Cardiovascular Physical Therapy: Treatment Part 2

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Goals

- Use the clinical decision making model to identify patients with limited activity tolerance who may benefit from PT
- To assess and develop a physical therapy plan of care giving consideration to the cardiopulmonary demands of exertion for patients with primary or secondary cardiovascular pathology
- To discriminate between normal & abnormal responses to activity

WHEN TO STAY AND WHEN TO GO!!!

Treatment: Plan of Care

- Will depend on setting and acuity of patient
  - Acute, outpatient, rehab, home
- Need to consider pre-existing status
  - Home, work environment, co-morbidities
- Need to consider patient needs, wants
- Use clinical decision making & problem oriented approach to document findings & establish goals and POC
The overall goal of physical therapy for patients with cardiovascular compromise is to increase O$_2$ delivery while decreasing relative functional demands on the patient.

Role of Physical Therapy

- Assess O$_2$ delivery with each ↑ in metabolic demand
- Metabolic demand (MET level) is estimated to assist in determining safe levels of participation

The physical therapist should document factors that demonstrate how well the patient’s O$_2$ delivery system supports metabolic demand imposed by functional training.
Treatment Goals

- Prevent airway obstruction
- Prevent accumulation of secretions
- Improve airway clearance
- Improve endurance & ex- 
  - Work move efficiently
- Maintain/improve physiological responses to activity
  - VO2 uptake, RPE, HR, RR, SV
- Reduce energy costs during activity
- Improve O2 transport, promote ventilation
- Promote relaxation
- Improve cough production
- Maintain or improve chest mobility
- Improve breathing pattern
- Prevent/limit systemic effects of immobilization
- Restore/improve function
- Effect behavioral/lifestyle changes
- Provide patient/family education (self monitoring)

Treatment Choices

Oxygen Delivery
(Supply: DO2)
- Breathing retraining
- Body positioning
- Airway Clearance

Oxygen Utilization
(Demand: VO2)
- Conditioning
- Strengthening
- Functional Training
- ↓ Energy Cost - Devices

PT Treatment Monitors

- Monitor during treatment:
  - Exercise intensity/RPE
  - Blood pressure (before, during, 1-5 min. post)
  - Pulse rate (before, during, 1-5 min. post)
  - Respiratory rate (dyspnea scale)
  - O2 saturation
  - General appearance: color, perspiration
  - ECG/Heart sounds
  - Anginal pain
- Decrease activity 10-15 beats below level where pain started
PT Treatment: Issues of Concern

- Patient in danger of arrest if:
  - Don’t warm up/cool down before & after exercise
  - Exercise above safe limits
  - Has low serum K+ values
    - Effects polarization of heart
    - Watch if on K+ depleting diuretics
  - Monitor CBC (infection), thyroid values (metabolic rate)

Treatment Plan of Care: Considerations

- Pre-existing diagnoses
- Acuity of patient
  - Ventricular tachycardia
  - Ventricular fibrillation
  - AV blocks
  - Sinus tachycardia
  - Pulmonary edema
  - Heart Failure
  - Cardiogenic shock

POC Considerations* (Hillegass)

- Heat and humidity
  - 80/80 rule
- Cold
- Altitude
Re-assessment

- Patient's should be re-assessed at each visit
- Modify treatment based on findings
- Modify STG and LTG if necessary
- Adjust patient's POC if necessary
- Re-state prognosis if appropriate

Graded Activity: Testing and Exercise

Graded Activity

- Primary cardiovascular diagnosis
  - Practice patterns 6A, 6B, 6D
- Secondary cardiovascular diagnosis
  - Neuromuscular
  - Musculoskeletal
    - Post-op
  - Medical
  - Integumentary
Graded Testing: Purposes

- Differential diagnosis
  - To identify symptoms - need to “stress”
- Assess medications
- Develop exercise prescription
  - What are safe levels for exercise
- Predict max VO$_2$/estimate functional ability

Graded Testing

- **Symptom limited/maximal** level
  - Terminate when reach maximal predicted HR or when limited by symptoms
- **Submaximal** (low level) testing safer & more comfortable
  - Pre-determined end point e.g. THR
  - May not be intense enough to find abnormalities
  - Done in hospital or after discharge
  - May be performed w/in 4-6 days after MI
- Need to understand signs and symptoms; abnormal vs. normal response to exercise

