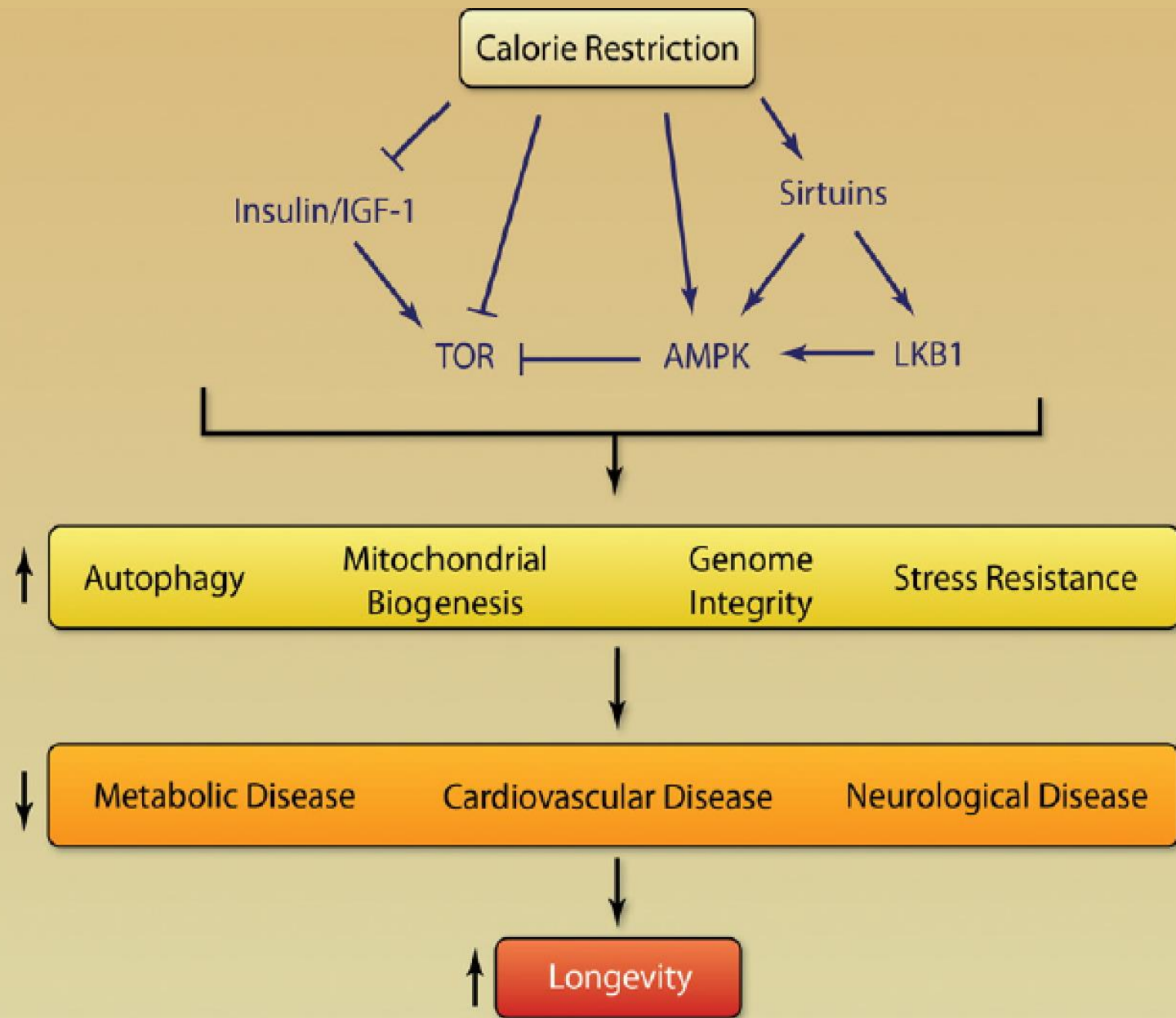
- Physical Activity
- Caloric Restriction
- Caloric Restriction Mimetics
 - Rapamycin
 - Resveratrol
 - Metformin
 - Canakinumab

