

Cardiac Disease in the Elderly

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Educational Objectives

By completing this educational activity, the participant should be better able to:

1. Review current guidelines for common cardiac conditions in older adults.
2. Describe impact of frailty on cardiac disease in older adults.
3. Discuss updated guidelines for exercise in older adults and indications for cardiac rehabilitation.

Speaker Disclosure

Dr. Burton has disclosed that neither he nor members of his immediate family have a relevant financial relationship with an ineligible company.

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C. Anthony Burton, MD, MPH
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Disclosures

- No commercial financial disclosures
- A portion of my salary is grant funded by Geriatric Workforce Enhancement Program (GWEP)

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Objectives

- Discuss current guidelines for common cardiac conditions in older adults.
- Describe impact of frailty on cardiac disease in older adults.
- Discuss updated guidelines for exercise in older adults and indications for cardiac rehabilitation.

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Topics Covered

- Effects of aging on cardiovascular function
- Cardiovascular risk factors
- Recent guideline updates on treatment of cardiovascular disease
- Research relevant to informing the geriatric perspective and practice
- Frailty and its impact on treatment of cardiovascular disease
- Guidelines for exercise in older adults
- Cardiac Rehabilitation, its indications, and its value in addressing cardiovascular disease in older adults

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Effects of Aging on Cardiovascular Function

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PRINCIPAL EFFECTS OF AGING ON THE CARDIOVASCULAR SYSTEM (1 of 2)

Age effect	Clinical implication
↑ Arterial stiffness	↑ Afterload and systolic BP
↓ Myocardial relaxation & compliance	↑ Risk of diastolic heart failure and atrial fibrillation
Impaired responsiveness to β-adrenergic stimulation	↓ Maximum heart rate and cardiac output; impaired thermoregulation
↓ Sinus node function and conduction velocity in the atrioventricular node and infranodal conduction system	↑ Risk of sick sinus syndrome, atrioventricular block, left anterior fascicular block, and bundle branch block

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PRINCIPAL EFFECTS OF AGING ON THE CARDIOVASCULAR SYSTEM (2 of 2)

Age effect	Clinical implication
Impaired endothelium-dependent vasodilation	↑ Demand ischemia and risk of coronary artery disease and peripheral arterial disease
↓ Baroreceptor responsiveness	↑ Risk of orthostatic hypotension, falls, and syncope
↓ Exercise response (↓ maximal heart rate, maximal cardiac output, VO_2 max, coronary blood flow, peripheral vasodilation)	↓ Exercise capacity and ↑ cardiac complications (ischemia, heart failure, shock, arrhythmias, death) with illness

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CLINICAL EFFECTS OF CV CHANGES

- In healthy older adults, age-related changes have modest clinically relevant effects on cardiac hemodynamics and performance at rest
 - Resting heart rate, ejection fraction, stroke volume, and cardiac output are well preserved even at very advanced age
- Ability to respond to increased demands associated with exercise or illness declines progressively with advancing age
 - Peak aerobic capacity declines inexorably with age

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Cardiovascular Risk Factors

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CVD RISK FACTORS

- Four major modifiable risk factors for CVD:
 - Hypertension
 - Diabetes mellitus
 - Dyslipidemia
 - Smoking
- Higher rates of CVD in older people: absolute number of cases per risk factor tends to increase with age
- Multiple risk factors act in concert with age-related CV changes to promote the development and progression of heart and vascular disorders

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HYPERTENSION

- Pulse pressure (the difference between systolic and diastolic BP) increases with age
 - Isolated systolic hypertension becomes the dominant form of hypertension in older adults

The SPRINT trial demonstrated a reduction in the risk of major adverse cardiovascular events and all cause mortality with more intensive systolic blood pressure lowering in patients at increased CV risk particularly those 75 years and older.

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DIABETES MELLITUS

- As in younger patients, the impact of diabetes confers a significant risk for CVD in older patients, approximately doubling the general risk.
- In the Framingham Heart Study, the excess risk associated with diabetes was greater in both men and women >65 yr old than in younger individuals
- Despite the risk, the AGS has recommended that for older adults with multiple chronic conditions, ADL impairment, or cognitive impairment, more lenient hemoglobin A_{1c} targets (e.g., <8%) are reasonable given limited life expectancy and the risk of hypoglycemia with overly aggressive therapies.