Graded Test: Safety Considerations

- Predict level of risk
- Appropriately medicated
- Trained staff
- Emergency care
- Properly supervised
- Patient familiarization
  - Cognition
Graded (Aerobic) Exercise

- Walking
- Arm Ergometry
- Leg Ergometry
- Combined Arm and Leg
- Treadmill
- Stair Climbing/Stairmaster
- Rower
- Elliptical

Activity Selection

- Chose test that aligns with functional activities
  - Serve as basis for training
  - Patient ‘comfort’ level
- Physician clearance
  - Hx of heart condition, cardiac meds
  - Pain in chest with activity or at rest
  - Pre-existing morbidity that is limiting activity e.g. dizziness, musculoskeletal limitations

Graded Activity: Protocol Selection

- TM, cycle, seated, pharmacological
- Usually lasts 8-12 minutes
  - Can be maximal or submaximal
- Intensity increased in steps
- Type of test determined by age, physical condition, health status, risk factors
- TM gives the best estimate of VO\(_2\) max in fitness testing for healthy subjects
- Patients get more CV stress with supported combined arm and leg activity (Gapmair E et al. MSSE 33:133-134)
Treadmill Protocols

- **Bruce**
  - Most commonly used w/ younger, fitter pops
  - Lower extremity stress is 1 due to?
- **Modified Bruce**
  - VO2 prediction
  - Lower grade inclines
- **Naughton**
  - Better for diseased pops - more gradual incl in intensity
  - Starts at grade
- **Balke**
  - Starts at 3.3 mph
  - Slowest/lowest incline increase
  - Good with older individuals
- **Modified Bruce**
  - VO2 prediction
  - Lower grade inclines
- **Naughton**
  - Better for diseased pops - more gradual incl in intensity
  - Starts at grade
- **Ramp vs. Staged**
  - Myocardial ischemia attenuated (lessened) w/ gradual incl in intensity than w/ standard staged Bruce protocol


Treadmill: Monitored/Unmonitored

Unweighted Treadmill Walking
Walking Tests/Activity

- Timed walk tests
  - 12 minute walk test
  - 6 minute walk test
  - 2, 3 minute walk test
  - Field endurance tests (1 mile walk/run)

- Defines patient’s ability to exercise
  - Intensity performed to where symptoms begin

- Improved results w/ 2nd test d/t learning effect
  - Demonstration prior to test

- Described differently in different references

- Studies use walk distance, walk time, walk work as outcomes

Six Minute Walk Test

- Patient walks at fastest pace possible
  - Record distance, time and rests taken
  - Calculate walking speed and compute METs
  - 100’ course
  - Circular vs. straight

- Monitor BP/HR, pt. hx sitting

- Instruct in RPE, scales, etc.

- Monitor and record responses pre, during, after
  - Chairs placed periodically for rests if needed

- Stop based on patient’s S/S

- Valid, reliable measure
  - Correlates with VO2 max for elderly, COPD, CHF
  - Predictive of death w/ mild to moderate CHF

Physiological Cost Index (PCI)

- Measures relative costs of walking/unit of distance walked

- Compares energy costs between different conditions
  - Walking vs. wheelchair propulsion
  - Pre/post intervention
  - With/without assistive device

- PCI= (HR walking - HR rest)/average speed= _____ beats/minute
**Standard Cycle Ergometry: YMCA Sub-Maximal Protocol**

- 3 minutes stages of continuous exercise
  - 2-3 minutes per stage
- 50 RPMs maintained throughout
- 25 watts - 1st stage
  - 10-15 watts for older individuals
- Seat adjusted with 10° knee flexion

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**Cycle Ergometry Protocols**

**Lung Disease:**

- Mass. Respiratory Hospital
  - ↑ 5 w every 20 sec (FEV₁ < 1L)
  - ↑ 10 w every 20 sec (FEV₁ > 1L)
- Godfrey (Children w/ CF- 1974)
  - ↑ 5, 10, 15 w based on height/FEV₁

*Jones and Campbell N Eng J Med 293:541 1975*

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**Clinic Protocols: Restorators**

- Positions
  - Supine – LEs
  - Sitting – LEs
  - Sitting – UEs
  - Standing - UEs
Upper Extremity Restorators