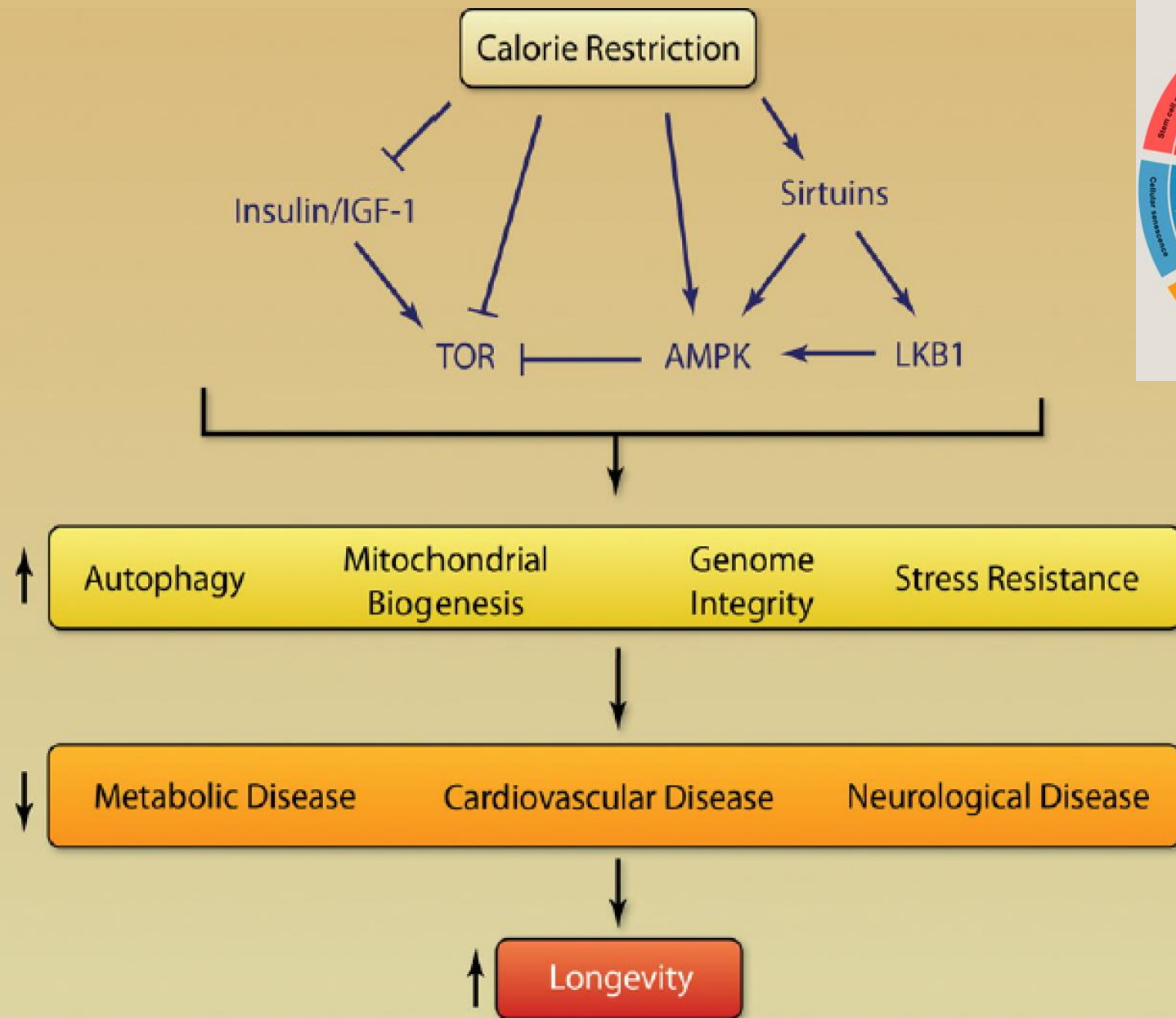
Physical Activity and Heart Failure

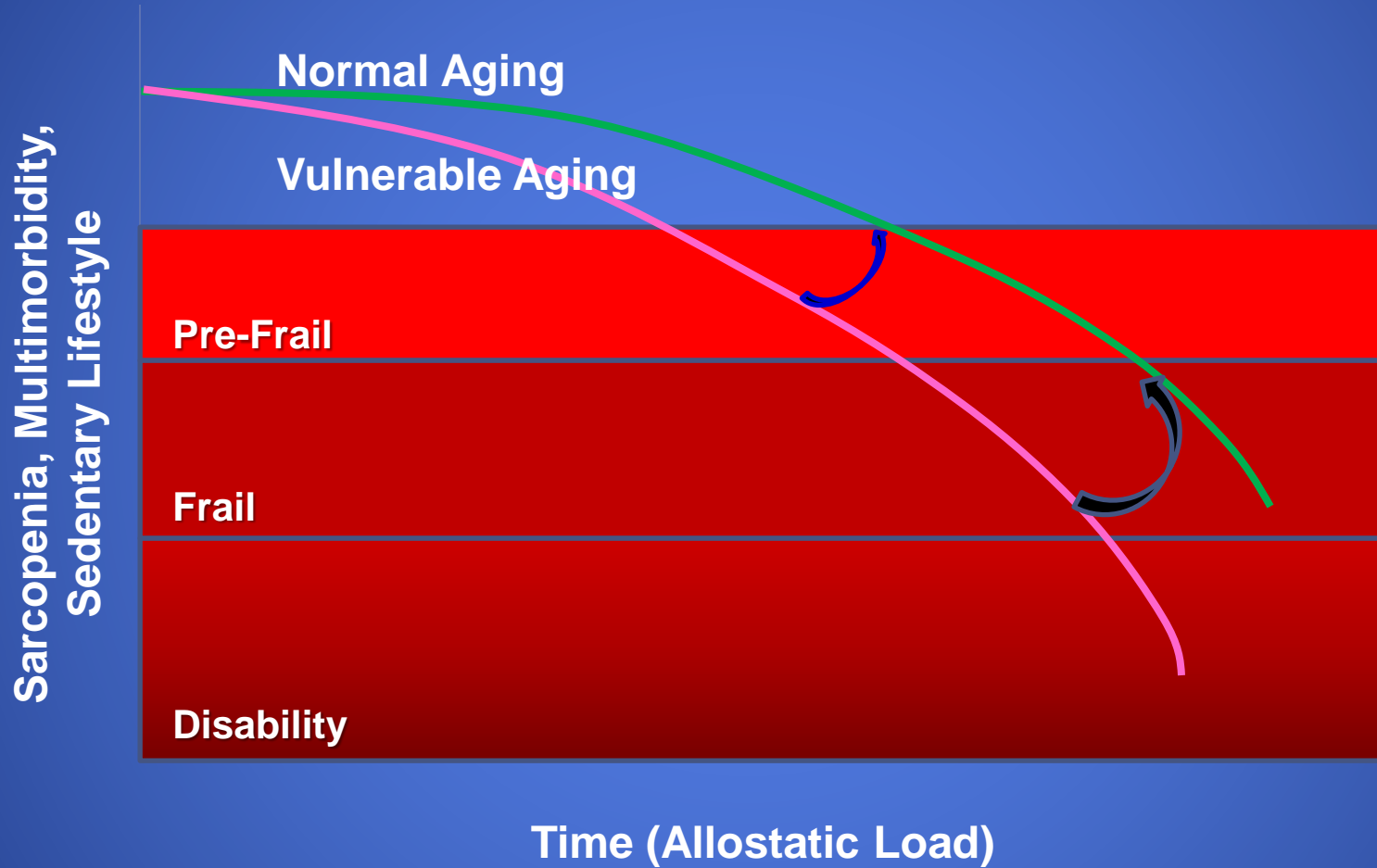


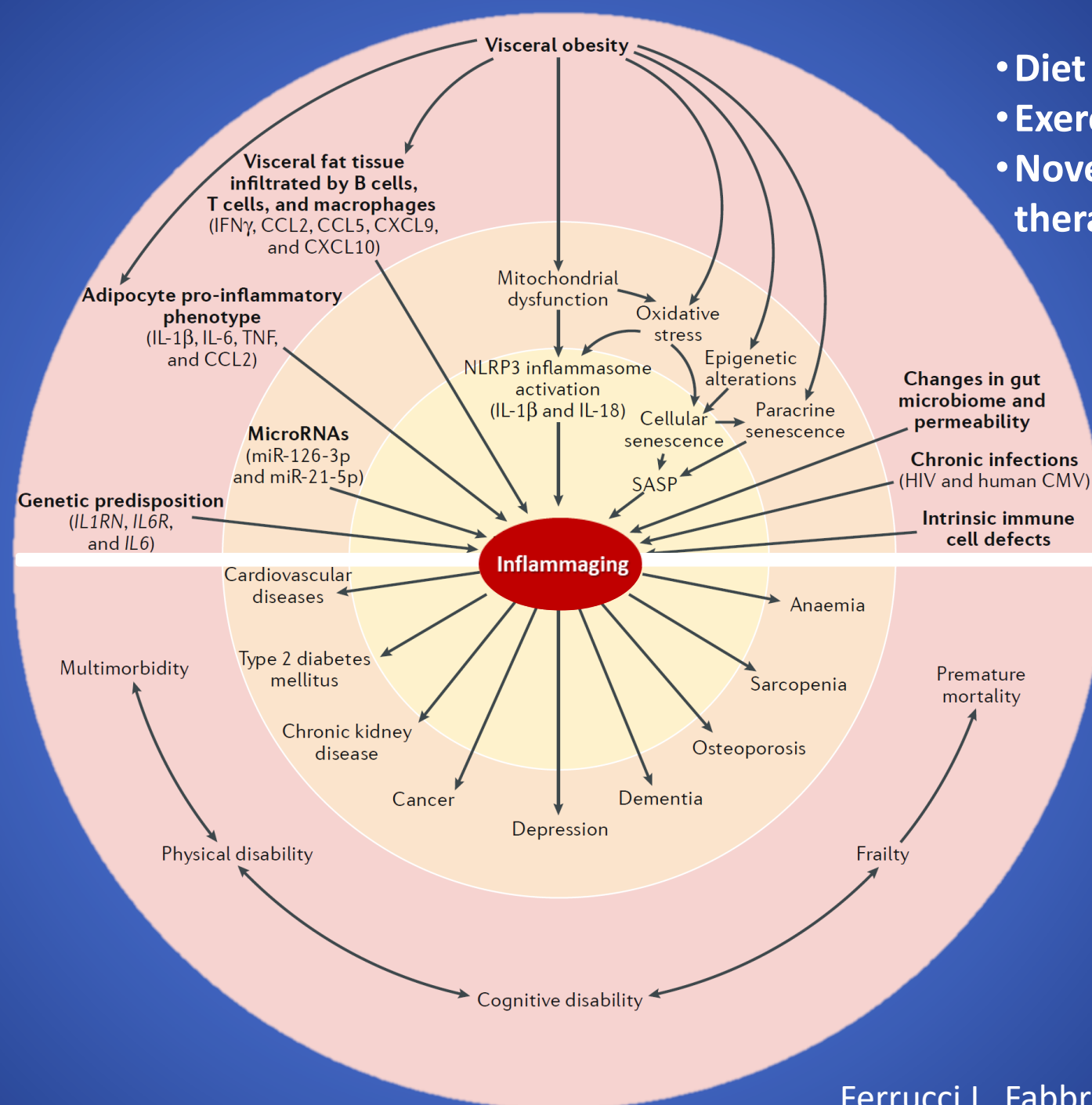
Exercise as Medicine

	Mitochondrial 	Skeletal Muscle 	Cardiac Muscle 	Conduit Arteries 
Sedentary 	<ul style="list-style-type: none"> • ↑ mitochondrial DNA deletions and mutations⁷¹ • Electron transport chain abnormalities⁷² • ↑ mitochondrial fission⁷³ • ↓ mitochondrial content⁷⁴ • ↓ respiration⁴ 	<ul style="list-style-type: none"> • ↑ IL-6 and CRP⁸⁰ • Activation of proteolytic systems⁸¹ • Inactivation of the PI3K/Akt/mTOR pathway⁸² • ↓ lean muscle mass⁸³ • Greater proportion of hybrid fibers possibly due to dysregulation in MHC isoform expression⁸⁴ 	<ul style="list-style-type: none"> • ↑ AGE accumulation indicative of collagen cross-linking⁸⁷ • ↑ Left ventricular stiffness⁸⁸ • β-adrenergic receptor desensitization resulting in impaired inotropic and chronotropic responses to adrenergic stimulation^{89, 90} • ↓ SERCA2a contributes to prolonged calcium transients⁹¹ 	<ul style="list-style-type: none"> • ↓ sympathetic baroreflex sensitivity and ↑ sympathetic activation⁹⁴ • ↑ NOS uncoupling, ↓ NO bioavailability, thereby ↑ oxidative stress⁹⁴ • Extracellular matrix remodeling through elastin degradation by MMPs and formation of AGEs⁹⁵ • Endothelial dysfunction⁹⁶