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DYSLIPIDEMIA

- The strength of the association between total cholesterol and LDL cholesterol levels and incident CAD ↓ with age, especially after age 80
- **But low HDL cholesterol levels (<40 mg/dL in men, <50 mg/dL in women) and high ratios of total cholesterol to HDL cholesterol (≥5.5 in men, ≥5 in women) are independently associated with coronary events among adults at least up to age 85**
- Clinical trials have demonstrated benefits of statin therapy in moderate- and high-risk patients up to 85 yr of age

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SMOKING

- Prevalence of smoking declines with age, partly due to successful smoking cessation, partly due to premature deaths in smokers
 - Among older smokers, smoking cessation is associated with substantial reductions in CVD risk
- In most studies, smoking remains a strong and independent risk factor for cardiovascular events among older adults

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Guidelines in Treatment of Cardiovascular Disease

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ACC 2017 Guidelines for Hypertension

TABLE 6 Categories of BP in Adults*			
BP Category	SBP		DBP
Normal	<120 mm Hg	and	<80 mm Hg
Elevated	120-129 mm Hg	and	<80 mm Hg
Hypertension			
Stage 1	130-139 mm Hg	or	80-89 mm Hg
Stage 2	≥140 mm Hg	or	≥90 mm Hg

COE	LOE	RECOMMENDATIONS
I	A	1. Treatment of hypertension with a SBP treatment goal of less than 130 mm Hg is recommended for noninstitutionalized ambulatory community-dwelling adults (≥65 years of age) with an average SBP of 130 mm Hg or higher (510.3.3-1).
IIa	C-EO	2. For older adults (≥65 years of age) with hypertension and a high burden of comorbidity and limited life expectancy, clinical judgment, patient preference, and a team-based approach to assess risk/benefit is reasonable for decisions regarding intensity of BP lowering and choice of antihypertensive drugs.

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Hypertension Guidelines

- RCTs repeatedly show benefit to treating systolic hypertension
 - Decrease in: Fatal and non-fatal stroke, cardiovascular events, death
 - SPRINT and HYVET (Hypertension in the Very Elderly Trial) both stopped early due to CVD benefits
- RCTs have included older adults into 80s
- RCTs have shown improved SBP management does not lead to orthostatic hypotension and injurious falls
- Studies have suggested that improved BP control can reduce incident dementia
- General recommendation: BP goals can be similar to patients <65 y.o.
- STEP Trial

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Hypertension Guidelines – Caveats

- Many trials exclude nursing home residents, advanced heart failure, those with less controlled Type II Diabetes Mellitus (HbA1c >8%), cognitive impairment (specifically dementia), stage IV CKD (eGFR <30) or Cr >2.5, valvular disease, atrial fibrillation, cancer
- And the list goes on!
- Essentially, many of my patients...

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TABLE 1 The 10 Most Common Comorbidities for 4 Index Cardiovascular Conditions: 2012 Data for Medicare Beneficiaries ≥65 Years of Age (13)

Comorbidity	Ischemic Heart Disease* (N = 8,678,960)	HF* (N = 4,366,489)	AF* (N = 2,556,839)	Stroke* (N = 1,145,719)
Hypertension	1 (81.3)	1 (85.6)	1 (84.5)	1 (89.0)
Hyperlipidemia	2 (69.1)	3 (62.6)	2 (64.4)	2 (69.9)
Diabetes mellitus	3 (41.7)	5 (47.3)	7 (27.1)	6 (41.5)
Arthritis	4 (40.6)	6 (45.6)	6 (41.7)	5 (44.2)
Anemia	5 (38.7)	4 (31.2)	5 (43.0)	4 (46.8)
HF	6 (36.3)	Index	4 (50.9)	7 (37.2)
Ischemic heart disease	Index	2 (72.1)	3 (63.5)	3 (58.1)
Chronic kidney disease	7 (30.2)	7 (44.8)	8 (34.4)	8 (35.2)
Cataract	8 (21.6)	†	10 (22.6)	†
COPD	9 (21.0)	8 (30.9)	9 (23.8)	†
AF	10 (18.7)	9 (28.8)	Index	†
Alzheimer's disease/dementia	†	10 (26.3)	†	9 (33.8)
Depression	†	†	†	10 (29.7)
Stroke	†	†	†	Index

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TABLE 2 The 5 Most Prevalent Comorbidities for 2012 Medicare Beneficiaries ≥65 Years of Age With at Least 2 (Dyads) or 3 (Triads) Chronic Conditions (14)