Lower Extremity Restorators

Arm Ergometry: Advantages

- Use w/ patients having LE impairments
- Ortho/musculo-skeletal, amputation, vascular insufficiency, neurological injuries
- Diagnostic for assessing CAD
- May ↑ work to diaphragm in COPD
Arm Ergometry: Disadvantages

- Poor BP & ECG monitoring
- Lower VO₂ Max/more variable
- ↓ Efficiency w/ ↑ workload
- ↑ RPP
- Local fatigue before CV stress

Upper Extremity Functional Activities

Elevated Arm Work
**Submaximal Work: Arm vs Leg**

At the same power output (watts) arm vs. leg, arm will to a greater extent:

- ↑ HR
- ↓ SV
- ↑ VO$_2$
- ↑ Ventilation (Ve)
- ↑ BP or MAP
- ↑ RPP

Collett & Liljestrand 1924; Miles DS et al. JAP 57:366-70, 1984

**UE vs LE Exercise**

- UE = greater demand on heart (increased work)
  - More readily symptomatic
  - Smaller muscles
  - Greater energy expenditure
  - SBP & HR greater at same work loads
- Work both UE & LE for max benefit

**Combined Arm and Leg Work**

![Combined Arm and Leg Work](image)
UE vs LE Exercise

Perform approximately 40% work with LE to:

- ↓ VASCULAR RESISTANCE
- MAINTAIN VENOUS RETURN
- ↓ RELATIVE MYOCARDIAL DEMAND

Sawka MN. Ex Sport Science Reviews vol 14, 1986
Toner MN et al. MSSE 22:773-778. 1990

Normal Response to Exercise

• Normal Response:
  - CO x HR increases linearly as the workload & O2 consumption demands increase
  - Max HR decreases w/ age
  - Blood pressure: systolic will rise but diastolic will remain level or increase slightly
  - BP affected by body position; cuff size; acute pain presence

Abnormal Response to Exercise

• Abnormal Response:
  - HR does not increase linearly w/ increased workloads
  - On ECG the ST segment will depress (ischemia) or elevate (heart injury)
    • 1mm depression may be normal at high intensity exercise
  - Blood Pressure:
    • Systolic: remains level during ex or stays high after ex
    • Diastolic: increases >/=20 mm Hg or decreases after ex
    • >240 SBP with exercise
    • >110 DBP with exercise
Abnormal Response cont’d

- Angina symptoms appear, escalate, change in intensity during exercise.
  - Can “work through” angina if no change from “normal” level
  - Lower intensity of exercise-monitor symptoms

- Abnormal heart rate: bradycardia, tachycardia
  - May relate to meds

- RR > 25 bpm

- Irregular pulse

- \(O_2\) saturation < 85
  - Sign of desaturation

Aging Changes: Implications for Exercise

- Need to exercise to maintain function

- Variety of assessment tools used
  - Bike ergometer for those w/ poor balance
  - Treadmill
    - Can increase grade instead of speed for older patients
  - 6 minute walk test-most commonly used

- Exercise prescription
  - Must relate and adapt to individual’s interests, lifestyle

Cardiovascular Treatment Parameters: Continuum of Care
Treatment Indications: CV Primary Diagnosis

- Medically stable
  - Hemodynamics, ECG, response to self-care/ambulation activities
- Complicated/uncomplicated MI
- Congestive heart failure (stable)
- Heart transplant
- Stable angina
- CABG; angioplasty
- Valve replacement
- Practice Pattern B, D

Treatment: Plan of Care

- Improve CV fitness level within safe limits
  - Supply able to meet demand
- Restore ability of patient to work at functional levels of activity
- Promote lifestyle changes through patient education and behavior modification
- Prevent new or recurrent CV complications
- Promote return to prior IADL level

Treatment Benefits

- VO2 and CO improves; RPP decreases
- Threshold for cardiac symptoms increases
- Loss of body weight/fat
- Decrease in lipid levels; increase in HDL levels
- Decrease in BP
- Improve glucose insulin levels
- Cardiac mortality decreased*

*Taylor, Brown, et al., ACP Journal Club, Nov-Dec, 2004; AHA, 2005
Treatment Team

- Physician
- Physical Therapist
- Occupational Therapist
- Nurse
- Exercise Physiologist
- Recreational Therapist
- Dietitian
- Psychologist/social worker
- Vocational Counselor
- PATIENT and family