Physical Activity 	<ul style="list-style-type: none"> • ↑ mitochondrial protein turnover through degradation of damaged proteins and de novo synthesis of new functional proteins⁷⁵ • ↑ expression of PGC-1α^{76, 77} • ↑ SIRT3 content⁷⁸ • ↑ mitochondrial volume⁷⁹ 	<ul style="list-style-type: none"> • ↑ metabolic enzymes profile: citrate synthase, β-HAD, glycogen phosphorylase⁸⁵ • ↓ catabolic mRNA expression (FOXO3a, MuRF-1, Atrogin-1, myostatin)⁸⁶ • ↑ capillary-to-fiber ratio⁸⁵ • ↑ insulin sensitivity⁷⁶ 	<ul style="list-style-type: none"> • ↑ SERCA2a mRNA & protein expression⁹² • ↑ phosphorylation of threonine-17 residue of phospholamban allowing for faster reuptake of cytoplasmic calcium⁹² • ↑ contractility and relaxation due to faster systolic rise and diastolic decay time of calcium⁹³ • ↓ Left ventricular stiffness⁸⁸ 	<ul style="list-style-type: none"> • Lower expression of the transcription factor p53 which is associated with senescence compared to sedentary counterparts⁹⁷ • Lower markers of senescence (p21 and p16)⁹⁷ • ↓ expression of nitrotyrosine and NADPH oxidase (prooxidant)⁹⁶ • ↑ expression of manganese SOD (antioxidant)⁹⁶



