



Cardiopulmonary Considerations for Safe Exercise

Upgrade Workshop March 17, 2007

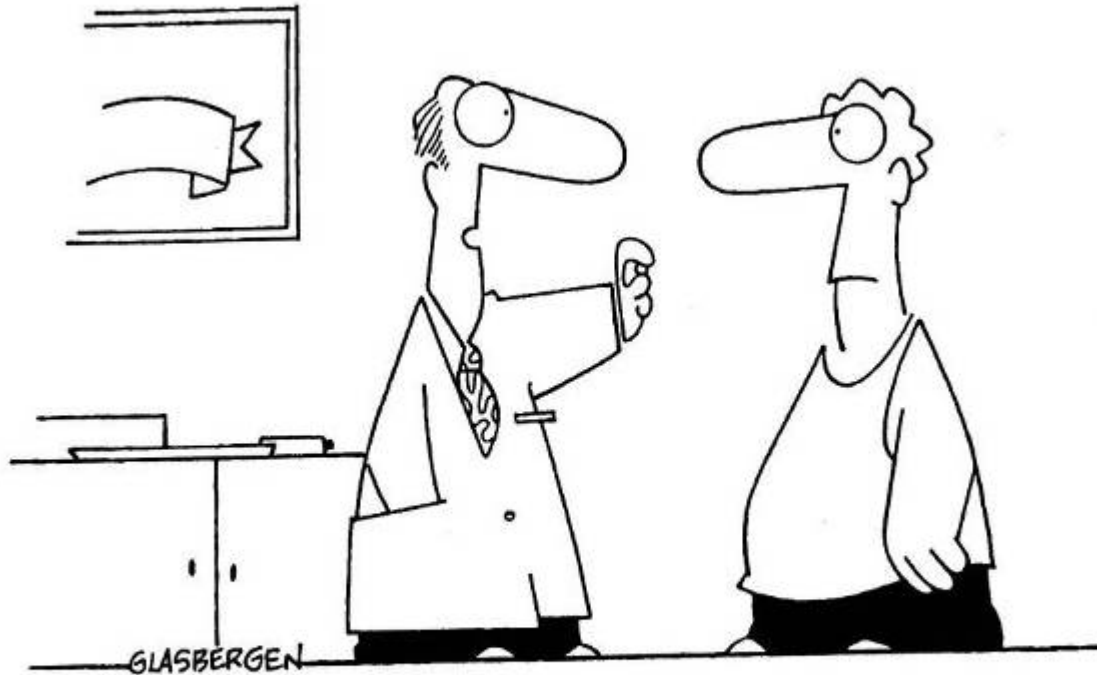
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*"To prevent a heart attack, take one aspirin every day.
Take it out for a jog, then take it to the gym, then take it for a bike ride..."*



Objectives

- Understand the common cardiopulmonary (CP) conditions
- Signs, symptoms and basic pathology
- Benefits of exercise training
- Exercise considerations
 - Medication considerations
 - Precautions and contraindications
- Exercise prescription/management