Treatment Continuum

- Positioning and splinting
- Airway clearance
  - Percussion and vibration
  - Postural drainage
  - Cough maneuvers/enhancement/huffing
  - Suctioning
- Oxygen supplementation
- Exercises
  - ROM, flexibility
  - Passive, active assistive, active
    - Progress to resistive

Treatment Continuum

- Breathing Strategies
  - IMT/Spirometry
  - Expiratory techniques
  - Chest wall stretching
  - Diaphragmatic, segmental, pursed lip, stacking breaths
  - Thoracic mobility exercises
  - Paced breathing
- Relaxation techniques
- Energy conservation/work simplification
Treatment Continuum

- Functional training/mobility
  - Bed, chair, upright
  - Family: Home environment
  - Community/IADL’s
- Graded endurance:
  - Intensity, Duration, Frequency, Mode
  - Vary-adjust to patient acuity
- Patient education
  - Lifestyle modifications/Psychosocial issues
- Discharge planning

Treatment Parameters: Risk Stratification (AACVPR)

<table>
<thead>
<tr>
<th>Low</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>No ischemia</td>
<td>ST segment depression &gt; 1-2 mm w/ ex</td>
<td>Marked ST (&gt;2mm) segment depression w/ ex</td>
</tr>
<tr>
<td>EF &gt;= 50%</td>
<td>EF = 31-49%</td>
<td>EF &lt;= 30%</td>
</tr>
<tr>
<td>&gt;= 6 METS-3 wks post event</td>
<td>&lt;5-6 METS-3 wks post event</td>
<td>Complicated cardiac incident</td>
</tr>
<tr>
<td>Uncomplicated cardiac event</td>
<td>Failure to comply w/ exercise ex</td>
<td>Survivor of cardiac arrest</td>
</tr>
</tbody>
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Treatment Purpose: Acute/Inpatient Setting (Phase I)

- Occurs in acute/inpatient setting
- Minimize effects of bedrest and deconditioning
- Promote cardiovascular fitness
- Support psychological recovery following cardiac event
- Provide secondary prevention of CV disease
- Encourage interdisciplinary approach to CV rehabilitation
**Acute/Inpatient Setting: Purpose**

- Prepare for safe performance of activities following IP discharge
  - Patient/family education
- Evaluate physiological response to activities
  - Feedback of patient response to establish safe treatment, medication parameters

**Acute/Inpatient Treatment Parameters**

- Initiate day 1 post-op CABG; 3-5 days post MI
  - When patient medically stable
  - Several times/day; short duration
  - Increase frequency/duration as tolerated
  - Progression dependent on physiological response to activity
- ALOS < 5-6 days
  - Dependent on patient PMH, acuity, age, etc.
  - STG = 3-5 days
  - LTG = 5-10 days

**Acute/Inpatient Treatment Parameters**

- Functional graded (endurance) activities
  - Monitored ambulation, ADLs
  - Begin at 1-2 METs
  - Goal is 3-5 METs at discharge
  - 3.0 MPH on TM
- Passive, active assistive, active exercises, ankle pumps
- Energy conservation/Work simplification
- Breathing exercises/cough production
**MET Intensity as % of 5 MET Max**

<table>
<thead>
<tr>
<th>Task</th>
<th>MET</th>
<th>% of 5 METS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baking</td>
<td>2.1</td>
<td>42</td>
</tr>
<tr>
<td>Cleaning</td>
<td>3.6</td>
<td>72</td>
</tr>
<tr>
<td>Eating</td>
<td>1.4</td>
<td>28</td>
</tr>
<tr>
<td>Food shopping</td>
<td>3.5</td>
<td>70</td>
</tr>
<tr>
<td>Card play</td>
<td>1.4</td>
<td>28</td>
</tr>
<tr>
<td>Walk 2.5mph</td>
<td>2.5</td>
<td>50</td>
</tr>
</tbody>
</table>

**Acute/Inpatient Treatment Parameters**

- **Patient/family education**
  - Self monitoring
  - Follow up activities
- **Pharmacological management**
- **Risk factor behavior modification**
  - Smoking
  - Stress reduction/relaxation; hostility management; depression
  - Diet
  - Controlled substances