Comorbidities	Prevalence (%)
Dyads (beneficiaries with ≥2 comorbidities, N = 19,139,696)	
High cholesterol and high BP	57.2
High BP and ischemic heart disease	36.8
High BP and arthritis	33.3
High BP and diabetes mellitus	32.7
High cholesterol and ischemic heart disease	31.3
Triads (beneficiaries with ≥3 comorbidities, N = 14,908,988)	
High cholesterol, high BP, and ischemic heart disease	35.8
High cholesterol, high BP, and diabetes mellitus	31.7
High cholesterol, high BP, and arthritis	28.8
High BP, diabetes mellitus, and ischemic heart disease	21.5
High BP, arthritis, and ischemic heart disease	20.6

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Hypertension

- Becomes important to consider the elderly patient in front of you
- Consider life-expectancy, patient preference, risk/benefits
- Ask about medication side effects, tolerability, falls every visit

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ACC 2017 Focused Update on Heart Failure

- Not all age-specific guidance, but some notable updates
- Blood pressure goal to prevent heart failure <130/80 – found in patients with elevated CVD risk age >75, valvular disease, CKD, and Framingham Risk >15%
- Systolic blood pressure goal in HFpEF (EF>40%) and HFrEF (EF<40%) is <130mmHg
- If able to switch from ACE inhibitor to ARB, may be mortality benefit
- If able to switch from ACE inhibitor or ARB to ARNI, may see morbidity and mortality benefit – hypotension, renal insufficiency, angioedema a risk
- Mineralocorticoid Receptor Antagonists may benefit certain patients with HFpEF – monitor labs closely

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ACC 2018 Guidelines for Hyperlipidemia

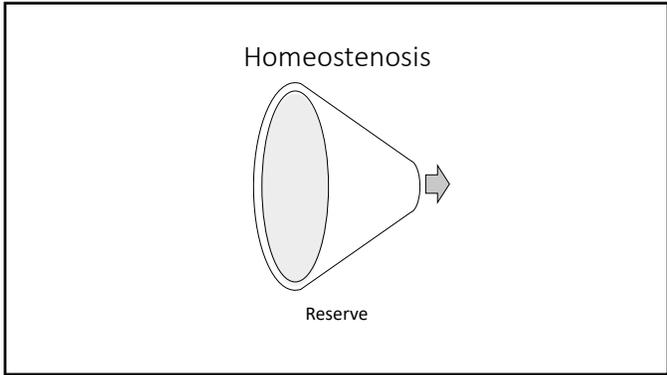
1. In all individuals, emphasize a heart-healthy lifestyle across the life course.
2. In patients with clinical ASCVD, reduce low-density lipoprotein cholesterol (LDL-C) with high-intensity statin therapy or maximally tolerated statin therapy.
3. In very high-risk ASCVD, use an LDL-C threshold of 70mg/dL (1.8 mmol/L) to consider addition of nonstatins to statin therapy.
4. In patients with severe primary hypercholesterolemia (LDL-C level >190 mg/dL [>4.9 mmol/L]), without calculating 10-year ASCVD risk, begin high intensity statin therapy.

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2018 HLD Guidelines, Continued

5. In patients 40 to 75 years of age with diabetes mellitus and LDL-C >70 mg/dL (>1.8 mmol/L), start moderate-intensity statin therapy without calculating 10-year ASCVD risk.
6. In adults 40 to 75 years of age evaluated for primary ASCVD prevention, have a clinician–patient risk discussion before starting statin therapy.
7. In adults 40 to 75 years of age without diabetes mellitus and with LDL-C levels >70 mg/dL (>1.8 mmol/L), at a 10-year ASCVD risk of >7.5%, start a moderate-intensity statin if a discussion of treatment options favors statin therapy.

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- ### How We Measure Frailty
- Fried's Frailty Phenotype
 - FRAIL Questionnaire
 - Short Performance Physical Battery
 - Frailty Index, Modified Frailty Index
 - Gait Speed, mobility, hand grip
 - Trauma-Specific Frailty Index
 - Comprehensive Geriatric Assessment
 - Edmonton Frail Scale
 - Et cetera, et cetera, et cetera!