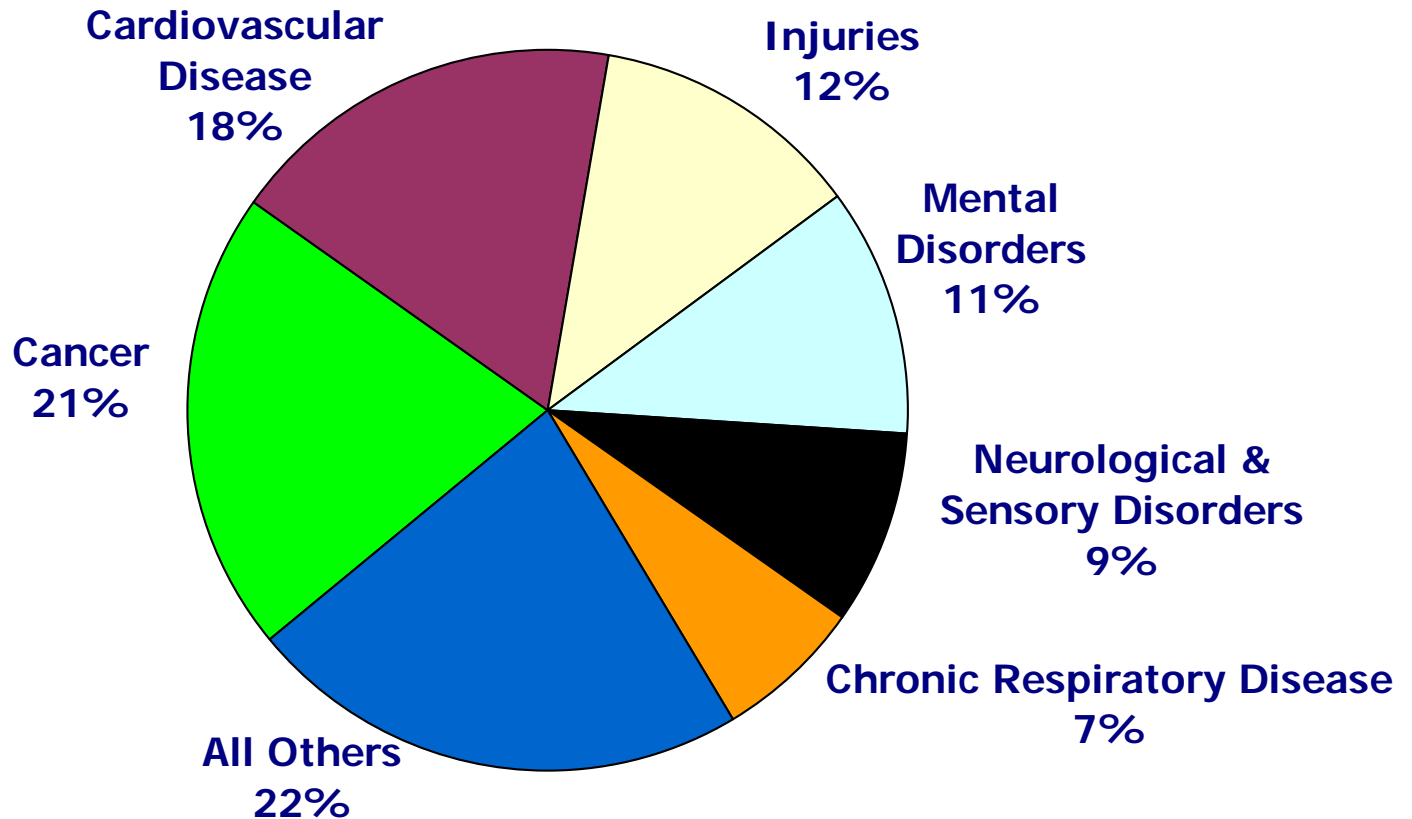
Assumptions

Knowledge of:

- Basic anatomy
- Risk factors
- Basic hemodynamics
- Normal/Abnormal hemodynamic responses to exercise
- Basic ECG
- Training adaptations of CP system
- Effects of detraining on CP system



The Problem: Causes of Premature Mortality and Years Lived in Poor Health





Common Cardiovascular (CV) Conditions

- Hypertension
- Coronary Artery Disease
- Peripheral Vascular Disease



General Benefits of Exercise for CV Conditions

- Improved cardiorespiratory function
- Improved coronary artery disease risk factors: cholesterol, hypertension, stress, weight, diabetes, smoking
- Improved mental health
- Decreased morbidity and mortality



Common Signs and Symptoms for CV Conditions

- Shortness of breath
- Over training HR
- Angina
- Lightheaded
- Headaches
- High BP's
- Musculoskeletal pain
- Weight gain
- Pitting edema



Common Exercise Considerations for CV Conditions: Contraindications to Exercise

Relative

- Stable cardiovascular disease (stenosis, blocks, previous MI, CHF, PVD)
- Electrolyte abnormalities
- Irregular heart beat
- Hypertension: 200/110 mmHg
- NM, MSK, rheumatoid disorder exacerbation
- Uncontrolled metabolic disease (diabetes)
- Chronic infectious disease