**Acute/Inpatient Treatment Parameters**

- **Sternotomy precautions post op**
  - No lifting > 5-10 lbs for 4-6 wks
  - No driving 4-6 wks
- **No WB on UE**
  - Rolling walker not preferred, but ok if needed for balance
- **Monitor isometrics (avoid valsalva)**
- **HR <= 120 bpm or 20-30 bpm over resting rate w/ exercise**
  - RHR 90-100 bpm
  - Don’t consider rate limiting medications
- **Must consider ECG reading, hemodynamics, symptoms**
Acute/Inpatient Treatment Parameters

- MI’s:
  - 7 day window of greatest risk
  - Avoid isometrics, Valsalva
- CABG:
  - Pain/anxiety of intubation, insertion/removal of tubes
  - Post anesthesia effects
    - Hypoxia (heart/lung), memory, personality
- Pacemakers: Ltd. movement for 4 wks

Acute Phase: Contraindications to Continuing Treatment

- Unusual heart rate increase
  - >50bpm
- Hypertensive response to activity
  - >210mmHg SBP
  - >100mm Hg DBP
- Drop in SBP >10 mm Hg w/ low level exercise
- Signs of pallor, cold sweat, ataxia
- Symptoms w/ activity
  - Angina 1+/4
  - Dyspnea 2+/4
  - Excessive fatigue
  - Mental confusion/dizziness
  - Severe leg claudication 2+/4
  - Changing heart sounds e.g. new murmurs
  - ECG abnormality
    - ST segment changes
    - Coupled/ectopic PVCs

Post Surgical Issues

- Head and Neck Pain
  - Cervical-intubation, cervical extension
  - Headaches-drug induced (NTG, heparin)
  - Headaches- occipital n. irritation or trapezius spasm
  - Headaches- decreased visual acuity
- UE
  - Brachial plexus (8% of pts.) injury from clavicle & 1st rib depression(chest cracked), lat deviation/ext of neck
  - Peripheral neuropathies (6-13% of pts)
Post Surgical Issues

- **Thorax:**
  - Unstable sternum
  - Asymmetric sternum
  - Non-union of sternum - watch for purulent drainage
  - Costal cartilage pain (ribs 2-5)

- **LE:**
  - N. injuries (3% of pts.) - Saphenous or peroneal
  - Incisional pain/swelling in knee joint

Sub-Acute/Conditioning: Phase II

- Upon discharge from IP acute (Phase I)
  - Home (HHA), SNF, OP, community setting
  - May not start formal program until 6 weeks post incident
  - May start 24-72 hrs. post discharge
  - Follows low-level monitored stress test & progresses to monitored maximal stress test
  - Monitored/supervised ambulatory phase
  - 3-7 times/wk
  - Generally lasts 6-12 wks*
  - Progress to 1/week

*AACVPR guidelines combine Phase II and III as conditioning/training phase - lasts 3-6 months

Sub-Acute/Conditioning

- Symptoms, HR, BP, †ex tolerance, †quality of life
- Education, secondary prevention of disease emphasized
  - Self monitoring
  - Risk factor reduction
- Don’t mix healthy and patients w/ pathology
- IEP to meet patient’s needs, limits
Sub-Acute/Conditioning

- Endurance/conditioning
  - Establish mode, frequency, duration, intensity
  - Progressive (graded activity) exercise
  - Begin 15 min/session, progress to 45-60 min/session
  - RPE 12-16
  - Specific to patient response e.g. dyspnea, angina, RPE scales, physiological signs

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Sub-Acute/Conditioning

- Determine baseline intensity (THR)
  - Training % x 220-age (general population)
  - Training % 60-70% for Phase II
  - Karvonen formula: (MHR-RHR) x training% + RHR
  - May be aggressive for Phase II cardiac pt:
    - Fit individuals > 40 use 205-age x training %
    - RPE’s
    - MET’s
    - VO2 max
    - Ventilatory threshold
- Medication effects
- Use warm-up/cool down

Sub-Acute/Conditioning

- Relaxation, energy conservation
  - Yoga, TM, biofeedback
- Breathing exercises
- Flexibility
- Progress to resistive
  - 30-50% 1RM; 1-3 lb wts; light theraband
  - Closely monitored
    - SBP > 160 mmHg; DBP > 100 mmHg needs further assessment - not absolute contraindication (AACVPR guidelines)
Sub-Acute/Conditioning

- Family/patient education
  - Self monitoring
  - Risk factors
  - Safety precautions

