Exercise Prescription for Patients with CHF

LESLIE AYRES, PT, DPT

Goals

After viewing this presentation the physical therapist will be able to:

- Discuss and understand the diagnosis of CHF including:
  - Clinical signs and symptoms, disease classifications, medical management, and medications
- Discuss the safety, efficacy and impact on quality of life exercise training provides for patients with CHF
- Review the basics of the body’s three energy systems
- List contraindications to initiation of aerobic exercise
- Discuss the basics of exercise prescription based on the FITT principle
- Complete patient case studies related to exercise prescription
Heart Failure (HF)

- “HF is a complex clinical syndrome that results from any structural or functional impairment of ventricular filling or ejection of blood.”

Heart Failure

- “HF may be associated with a wide spectrum of LV functional abnormalities, which may range from patients with normal LV size and preserved ejection fraction (EF) to those with severe dilatation and/or markedly reduced EF. In most patients, abnormalities of systolic and diastolic dysfunction coexist, irrespective of EF.”
Heart Failure

HF Stages and Recommended Therapy

<table>
<thead>
<tr>
<th>HF Stages and Recommended Therapy</th>
<th>At Risk for Heart Failure</th>
<th>Heart Failure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>STAGE A</strong></td>
<td>All high-risk for HF but without structural heart disease with prior or current symptoms of HF</td>
<td><strong>THERAPY</strong></td>
</tr>
<tr>
<td><strong>STAGE B</strong></td>
<td>Structural heart disease without current signs or symptoms of HF</td>
<td><strong>GOALS</strong></td>
</tr>
<tr>
<td><strong>STAGE C</strong></td>
<td>Structural heart disease with acute or current symptoms of HF</td>
<td></td>
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<tr>
<td><strong>STAGE D</strong></td>
<td>Definition of requiring specialized interventions</td>
<td></td>
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</table>

Table 4-6: Descriptors of Heart Failure

<table>
<thead>
<tr>
<th>Heart Failure Classification</th>
<th>Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right heart failure vs. left heart failure vs. isolated</td>
<td>Right heart failure: Right ventricle fails to pump effectively with back up into lungs and then into periphery. Left heart failure: Left ventricle fails to pump effectively with back up into lungs, with too much back up in lungs, pressure in pulmonary artery rise, increasing resistance for right ventricle, and left heart failure.</td>
</tr>
<tr>
<td>Low-output vs. high-output failure</td>
<td>Low output: Low cardiac output at rest or with exertion. High output: Results from fluid overload on heart, with decreased compliance.</td>
</tr>
<tr>
<td>Systolic vs. diastolic dysfunction</td>
<td>Systolic dysfunction: Impaired compliance of ventricles causes low stroke volume and low ejection fraction. Diastolic dysfunction: inability of ventricles to accept blood from atria during rest or with activity.</td>
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</tbody>
</table>
### NYHA Heart Failure Classification

<table>
<thead>
<tr>
<th>Class</th>
<th>Patient Symptoms</th>
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<tbody>
<tr>
<td>I</td>
<td>No limitation of physical activity. Ordinary physical activity does not cause undue fatigue, palpitation, dyspnea (shortness of breath).</td>
</tr>
<tr>
<td>II</td>
<td>Slight limitation of physical activity. Comfortable at rest. Ordinary physical activity results in fatigue, palpitation, dyspnea (shortness of breath).</td>
</tr>
<tr>
<td>III</td>
<td>Marked limitation of physical activity. Comfortable at rest. Less than ordinary activity causes fatigue, palpitation, or dyspnea.</td>
</tr>
<tr>
<td>IV</td>
<td>Unable to carry on any physical activity without discomfort. Symptoms of heart failure at rest. If any physical activity is undertaken, discomfort increases.</td>
</tr>
</tbody>
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**Image 1:**
- **Neuroendocrine:** increased sympathetic stimulation
- **Pulmonary “failure”** of blood due to poor cardiac performance or primary pulmonary disease
- **Liver:** hypoplasia and or veno-occlusion may lead to congestive heart failure
- **Pancreas:** genetic or acquired disease, leading to diabetes mellitus
- **Behavioral/Neurological:** decreased blood flow, decreased renal function, increased blood volume, hypertension, and hypovolemia
- **Nephrocardiologic:** decreased blood flow, renal impairment, and poor tolerance to reduced cardiac output, further aggravating heart failure.
Medications

- Attempt to address underlying contribution to the failure and maintain adequate cardiac output

Commonly used Medications

- **Diuretics**
  - ↓ Circulating blood volume = ↓ preload

- **Positive inotropes**
  - ↑ Contractility

- **Vasodilators**
  - Reduce afterload and preload

- **Calcium-channel blockers**
  - Relax smooth muscle in arterial walls → reduction in afterload