- Move forward after careful evaluation

Absolute

- Recent significant change in ECG
- Unstable cardiovascular disease (angina, stenosis, heart failure)
- Uncontrolled arrhythmias
- Hypertension: 200/110 mmHg
- Pulmonary embolus
- Myo/perocarditis
- Aneurysm
- Acute infections

- Need to wait to be cleared



Common Exercise Prescription for CV Conditions: Borg Scale

6	
7	Very Very Light
8	
9	Light
10	
11	Fairly Light
12	
13	Somewhat Hard
14	
15	Hard
16	
17	Very Hard
18	
19	Very Very Hard
20	



Hypertension

Resting BP $>140/90$ mmHg and/or current use of anti-hypertensive medication

- Signs and Symptoms: Over THR, lightheaded, headaches, weight gain, pitting edema
- Benefits of Exercise
 - Reduced BP (10 mmHg), atherosclerosis, ...reduced morbidity and mortality



Hypertension: Exercise Considerations

- Medications
- Post exercise hypotension - Longer cool down
- Monitor BP
- Hydrate
- Avoid isometric activities; Uni- vs Bi-lateral
- Avoid vigorous activities
- Avoid valsalva
- Lifestyle modification



Hypertension: Exercise Prescription (FITT Principle)

Aerobic

F: 4-7 days per week

I: 50-85% VO₂ max/HR max, **RPE of 11-13**

T: 30-60 min/session

T: Large muscles, aerobic

Resistance training as well, just not alone

F: 2-3 days per week

I: Low resistance and high reps

T: 1-3 sets; up to 30 minutes/session



Coronary Artery Disease (CAD)

(angina, MI, bypass/ angioplasty)

- Signs and Symptoms
 - Chest discomfort, radiating pain, ECG changes, dizziness...
- Benefits of Exercise
 - Improved aerobic capacity; reduce load on the heart
 - Reduced atherosclerosis; increased blood flow
 - Reduced angina (and ischemic threshold)
 - Reduced cardiac risk factors



CAD: Exercise Considerations

- Medications (Many !)
- Use of GXT results; Medical supervision
- Silent ischemia
- Monitor signs and symptoms (self monitoring)
- Longer warm up and cool down
- Incision healing
- Stretching for chest areas
- Avoid vigorous activity
- Avoid isometric activities; Uni- vs bi-lateral
- Avoid cold temperatures
- Avoid valsalva
- Any change in health status
- Lifestyle modification



CAD: Medications

- Beta blockers
 - Decrease HR and BP at rest and exercise
- Nitrates
 - Increase HR and decrease BP at rest and exercise
- Ca⁺⁺ Channel Blockers
 - Inc/dec HR and decrease BP at rest and exercise
- Diuretics
 - No effect on HR but increases arrhythmias
- Vasodilators
 - Increase HR and decrease BP at rest and exercise
- ACE Inhibitors
 - Decreases BP at rest and exercise
- Hyperlipidemic Agents
 - Increase HR and BP at rest and exercise



CAD: Exercise Prescription (FITT Principle)

Aerobic

F: at least 3 days per week

I: 40-85% HRR; **RPE of 11-16** (and 10-15 beats below ischemic threshold)

T: up to 60 min/session

T: Large muscles, aerobic

Eventually *Resistance training* as well

F: 2-3 days per week

I: Low to moderate resistance and high reps

T: 1-3 sets; up to 30 minutes

T: Circuit training, tubing/bands



Peripheral Vascular Disease (PVD)

Stenoses and occlusions of arteries

- Signs and Symptoms
 - Claudication
- Benefits of Exercise
 - Improved status of claudication
 - Improved blood flow
 - Reduce cardiac risk factors



PVD: Exercise Considerations

- Medications
- Non weight bearing for warm up and cool down; longer warm up in cold conditions
- Use all 4 limbs
- Use of interval training
- Increase duration (first) and intensity every 3-4 weeks
- Monitor co-morbid conditions



PVD: Exercise Prescription (FITT Principle)