Intensive Rehabilitation: Phase III

- Progress to training/intensive rehab program
- Performed under supervised conditions i.e.
  - 1xwk for 6-12 months
    - Progress to 1x mo
    - 30-50 min session
    - High level exercise conditioning phase
    - Initiate resistance training
    - Exercise at 60-85% of MHR, obtained via max stress (symptom limited) test results

- Interval vs. circuit training
  - Can increase work loads w/ interval
  - Encourage camaraderie/social aspects of training

- Functional activities
  - Strength training w/ aerobic exercise
    - Large muscle groups vs. small muscle groups
    - 3 sets; 12-15 reps; 2-3xwk.
    - 30-50% 1RM
    - 12-16 on RPE scale
    - peripheral m. strength/endurance, ex tolerance, cardiopulmonary function & symptoms
    - 5 weeks post MI
    - 8 weeks post CABG
**Maintenance/Prevention Program Phase IV:**

- High risk individuals
- Continuation of Phase II/III patients
  - >12 months
- Preventive program pre-moribidity
- Life long commitment to exercise
  - Independent compliance with lifestyle modifications including diet, exercise, stress reduction, substance abuse

**Individualized Exercise Plan: Summary (Hillegass, 2011)**

- Exercise should be specific to patient’s daily needs, interests
  - Incorporate fun, camaraderie, competition
- Aerobic exercise prescription:
  - Mode: Functional, large muscle groups
  - Intensity: May use HR, perceived exertion
  - Duration: start with short intervals 2-5 min, progress to 30-45 min
  - Frequency: Start w/ short intervals multiple times/day

- Those who exercise 20-30 minutes, progress to daily 5-7xweek

- Resistance training
  - Avoid strain, exhale during exertion
  - Weight belt 30-50% 1RM
  - 8-10 repetitions of each muscle group

- Flexibility
  - Assess for limitations
    - UE; LE; hamstrings and gastrocs
**Individualized Exercise Plan: Summary**  
(Hillegass, 2011)

- **Education/Self Monitoring**
  - HR, RPE, dyspnea
  - Weight self daily if have CHF
  - Understand signs/symptoms of angina vs musculo-skeletal and/or systemic pain

**Patient Progression**

- Patient specific within pathology guidelines
  - Healing process: cardiac muscle; post op; sternum
  - Physiological response to activity
  - Medical status; complications
  - Patient pre-existing, co-morbidities
- **Treatment parameters**
  - Increase duration, intensity, frequency
  - Change mode

**Outcome & Quality of Life Measures: Cardiac Specific**

- **Minnesota Living with Heart Failure**
  - Measures physical, socioeconomic, psychological impairment
- **Seattle Angina Questionnaire (SAQ)**
  - Measures limitations, angina stability, frequency, treatment satisfaction, disease perception
- **Exercise as outcome predictor of Q of L**
  - Quad strength shown to be powerful predictor of Q of L for pts with CHF (Ball, Michel, Cahalin, 1997)
  - Body weight also predictive (Cahalin, Semigran, Kacmarek, 1997)
Outcome & Quality of Life Measures: Functional Measures

- PMADL-8 associated with CHF disease severity
  - To assess disease-specific functional limitations as predictor of CHF severity (Shimizu, et al., 2009)
- Duke Activity Status Index (DASI)
  - Correlates with Vo2max
- NYHA scale
- BORG scale
- 6 or 12 minute walk tests

General Red Flags: Contraindications/Precautions

- Acute/recent MI
- Angina
- Thrombus
- Pericarditis
- Rapid weight gain or edema
- EtOH hangover
- Sunburn
- Heavy food intake

Precautions/Contraindications to PT

- Moderate to severe aortic stenosis
- Medications effect on response: beta blockers, diuretics
- Uncontrolled diabetes
  - Blood sugar > 300
- Symptomatic CHF/pulmonary edema
- Resting ST displacement>2 mm
- Post ‘long bone’ surgery
Precautions/Contraindications to PT

- Incisional pain
- Dissecting aneurysm
- Persistent hypotension
- Acute fever/infection
- Thrombophlebitis

Precautions & Contraindications to Exercise or Exertion *

- Increased HR over prescribed limit
  - Don’t start if >120 at rest
  - HR > 20 over RHR w/ post MI
  - HR > 30 over RHR w/ post CABG
- Significant dyspnea
- Excessive fatigue
- Resting systolic > 200 or diastolic > 110
- Marked change in BP w/ exertion
  - Orthostatic drop SBP =>20 mm Hg
  - DBP of >10-20 mm Hg
  - Decrease in BP w/ increasing workloads
*ACSM & AACVPR Guidelines