- **Angiotensin-converting enzyme inhibitors**
  - ↓ intravascular volume that occurs as a result of sodium and water retention

- **Beta blockers**
  - ↓ heart rate
Heart Failure

Characteristics of Heart Failure

Dyspnea
Tachypnea
Paroxysmal nocturnal dyspnea (PND)
Orthopnea
Peripheral edema
Cold, pale and possibly cyanotic extremities
Weight gain
Hepatomegaly
Jugular venous distension
Rales (crackles)
Tubular breath sounds and consolidation
Presence of an S₃ heart sound
Sinus tachycardia
Decreased exercise tolerance or physical work capacity
Anaerobic and Aerobic Metabolism

- **Anaerobic System**
  - Goal: Improve short duration activities
    - Sit to Stand
    - Bed to chair
    - Lifting to shelf
  - Goal: Tolerate high intensity activities
    - Anaerobic work requires short bursts with rests in between
Anaerobic and Aerobic Metabolism

- **Aerobic System**
  - Goal: Improve walking tolerance to be able to walk outside or to be a community ambulator
  - Goal: Improve exercise tolerance to be able to perform ADLs or kitchen activities
    - Longer duration – a minimal of 2 minutes of activity
    - Can still perform multiple bouts until duration increases

HF-ACTION – Efficacy and Safety

- **Objective**
  - To test the efficacy and safety of exercise training among patients with HF

- **Design**
  - Multicenter, RCT of 2331 medically stable outpatients with HF and reduced EF
  - Usual care plus aerobic exercise training vs. usual care alone.

- **Conclusions**
  - Exercise training resulted in non-significant reduction in the primary end point of all cause mortality or hospitalization in key secondary endpoints. After adjustment for highly prognostic predictors of the primary end point, exercise training was associated with modest significant reductions for both all-cause mortality or hospitalization and cardiovascular mortality or heart failure hospitalization.
HF-ACTION Trial

- Heart Failure: A Controlled Trial Investigating Outcomes of exercise training
  - In patients with stable heart failure, regular structured exercise training, when added to usual, evidence-based care in accordance with published guidelines, would significantly reduce the incidence of a combined end point of all-cause mortality or all-cause hospitalization.

HF-ACTION – Efficacy and Safety

- “Regular exercise training in patients with systolic heart failure was safe.”
- The HF-ACTION results support a prescribed exercise training program for patients with reduced LV function and HF symptoms in addition to evidence-based therapy.
HF – ACTION – Health Status

- **Objective**
  - To test the effects of exercise training on health status among patients with HF

- **Conclusions**
  - Exercise training conferred modest but statistically significant improvements in self-reported health status compared with usual care without training. Improvements occurred early and persisted over time.

HF – ACTION – Health Status

- The KCCQ overall summary score improved by 5.21 points in the exercise training group and by 3.28 points in the usual care group from baseline to 3 months.
  - 5 points considered minimally noticeable clinical difference
Research

- **Metanalysis**
  - Results demonstrate clinically relevant improvements in exercise capacity and HRQoL in response to exercise training in patients with HfPEf
  - Exercise training appears to be safe in this patient population

Contraindications

- **Unstable angina**
- Resting SBP >200 or DBP >110
- Orthostatic BP >20 mmHg drop, symptomatic
- Critical aortic stenosis
- Acute systemic illness or fever
- Uncontrolled dysrhythmias, sinus tachycardia >120 bpm
- Uncompensated CHF*
- 3rd degree heart AVB without pacemaker
- Acute pericarditis or myocarditis
- Recent embolism
- Thrombophlebitis*
- ST depression at rest >2mm
- Metabolic conditions such as acute thyroiditis, hypokalemia, hyperkalemia, hypovolemia
Components of an Exercise Session

- **Warm-up**
  - 5-10 minutes of low-moderate cardiovascular and muscular endurance activity
  - Reduce potential for muscle soreness
  - Seated exercises, low intensity walking

- **Conditioning**

- **Cool-down**
  - 5-10 min of low to moderate activity
  - Allows for gradual recovery of HR, BP and allow removal of metabolic end products

Frequency

- “Most days of the week”
  - 3-5 days per week

- Dependent on intensity and duration
  - Lower intensity → increased duration

- **Intervals**
  - Allow greater total time, performed with less fatigue

- Ex. – patient can only tolerate 10 min then increase frequency to 2x per day
Exercise Testing

- Current guidelines recommend graded exercise test (GXT) prior to initiating any exercise program
- If unavailable calculate for age adjusted max HR, symptom limited tolerance or based on what is “accomplished” in the acute phase