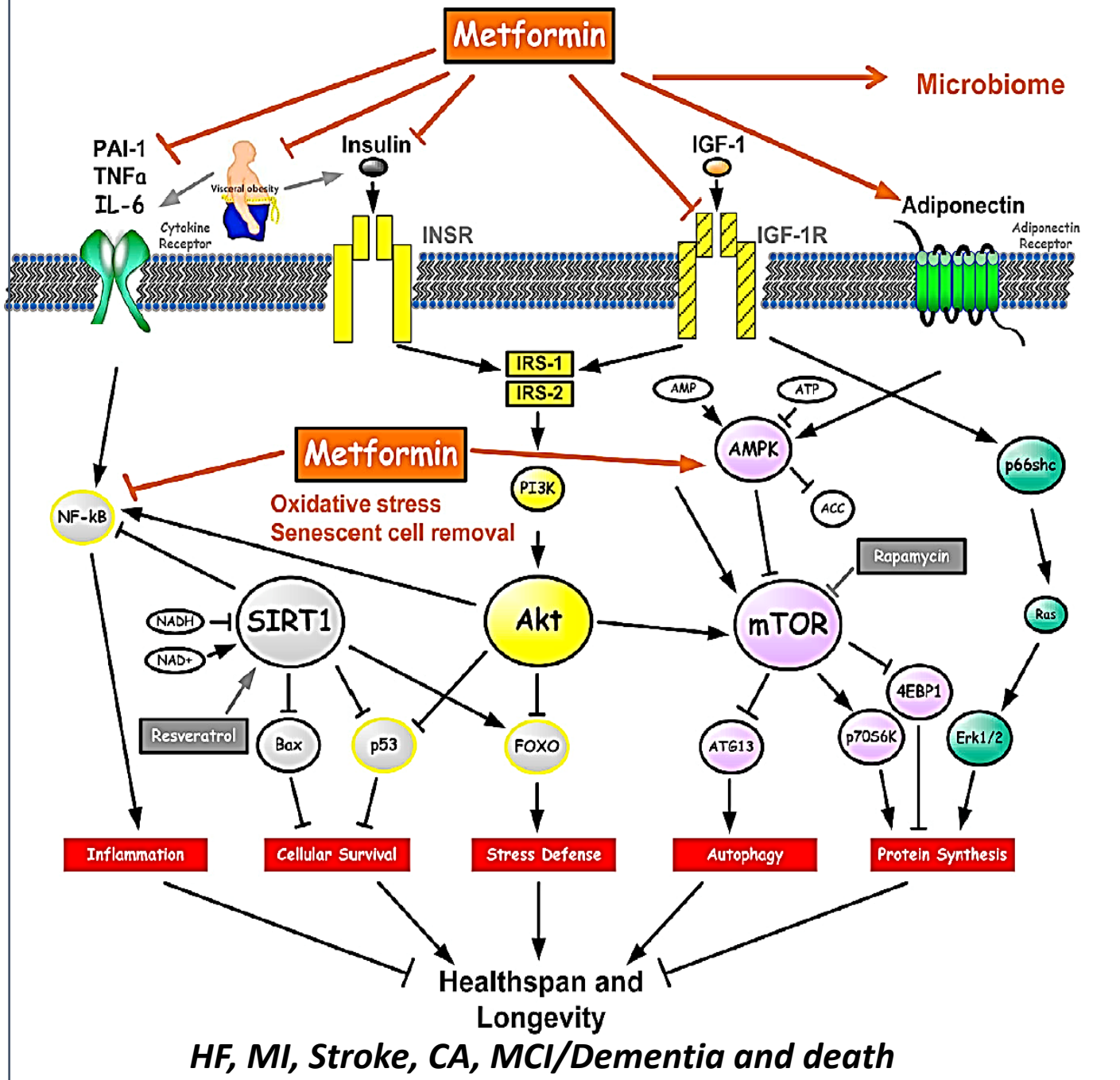






- Diet
- Exercise
- Novel anti-inflammatory therapeutics (Canakinumab)

Targeting Aging with Metformin (TAME)



Metformin

- Most widely prescribed oral medication for type 2 DM worldwide

Summary

- The rapidly growing population of older adults is intrinsically vulnerable to incident CVD
- Traditional risk factors have sustained and even increased benefit to moderate risks of HF amidst high susceptibility to CVD
- Novel risk factors associated with aging are now being recognized and provide new targets for risk modification

Heart Failure Awareness Week

Lunch & Learn

Monday, February 14th, 2022

Prevention and Early Detection of Heart Failure
Patients



American
Heart
Association.

Heart Failure Awareness Week!

- Welcome!
- Daily Newsletters via email
- Lunch & Learns Monday - Friday 12om CST/ 1pm EST
- Join [HFSA](#) and other heart failure-focused organizations on Twitter at 11:00 AM CT on **Wednesday, February 17** for a lively discussion on heart failure. The purpose of the chat is to provide healthcare providers and heart failure patients with an overview on the status of heart failure and to discuss ways to improve quality of care and expand heart failure awareness. **Follow hashtag #HFChat2022**
- Recordings
- Slides & Attachments
- Submit questions through the question panel