Cardiac Treatment: Absolute Contraindications

- Rapid atrial rhythm
- Serious arrhythmias, conduction defects
- Organ system failure
- Uncontrolled hypertension
- Other disease/illness that precludes exercise
- Active inflammatory conditions, fever/infection
- Acute/severe congestive heart failure
- Unstable angina
- Unstable hemodynamics
  - Falling BP w/ exercise
  - Persistent hypotension (<90 mmHg SBP)
  - 2nd/3rd degree heart block (leads to sudden death)
Criteria for Termination of Treatment

- Fatigue
- Light headedness, confusion
- Ataxia
- Pallor, cyanosis, dyspnea, nausea
- Excessive sweating, flushing
- Angina onset w/ activity
- Decreased HR w/ increase or no change in work load (> 10bpm)
- DBP =/>110 mm Hg
- Decrease in SBP > 10mm hg during exercise

Criteria for Termination of Treatment

- Maximal SOB/reaching ventilatory maximum (RPE/RR)
- Fall in PaO2 of > 20 mmHg or PaO2 < 55 mmHg
- Rise in PaCO2 > 10 mmHg or PaCO2 > 65 mmHg
- Cardiac ischemia or arrhythmias
  - Frequent PVC’s
  - Ventricular arrhythmias
- Leg Pain
  - Check for DVT; color, temp, pulses
- Signs of insufficient cardiac output

Assessment: Case Study

- The patient is a 68 year old black male referred for physical therapy prior to discharge home from the acute care hospital. He was admitted following a hip contusion sustained when he fainted at home 2 days ago. The patient is weight bearing, but presents with pain (7/10) at the hip on weight bearing. He has been OOB for 30 minutes BID and requires contact guard and assistance to ambulate without a device to the bathroom. He has a history of coronary artery disease and had a MI one year ago.
- Referral: Evaluate and treat
- Stay or Go?
Chart Review

- PMH: HTN, hyperlipidemia, MI prior year, CAD
- PSH: Appendectomy
- Psychosocial hx: The pt. denies smoking, alcohol and drug use
- Family Situation: He is retired and lives with his wife in a duplex with bedrooms upstairs. He drives and does chores around the house.
- Medications: Propranolol (inderal), furosemide (lasix), esomepraxole (nexium)
- V/S: Temp. 99 degrees, B/P: 155/84, RHR: 102, RR: 22; SpO2: 90% at rest

Consider the Following:

- What assessments would you do with this patient?
  - What findings are significant and what impact will they have on this patient’s plan of care
  - What are the patient’s primary problems, what practice pattern(s) would you apply?
- What treatment interventions would you recommend for this patient in this setting?
  - What treatment parameters would you use?
    - Frequency, intensity, duration, mode
- What recommendations would you make for this patient prior to his discharge?
- How might this POC differ in the home setting? In the outpatient setting?

Final Thoughts

Know your patient when developing a treatment plan that will meet the patient’s needs...

Questions

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Resources

- Collet & Liljestrand 1924; Miles DS et al. JAP 57:366-70, 1984
- Gappmair D et al. MSBE 33:S130 #740
- Guide to PT Practice: APTA 3rd Ed.
- Jones and Campbell N Eng J Med 293:541 1975
- NHLBI, National Heart Lung and Blood Institute
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- O’Sullivan & Schmitz. Physical Rehabilitation: Assessment and Treatment, 9th Ed. FA Davis Co.
- Sullivan & Schmitz. Physical Rehabilitation: Assessment and Treatment; 5th Ed. FA Davis Co.
- Sakaia MM, Ex Sport Science Reviews Vol 14, 1988
- Taylor, Brown, et al., ACP Journal Club, Nov-Dec, 2004; AHA, 2005
- University of Iowa Hospitals and Clinics, 200 Hawkins Drive, Iowa City, Iowa 52242

Internet Resources

- http://www.yourdiseaserisk.wustl.edu/
- http://nursing411.org/Courses/MD0531_Taking_Vital_Signs/3-4_taking_vital_signs
- http://www.med.ucla.edu/wilkes/Homebanner.htm
- http://meded.ucsd.edu/clinicalmed/lung.htm