Aerobic

F: 3 – 7 days per week

I: 3 out of 4 on pain scale; 40-70% HRR/ peak
VO₂

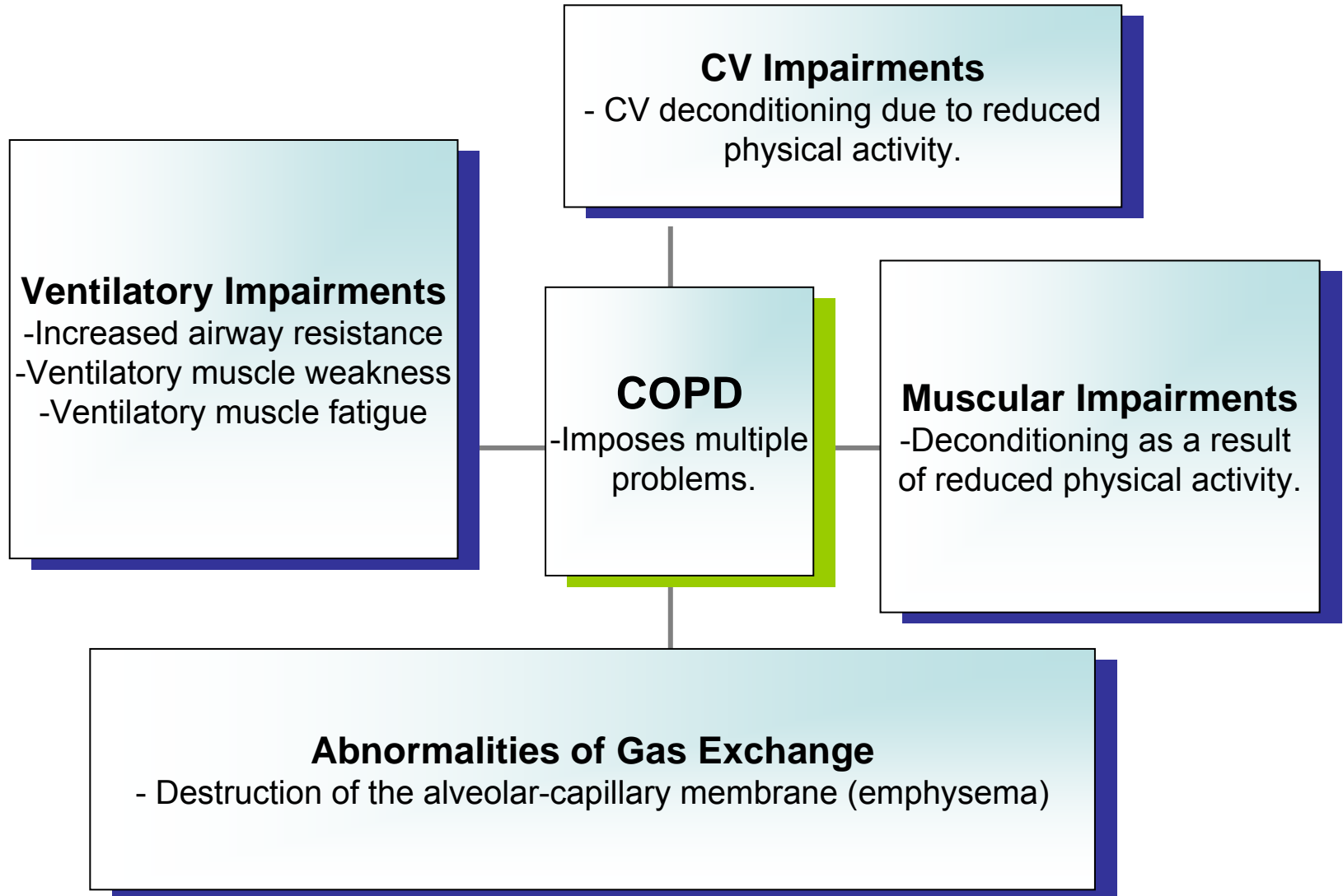
T: Build up to accumulating 40 min/session

T: Large muscles, aerobic



Common Pulmonary Conditions

- Chronic Obstructive Pulmonary Disorder (COPD)





Common Signs and Symptoms for COPD

Increased airway resistance and narrows lumen of lower airways

- Dyspnea (breathless); cough, wheezing, hyperventilating
- Chest tightness
- Muscle weakness; De-conditioning
- SOB
- Anxiety/depression
- Other co-morbidities