Prevention and Early Detection of Heart Failure Patients

Jennifer Maning, DO



Heart Failure Burden

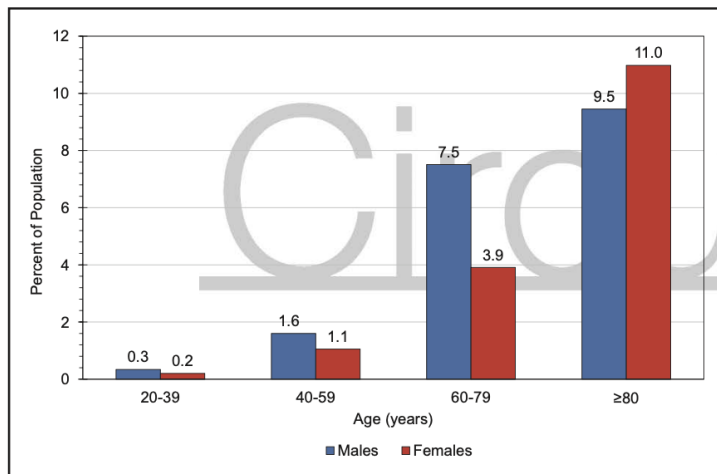
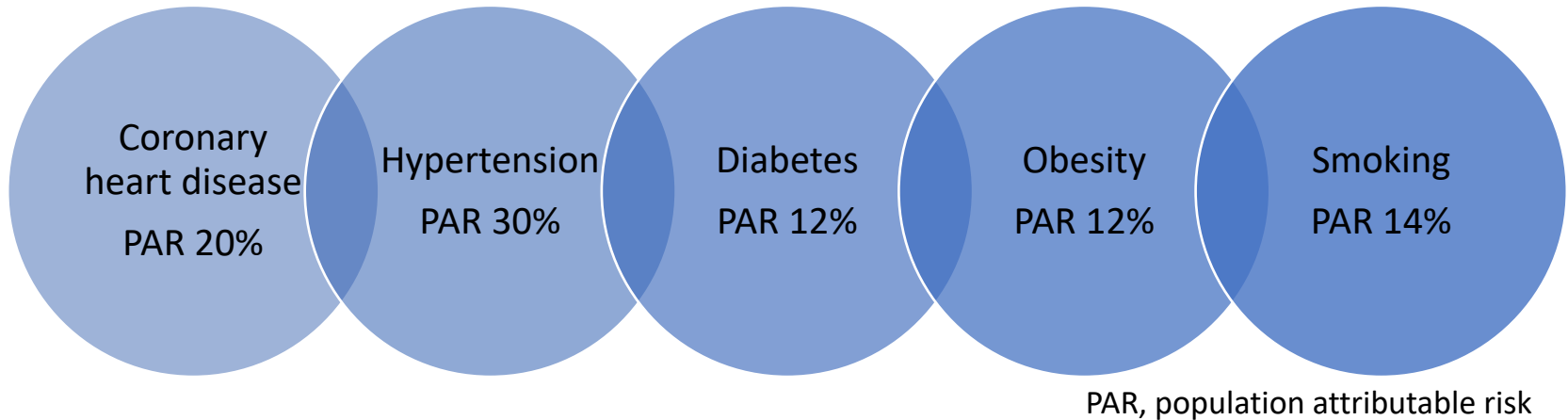


Chart 22-3. Prevalence of heart failure among US adults ≥ 20 years of age, by sex and age (NHANES, 2015–2018).

NHANES indicates National Health and Nutrition Examination Survey.
Source: Unpublished National Heart, Lung, and Blood Institute tabulation using NHANES.³¹

Prevalence of HF is projected to increase by 46% from 2012 to 2030, **affecting >8 million people 18 years of age or older**

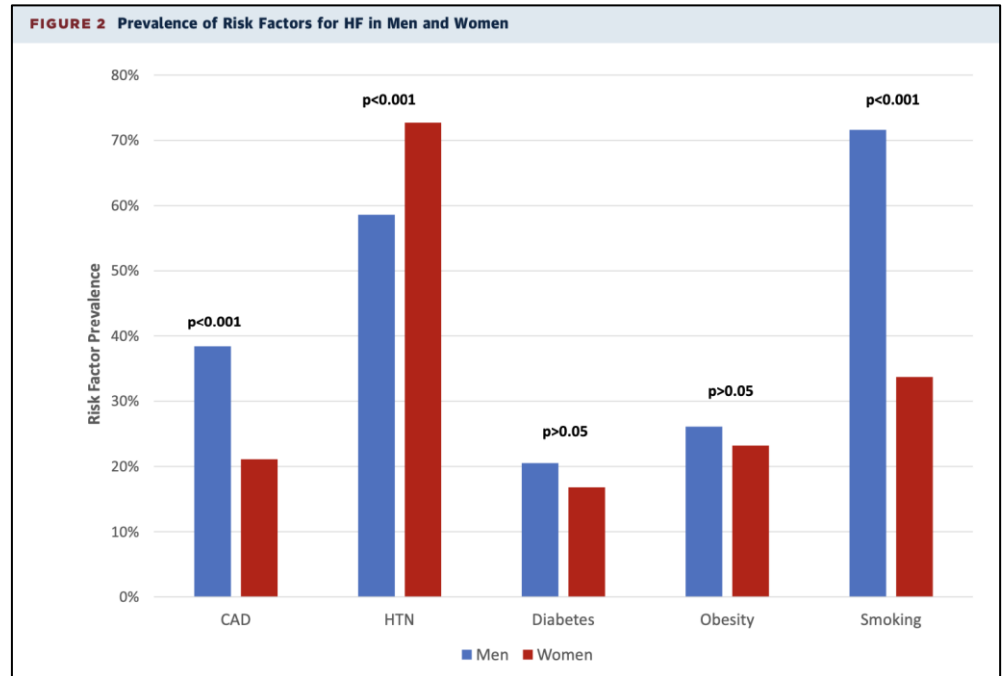
Heart Failure Risk Factors



Data from NHANES show that one-third of US adults have at least 1 HF risk factor

Sex Differences in Risk Factors

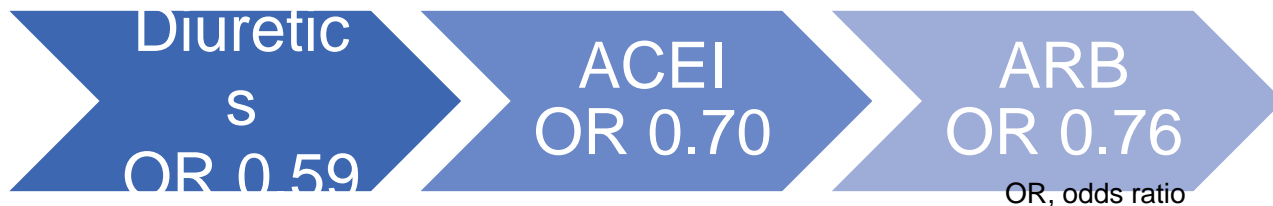
- *Hypertension* is the most common risk factor in women while *coronary artery disease* is the most common risk factor among men