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Guidelines for Exercise in Older Adults

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- ### PREVENTIVE HEALTH EFFECTS OF PHYSICAL ACTIVITY (1 of 2)
- Physical activity reduces the risk of:
- | | |
|---|-------------------------|
| • Mortality (CVD and non-CVD) | • Cognitive impairment |
| • Coronary heart disease | • Depression |
| • High blood pressure | • Osteoporosis |
| • Stroke | • Colon cancer |
| • Some lipid disorders | • Breast cancer |
| • Non-insulin-dependent diabetes mellitus | • Unhealthy weight gain |
| | • Falls |

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- ### PREVENTIVE HEALTH EFFECTS OF PHYSICAL ACTIVITY (2 of 2)
- The health benefits of physical activity:
- Accrue independently of other risk factors for chronic disease such as smoking
 - Accrue whether or not a person loses body weight as a result of physical activity
 - Include reduced risk of moderate or severe functional limitations, both physically and mentally in older adults

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- ### THERAPEUTIC EFFECTS OF PHYSICAL ACTIVITY
- Physical activity has a therapeutic role in many chronic illnesses
 - The benefits of physical activity are demonstrable in older adults with existing mild, moderate, or significant functional limitations

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ECONOMIC EFFECTS OF PHYSICAL ACTIVITY

- Habitually active adults have lower medical expenditures
- Evidence is growing that medical expenditures decline in sedentary older adults who become more active

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RECOMMENDED TYPES AND AMOUNTS OF PHYSICAL ACTIVITY FOR OLDER ADULTS (1 of 3)

Type of Exercise	Frequency/Duration	Examples of Activities	Examples of Targeted Conditions
Aerobic	≥150 minutes of moderate-intensity activity each week, spread throughout the week ≥75 minutes of vigorous-intensity activity each week, spread throughout the week	Walking, running, swimming, bicycling, rowing, or aerobic exercise machines (e.g., ellipticals, stair steppers); walking 30 minutes/day, 5–6 days/week, or 10,000 steps/day using a pedometer	Many conditions, including cardiovascular disease, cancer, diabetes, osteoarthritis, and depression; low physical work capacity

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RECOMMENDED TYPES AND AMOUNTS OF PHYSICAL ACTIVITY FOR OLDER ADULTS (2 of 3)

Type of Exercise	Frequency/Duration	Examples of Activities	Examples of Targeted Conditions
Muscle strengthening	≥2 days each week for 20–30 minutes	Resistance training (e.g., using weight machines) or floor exercises using body weight against gravity (e.g., abdominal “crunches,” push-ups off knees or against a table, climbing stairs); pool exercises against water resistance	Falls, frailty, sarcopenia, osteoporosis

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RECOMMENDED TYPES AND AMOUNTS OF PHYSICAL ACTIVITY FOR OLDER ADULTS (3 of 3)

Type of Exercise	Frequency/Duration	Examples of Activities	Examples of Targeted Conditions
Flexibility	10 minutes stretching daily to maintain range of motion	Stretching, gentle yoga, Pilates	Osteoarthritis, joint stiffness
Balance training	≥3 days/week	Backward walking, heel-to-toe walking, Tai Chi exercise, standing on one foot	Falls, osteoporosis

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MANAGEMENT OF BODY WEIGHT

- To attain a healthy weight, first achieve activity level of 140–175 minutes of aerobic exercise per week (20–25 minutes daily)
- If 150 minutes/week is insufficient, increase intensity and duration of physical activity and decrease caloric intake
- When older adults cannot do higher levels of activity, emphasize caloric restriction
- Older adults should avoid weight loss by caloric restriction **alone**, because physical activity opposes the loss of muscle and bone mass that occurs during weight loss

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SCREENING BEFORE PARTICIPATION (1 of 3)

- ACSM exercise pre-participation health screening process seeks to remove unnecessary barriers to beginning and maintaining a structured exercise program, a lifestyle of habitual physical activity, or both
- Evidence suggests the risk of acute exercise-related cardiovascular events is highest among sedentary individuals with known or occult cardiovascular disease who participate in unaccustomed vigorous intensity physical activity

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SCREENING BEFORE PARTICIPATION (2 of 3)

Pre-participation health screening based on:

- 1) The individual's current level of physical activity
- 2) Presence of signs or symptoms and/or known cardiovascular, metabolic, or renal disease
- 3) Desired exercise intensity

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SCREENING BEFORE PARTICIPATION (3 of 3)

The goal of this screening process is to identify individuals:

- 1) Who should receive medical clearance before initiating or increasing the frequency, intensity, and/or the volume of their current program
- 2) Who may have clinically significant disease but who might benefit from participating in a medically supervised exercise program
- 3) Who have medical conditions that may require exclusion from exercise programs until those conditions are eliminated or better controlled.