General Benefits of Exercise for COPD

- Cardiovascular reconditioning
- Desensitization to dyspnea
- Improved ventilatory efficiency
- Energy conservation
- Increased fitness, functional capacity and QOL



COPD: Exercise Considerations

- Medication
- Breathing retraining: pursed lips and diaphragmatic breathing
- Monitor dyspnea
- Oxygen therapy/oximetry
- Accommodate health status
- Intervals of 5-10 minutes
- Resistive Inspiratory Muscle Training (RIMT)
- Best mid to late morning
- Avoid extreme temperatures and humidity
- Complex interaction with CV and MSK systems
- Lifestyle modification



Common Exercise Prescription for COPD: Borg Scale

6	
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15	Hard
16	
17	Very Hard
18	
19	Very Very Hard
20	



COPD: Exercise Prescription (FITT Principle)

Aerobic

F: 1-2 sessions, 3-7 days per week

I: RPE of 11-13

T: Accumulate 30 min/session

T: Large muscles, aerobic

Resistance training as well

F: 2-3 days per week

I: Low resistance and high reps

T: 1-3 sets, up to 30 minutes

T: RIMT, Upper Body



Helpful Resources

- ACSM Guidelines for Exercise Testing and Prescription (7th Edition)
- ACSM Resource Manual
- ACSM Exercise Management for Persons with Chronic Diseases and Disabilities

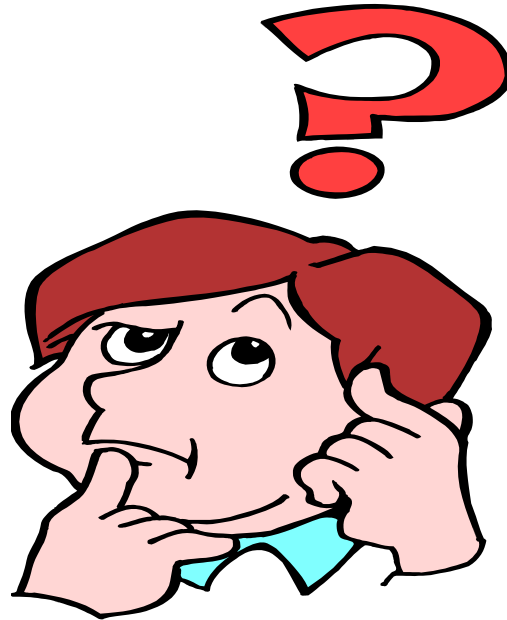


Helpful Websites

- www.heartandstroke.ca
- www.cacr.ca
- www.canadian-health-network.ca
- www.acsm.org
- www.paguide.com
- www.hypertension.ca
- www.lipidnurse.ca
- www.diabetes.ca
- www.rnao.org/smokingCessation/index.asp
- www.familydoctor.org/druginfo.xml



Questions before we move
on to the case studies?





Common CP Conditions Case Studies

Objectives:

- Review the following case studies and consider:
 - Important Information (disease status)
 - Medication considerations (effect on HR & BP)
 - Exercise considerations/client education
 - Exercise Prescription



Case Study #1

Cardiac Rehabilitation Setting

- 59 yr old male, CFO of large plumbing company
- 12 wks post anterior MI (100% blockage of LAD)
- Good left ventricular function (EF 65%)
- Functional capacity 10.4 METS (12 min. on Bruce Protocol)
 - No angina, no dysrhythmias, no ST depression (no ischemia)
 - Resting HR: 68 bpm
 - Maximal HR: 148 bpm (92% of age predicted)
 - Resting BP: 122/78 mmHg
 - Maximal BP: 168/82 mmHg
- Medications: Atenolol (BB), Ramipril (ACE inhibitor), ASA (blood thinner), Zocor (statin)
- Exercise History: 30-40 min. walk periodically
- Body Composition: BMI: 29, WG: 108 cm
- Non smoker
- No MSK issues
- Reports feeling well & ready to exercise



Important Information for CEP

- Disease Status
 - Confirmed CAD
 - Ventricular function is normal
 - No symptoms
 - No ischemia (good O₂ supply) up to 148 bpm
 - BP & HR response to increasing demand is appropriate
 - Other risk factors are present
 - Overweight, abdominal adiposity, fairly sedentary, high stress job with long hours