Hypertension

- Long term treatment of hypertension **reduces the risk of HF by ~50%** and is associated with lower HF mortality

Most effective anti-hypertensive medication classes in reducing the incidence of HF



Diabetes

- For patients with diabetes, **SGLT2 inhibitors** have been shown to reduce incident heart failure (*even without a history of a prior MI or ASCVD)

Dyslipidemia

Circulation

Volume 120, Issue 23, 8 December 2009; Pages 2345-2351
<https://doi.org/10.1161/CIRCULATIONAHA.109.830984>



EPIDEMIOLOGY AND PREVENTION

Relations of Lipid Concentrations to Heart Failure Incidence

The Framingham Heart Study

Raghava S. Velagaleti, MD, Joseph Massaro, PhD, Ramachandran S. Vasani, MD, Sander J. Robins, MD, William B. Kannel, MD, and Daniel Levy, MD

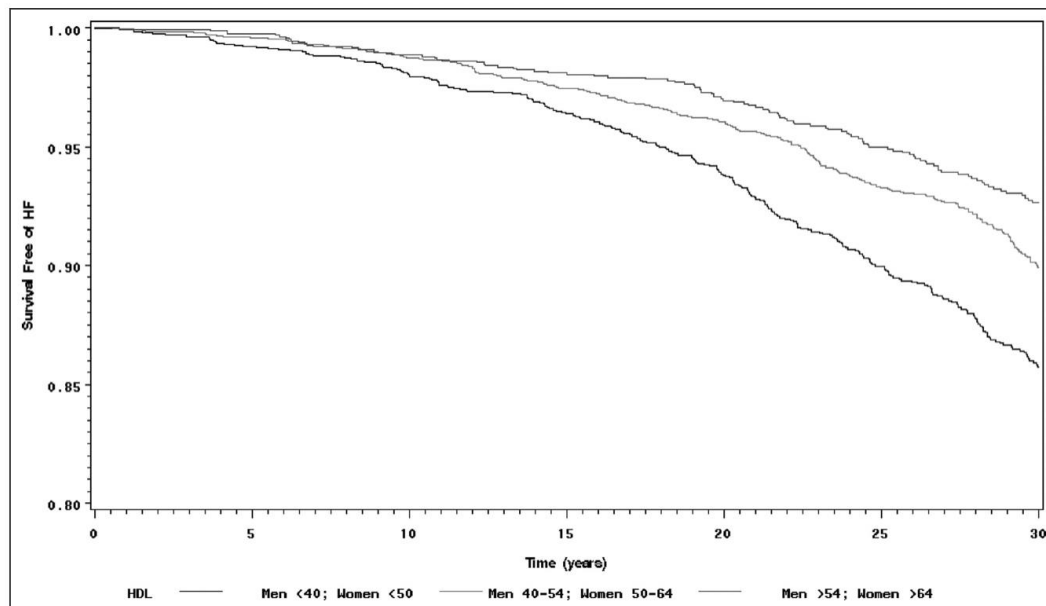


Figure 1. Kaplan-Meier curves of unadjusted survival free of HF in each HDL-C category.

Velagaleti RS, Massaro J, Vasani RS, Robins SJ, Kannel WB, Levy D. Relations of lipid concentrations to heart failure incidence: the Framingham Heart Study. *Circulation*. 2009 Dec 8;120(23):2345-51

Smoking

Tobacco use dependence is a
without a history of a prior
MI or ASCVD but with
multiple risk factors,

*For former smokers, the risk of
HF is comparable to that of
never smokers after >15 years
of tobacco cessation*



ANSWERS
by heart



Lifestyle + Risk Reduction
Smoking

How Can I Quit Smoking?

Smoking harms almost every tissue and organ in the body, including your heart and blood vessels. Nicotine, one of the main chemicals in cigarettes, causes your heart to beat faster and your blood pressure to rise. Carbon monoxide from smoking also gets into the blood and robs your body of oxygen. Nonsmokers who are exposed to secondhand smoke are also harmed.

If you smoke or vape, you have good reason to worry about its effect on your health and the health of your loved ones and others.

Deciding to quit is a big step. Following through is just as important. Quitting tobacco and nicotine addiction isn't easy, but others have done it, and you can, too.



Arnett DK et al. 2019 ACC/AHA Guideline on the Primary Prevention of Cardiovascular Disease: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *Circulation*. 2019 Sep 10;140(11):e596-e646

Physical activity

Meta-analysis of 10 cohort studies comprised of **282,889** patients who were followed for up to 30 years,

RR for HF among patients with regular exercise pattern was **28% lower**

(RR: 0.72; 95% CI: 0.67 to 0.79)