Intensity

- Moderate intensity
  - % of max HR 60-80%
    - Target HR = ((max HR – resting HR) × %Intensity) + resting HR
  - % of HRR 55-80% (HF-ACTION) 60-70%
  - RPE* = 4-6 on modified borg
    - Good to estimate intensity for patients with a-fib, beta blockers
  - Upper limit of HRrest + 20 bpm → titrate based on RPE, signs and symptoms, and physiologic response

- Do not use age calculated max HR
Intensity - Considerations

- Beta blockers
  - Are patients taking their meds?
  - Timing of medications

- Symptom limited
  - If adverse hemodynamic responses occur use HR at which events occur and prescribe upper limit of HR - 10 bpm

- Dyspnea and fatigue are common HF symptoms
  - In and of themselves not adequate reasons to not exercise patients with HF

Warning signs to progress slowly

- Low angina threshold
- Resting tachycardia (HR > 100)
- Excessive SOB or other S & S
- Fall of SBP > 20 mmHg
- Slow recovery from activity
- Excessive fatigue lasting > 1-2 hours post ex
- Increase in arrhythmias during activity
- Lack of HR or BP response to activity
- Excessive HR or BP response to activity
- LE claudication or other pain
**Type**

- Traditionally walking or cycle ergometry
- Sustained exercise that involves larger muscle groups
- Patient preference, weather, accessibility
- Stair climbing
- Rower
- Elliptical

**Time**

- 40-60 min/session including WU/CD
  - 20-30 min in moderate range
- Shorter sessions
  - 10-15 min and progress duration
- Interval
  - 1:1 ratio of exercise: rest and progress to 2:1
- 5-10 min sessions with gradual progression of 1-5 min per session
**Progression**

- **Progress duration before intensity**
  - 5-10 min every 1-2 weeks
- **Any components in FITT can be increased**
  - Gradually, avoid large increases in any area
- **Patient handout example**
  - Week 1: Walk for ____ minutes at a comfortable pace, ____ times per day
  - Week 2: Walk for ____ minutes, ____ times per day
  - Week 3: Walk for ____ minutes, ____ times per day
  - Week 4: Walk for ____ minutes, ____ times per day

**Case Study 1 - PMH**

- **57 year old female with past medical history significant for HFpEF (65-70%), NSTEMI 2 years ago with DES x 2. Admitted with increasing DOE on exertion over past 2 months.**
- **Medications**
  - Lisinopril, Metoprolol
- **Lives with her husband in single story home, independent and active in community and participates in yoga 3x per week. Owns a treadmill but doesn’t use regularly.**
### Case Study 1 - Assessment

- **Pain**
  - 0/10

- **Strength**
  - 4/5 grossly

- **Balance**
  - Independent

- **Ambulation**
  - 10 min
  - Decreased cadence
  - No CP
  - No DOE

- **Vitals – pre activity**
  - BP 110/78
  - HR 65
  - SpO2 98%

- **Vitals – during activity**
  - HR 97
  - SpO2 97%

- **Vitals – post activity**
  - BP 120/82
  - HR 86
  - SpO2 98%

- **RPE**
  - 4/10

### Case Study 1 – Exercise Prescription

- **Frequency**
  - 4 days per week (patient wants to keep yoga Tuesday/Thursday)

- **Intensity**
  - \((163 - 65) \times 0.65/0.75\) + 65 = 128 - 138 bpm
  - 65 + 20 = 85 bpm
  - RPE 4-6/10

- **Type**
  - Walking on treadmill

- **Time**
  - 30 min plus 5 min WU/CD
Case Study 2 – PMH

- 68 yo male with PMH significant for HFrEF (25-30%), A-fib, CVA, HTN, CKD, admitted for acute on chronic CHF exacerbation with abdominal distension
- LABS
  - HCT 31.2
- Medications
- Lives alone in a 2 level home with restrooms upstairs
- Independent with ADLs, IADLs and mobility
  - Reports increased difficulty in past two months requiring increased rest breaks and SOB with stairs and long distances

Case Study 2 – Assessment

- Pain 0/10
- Strength/AROM
  - WFL, grossly 5/5
- Balance
  - Good, without AD
- Ambulation
  - 300 feet without AD
  - No DOE
  - No CP
- Vitals – pre activity
  - BP 90/52
  - HR 75
  - SpO2 97%
- Vitals – post activity
  - BP 98/64
  - HR 86
  - SpO2 92%
- RPE
  - 6/10
Case Study 2 – Exercise prescription

- **Frequency**
  - 5 days per week
- **Intensity**
  - \(HR_{max} = 95\) bpm
  - 4-6 RPE
- **Type**
  - Walking
- **Time**
  - 10 min x 2 reps

Discussion

- Questions
- Concerns
- Thoughts
- Implementation
References

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