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PROMOTION OF PHYSICAL ACTIVITY IN CLINICAL SETTINGS

Clinical settings need a system for routinely:

- Assessing levels of physical activity in patients
- Providing patients with a recommendation about physical activity
- Helping patients achieve recommended levels
- Evaluating the effectiveness of the system in promoting physical activity

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ASSESSING PHYSICAL ACTIVITY (1 of 2)

- Tools can provide quick assessments of the physical activity level of older adults, such as Rapid Assessment of Physical Activity
 - 9-item questionnaire
 - Patients self-rate their strength, flexibility, and frequency and intensity of exercise
- Both the amount of aerobic activity and the amount of muscle-strengthening activity should be assessed

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ASSESSING PHYSICAL ACTIVITY (2 of 2)

- **Studies have shown that time that is spent sitting is independently associated with total mortality, regardless of physical activity level**
 - Those who sit in front of computers all day without hourly walking breaks and older adults with or without limited mobility, who spend excessive time laying down are at increased risk
- Clinicians should provide advice on ways to avoid excessive time sitting and in bedrest
- Caregivers should be aware that doing too much for those in their care may not be in the best interest of the patient

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ACTIVITY PRESCRIPTION (1 of 2)

- In ACSM/AHA recommendations, the activity prescription is part of a broader approach of developing the physical activity plan
 - Plan considers preferences, individual abilities and fitness, chronic conditions and activity limitations, risk of falls, strategies for decreasing risk of injury
 - Includes behavioral strategies to increase adherence
- A resource for developing the plan is ACSM's *Exercise Management for Chronic Diseases and Disabilities*

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ACTIVITY PRESCRIPTION (2 of 2)

- Guidelines for developing an activity plan:
 - Emphasize walking or for those with knee arthritis, swimming, pool exercise, and non-weight bearing activities such as cycling or rowing
 - Importance of gradually increasing physical activity over time
 - Start in a supervised, evidence-based program
 - Importance of social support

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ASSISTANCE IN INCREASING PHYSICAL ACTIVITY (1 of 2)

- Some clinic-based systems of promoting physical activity have been carefully studied and reported to increase physical activity
- A clinic can implement either an existing evidence-based approach, or implement and evaluate a new approach tailored to the clinical situation, based on principles of behavior change and building on existing approaches

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ASSISTANCE IN INCREASING PHYSICAL ACTIVITY (2 of 2)

- For adults with some functional limitations, an appropriate way to provide assistance is to make a referral to an evidence-based program
- Resources to consider:
 - National Council on Aging Web site (www.ncoa.org)
 - *Exercise: A Guide from the National Institute on Aging*

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MANAGEMENT OF RISKS OF PHYSICAL ACTIVITY

- Increase physical activity gradually over time
 - **In reasonably healthy adults**, adding a small amount of light- to moderate-intensity activity each week (e.g., increasing walking time by 5–15 minutes on 2 to 3 days per week) has low risk of musculoskeletal injury and no known risk of sudden cardiac events
 - **In less healthy adults**, increase activity level as seldom as once per month
- Prefer moderate-intensity activity

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OLDER ADULTS WITH LOW FITNESS OR LOW FUNCTIONAL ABILITY

- It can be challenging to match abilities with types and amounts of activity
 - Sometimes referrals can be made to specific rehabilitation programs (such as pulmonary rehabilitation) for assessment, exercise prescription, and medically supervised exercise
- Assessment by a physical therapist is generally appropriate
 - The therapist can design and tailor an exercise program to the specific limitations of the patient

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Cardiac Rehabilitation

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Cardiac Rehabilitation

- Cardiac Rehab is a cost-effective intervention that can improve function, quality of life, reducing disability, and age-related deconditioning
- Cardiovascular assessment in older adults is complemented by evaluation of body composition, functional status, mobility and fall risk, MSK impairments/capacity, neuropsychological function, nutritional status and polypharmacy
- Frailty and Sarcopenia are NOT contraindications to robust anabolic exercise prescription in cardiac rehabilitation, but represent the most important reasons to promote it