Medication Considerations

- Atenolol
 - Category – beta blocker
 - Lowers HR & BP @ rest & exercise
- Zocor
 - Category – statin to lower cholesterol
 - Can cause muscle soreness
- Ramipril
 - Category – ACE inhibitor
 - Little effect on HR, lowers blood pressure @ rest & exercise
 - » more susceptible to postexercise hypotension



Exercise Considerations/Client Education

- Goals of exercise training
 - Secondary prevention (slow down progression of CAD, help weight loss, control blood pressure)
- Importance of THR
 - Use RPE as adjunct to gauge intensity
- Medication
 - Timing of exercise may elicit different heart rates
- Importance of Warm-up & Cool down
- Report any changes in exercise tolerance, symptoms, medication



Exercise Prescription

- FITT Principle
 - F: 3-4 sessions per week
 - I: Calculate THR using heart rate reserve method (40-85% of values on GXT)
 - T: Start @ 20-30 min/session, progress 10% of total time every 3-4 weeks
 - T: Walking, cycling – larger muscle groups
 - Resistance Training – 1 set 10-15 reps, 8-10 exercises covering major muscle groups, 40-50% of 90% maximal voluntary contraction, avoiding valsalva



Case Study #2

Cardiac Rehabilitation Setting

- 68 year old female
- CHF due to significant myocardial damage of 2 anterior wall MIs'
- Atrial fibrillation (irregular atrial depolarizations)
- Poor ventricular function: EF <35%
- Functional Capacity 4 METS modified Bruce Protocol
 - No angina, significant SOB, leg fatigue
 - Atrial fibrillation noted
 - Resting HR: 60 bpm & irregular
 - Maximal HR: 84 bpm & irregular (55% of age predicted max)
 - Resting blood pressure: 108/64 mmHg
 - Maximal blood pressure: 120/66 mmHg
- Medications: Coumadin (blood thinner), HCT (diuretic), Metoprolol (BB), Digoxin (controls Atrial fibrillation), Lipitor (statin), Norvasc (CCB)
- Body Composition: BMI 33, WG: 112 cm
- Quit smoking 2 months ago
- No history of exercise
- Reports feeling easily fatigued doing housework, sore left knee due to osteoarthritis



Important Information for CEP

- Disease status
 - ↓in cardiac output (low EF, poor contractility, atrial arrhythmia)
 - ↓in muscle metabolism (poor delivery system plus poor O₂ utilization)
 - General deconditioning
 - Presence of other risk factors
 - Overweight, abdominal adiposity
 - History of smoking (high risk for relapse)
- Unfamiliar with exercise
- Osteoarthritic knee – limits walking tolerance
- Symptoms of fatigue & SOB ↑her reluctance to exercise



Medication Considerations

- Metoprolol
 - Category – beta blocker
 - Lowers HR & BP @ rest & exercise
- Digoxin
 - Category – controls atrial fibrillation
 - Lowers HR @ rest & exercise
- HCT
 - Category – diuretic
 - Little effect on HR but increases urination frequency



Exercise Considerations/Client Education

- Goal of exercise training
 - Increase functional capacity
- Importance of pacing
 - Focus on endurance, not speed
 - Rest as required
- Report the following symptoms
 - Sudden weight gain of 5 lbs or more
 - Increase in SOB
 - Decrease in exercise tolerance



Exercise Prescription

- FITT Principle
 - F: 3-5 days/week, encourage movement on most days
 - I: Use RPE due to arrhythmia (9-11 Borg Scale), start slow, easy effort
 - T: 10 minute bouts to start, up to 3x/day can benefit
 - T: short walks, stationary cycling to ↓ orthopaedic stress
 - Progression: as tolerated, focusing on endurance
 - Resistance training: high repetitions (15/set is the goal), low resistance (2-3 lbs), performed seated for added safety. Keep it simple!



Acknowledgements

- CSEP H&FP Executive
- CSEP H&FP Subcommittees (CEP)
- Nancy Payne
- Annalyn Brine
- Leslie Wilson



Thank You!
Questions?