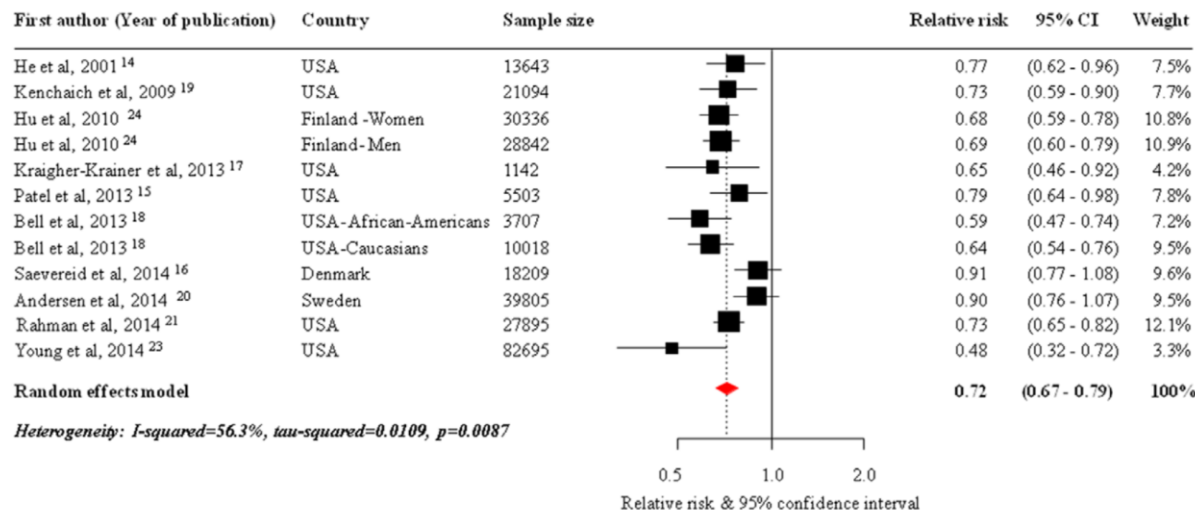
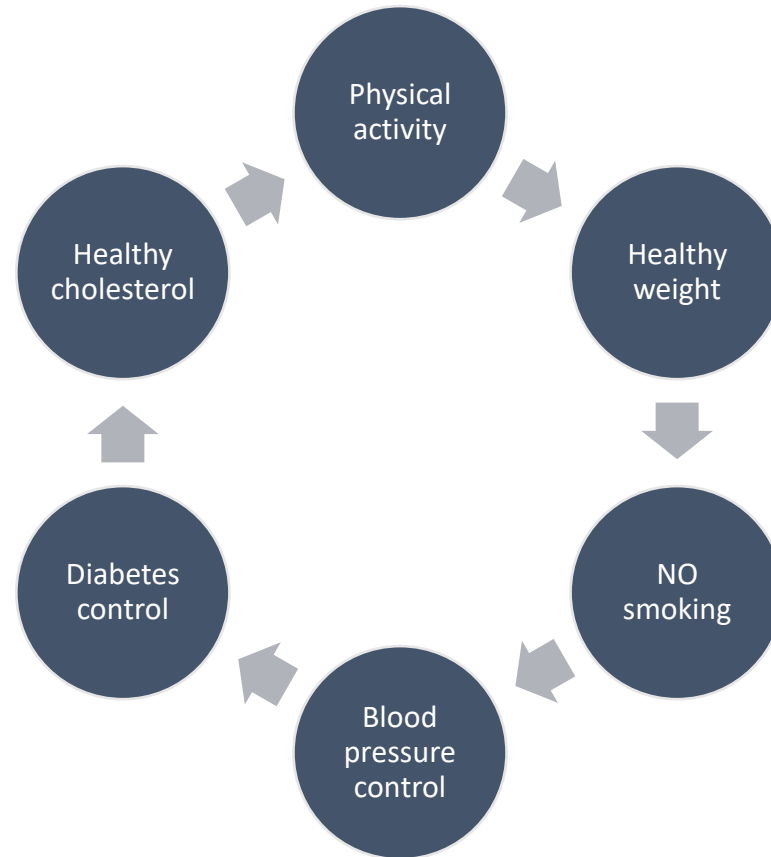


Figure 2. Meta-analysis of effect estimates from studies of the association of physical activity with incident heart failure. Forest plot showing the overall estimate of the association of physical activity and heart failure. CI indicates confidence interval.

Key Preventative Strategy

- Promote a healthy lifestyle throughout life

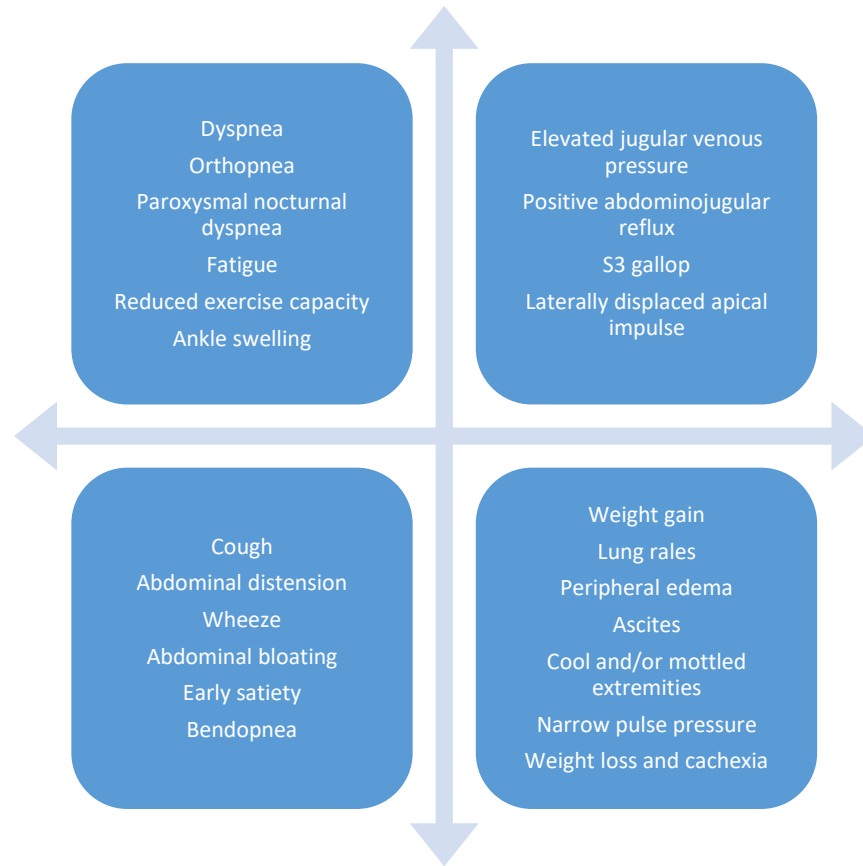


Social Determinants of Health

Table 2. Example Considerations for Addressing Social Determinants of Health to Help Prevent ASCVD Events