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Cardiac Rehab – Benefits

Improvement	Functional Benefits
Improved Exercise Capacity	Increased ability to perform ADL
Improved strength	Increased ability to perform ADL Increased muscle strength, mass, power Reduced sarcopenia
Improved balance	Reduced risk of falls
Improved cognition	Reduced or delayed cognitive dysfunction
Improved frailty	Improved morbidity and mortality Improved gait velocity

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Cardiac Rehab – Benefits

Improved Sarcopenia	Increased muscle mass, strength, and protein synthesis Reduced dependence on wheelchairs/walkers
Improved depression	Reduced morbidity; reduced health care utilization; improved QOL
Improved self-efficacy	Improved self-esteem, QOL, physical function
Improved socialization	Reduced risks associated with social isolation – cognitive decline, negative phys/mental health Improved emotional support
Improved medication monitoring	Reduced polypharmacy, associated adverse drug reactions, falls, mortality Regular hemodynamic monitoring, assessment of tolerance of medications

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Permanent Exclusions

- End stage, progressive congestive heart failure or respiratory failure/hypoxemia
- Permanent bed-bound status, contractures
- Severe cognitive impairment or behavioral disturbance precluding mimicking movements or understanding instructions
- Untreated severe aortic stenosis
- Rapidly terminal illness

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Temporary Exclusions

- Suicidality
- Acute confusion/delirium
- Balance/gait disorder recurrent falls/injuries
- Cerebral hemorrhage in last 2 mo
- COPD/Asthma exacerbation
- Exacerbation of chronic inflammatory MSK disease or OA
- Eye surgery in last 2 weeks
- Fracture in last 6 weeks, until cleared
- Hernia or significant bleeding hemorrhoids
- MI or cardiac surgery, until cleared by cardiology

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Temporary Exclusions, Continued

- New significant neuro sign/symptom, central or peripheral
- Orthostatic hypotension
- Proliferative diabetic retinopathy or severe NPDR, until cleared
- PE or DVT in last 3 mo
- Seizure disorder, uncontrolled or recent, until cleared
- Soft tissue injury, until healed
- Systemic infection, sepsis
- Uncontrolled BP (>160/100mmHg)
- Uncontrolled DM (FBS >200)
- Uncontrolled malignant cardiac arrhythmia until controlled
- Unstable angina

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Frailty and Cardiac Rehab

- Cardiac Rehab underutilized among frail, older adults
- Treating physician explaining and strongly recommending cardiac rehab has been found to be one of the most impactful strategies
 - Framed as: "helping to perform ADLs as long as possible" and "contributing to healthy aging."
- Other helpful strategies
 - Beside visit by cardiac rehab liaison
 - Automatic referral upon discharge
 - Scheduling an appointment at the time of discharge
 - Transportation and parking assistance
 - Repeated contact with patients who have been referred but not yet enrolled

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Frailty and Cardiac Rehab

- Frailty should be objectively measured during index hospitalization, before initiating cardiac rehab, and after completion of rehab
- While hospitalized, frail patients should be targeted for early mobilization and protein-dense nutritional support
- Frail patients should be prioritized for referral and early initiation of cardiac rehab
- Patients should be counselled about the person-centered benefits of cardiac rehab by their treating physician
- Patients that have difficulty attending a center-based cardiac rehab should be referred to a home-based program

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Frailty and Cardiac Rehab

- At the inaugural cardiac rehab visit, older patients should be screened with a multi-domain frailty scale (such as Capacity Screener or Edmonton Frailty Scale) to identify and address impairments in locomotion, cognition, mood, vision, hearing, and nutrition
- At inaugural cardiac rehab visit, older patients should be stratified with a 6-minute walk test and SPPB
- Significant limitations in the 6-minute walk test and SPPB should be addressed before beginning an aerobic exercise program and before transitioning to an unsupervised program
- Frail patients, particularly those with sarcopenia, should receive lower-extremity strength and balance training as well as protein-dense nutritional supplementation
- The post-cardiac rehab care plan should address that patient's needs for PT, OT, HH services, mental health services, and geriatric follow up

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Questions?

Thank you!

Special thanks to our Family Medicine Chair, Dr. Grant Fowler, for his constant encouragement in our pursuit of great patient care across the age spectrum in Family Medicine, and to Dr. Benjamin Cooper for being an inspiration and a bright spot in medical education.

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