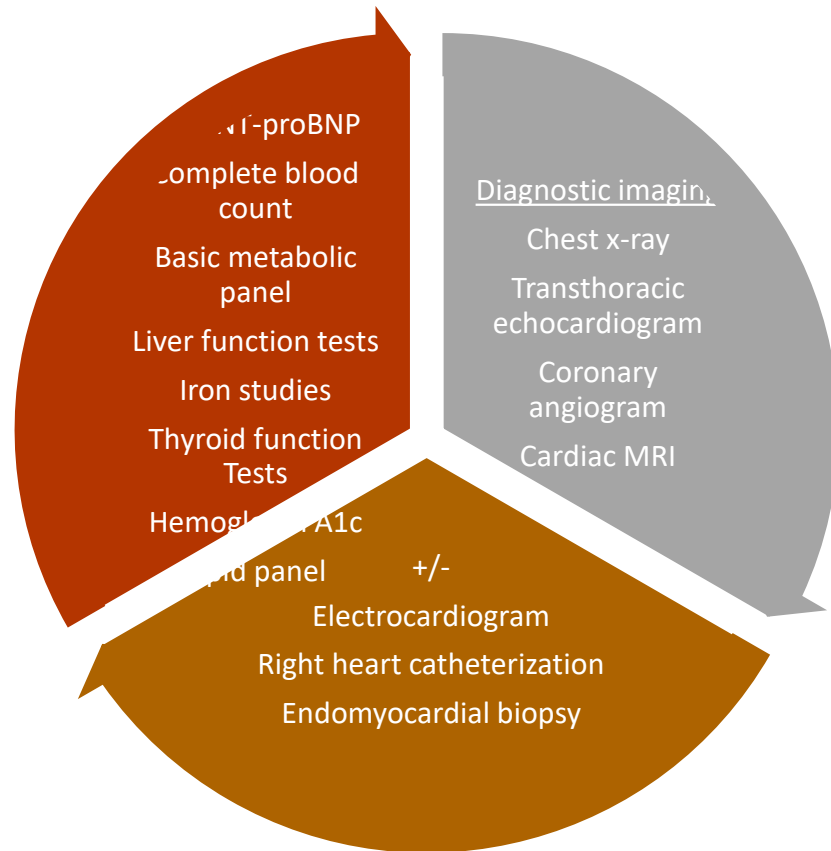
Topic/Domain	Example Considerations
Cardiovascular risk	Adults should be routinely assessed for psychosocial stressors and provided with appropriate counseling. ^{52.1-31}
	Health literacy should be assessed every 4 to 6 y to maximize recommendation effectiveness. ^{52.1-36}
Diet	In addition to the prescription of diet modifications, body size perception, as well as social and cultural influences, should be assessed. ^{52.1-37,52.1-38}
	Potential barriers to adhering to a heart-healthy diet should be assessed, including food access and economic factors; these factors may be particularly relevant to persons from vulnerable populations, such as individuals residing in either inner-city or rural environments, those at socioeconomic disadvantage, and those of advanced age*. ^{52.1-39}
Exercise and physical activity	In addition to the prescription of exercise, neighborhood environment and access to facilities for physical activity should be assessed. ^{52.1-30,52.1-40,52.1-41}
Obesity and weight loss	Lifestyle counseling for weight loss should include assessment of and interventional recommendations for psychosocial stressors, sleep hygiene, and other individualized barriers. ^{52.1-42-52.1-44}
	Weight maintenance should be promoted in patients with overweight/obesity who are unable to achieve recommended weight loss.
Diabetes mellitus	In addition to the prescription of type 2 diabetes mellitus interventions, environmental and psychosocial factors, including depression, stress, self-efficacy, and social support, should be assessed to improve achievement of glycemic control and adherence to treatment. ^{52.1-45-52.1-48}
High blood pressure	Short sleep duration (<6 h) and poor-quality sleep are associated with high blood pressure and should be considered. ^{52.1-49} Because other lifestyle habits can impact blood pressure, access to a healthy, low-sodium diet and viable exercise options should also be considered.
Tobacco treatment	Social support is another potential determinant of tobacco use. Therefore, in adults who use tobacco, assistance and arrangement for individualized and group social support counseling are recommended. ^{52.1-50,52.1-51}

Detecting Heart Failure: symptoms and/or signs

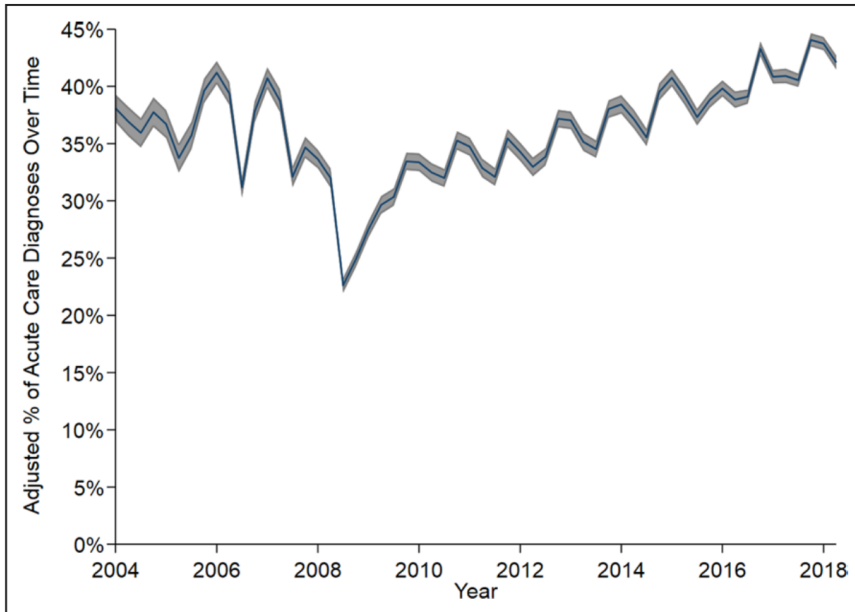


Detecting Heart Failure

- *Diagnostic tools*



Disparities in Detection of Heart Failure



Critical disparities in diagnosis of HF:
female sex, black race, and low net
worth were associated with higher
rates of diagnosis in the acute care
setting

THANK YOU!

For questions or more information: please contact your local AHA Quality Improvement Manager OR reach out via the below link:

<https://www.heart.org/en/professional/quality-improvement/contact-your-local-get-with-the-guidelines-representative>

Registration for tomorrow's Lunch & Learn on Health Equity in Heart Failure can be completed by clicking [here](#).



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