Physical Therapy Assessment and Intervention in the Medically Complex Geriatric Patient

Jeff Nickel, PT, GCS, CLT

Learning Goals

- Identify factors that limit or contraindicate physical therapy assessment and intervention
- Describe common disease processes in the medically complex geriatric patient and their impact on intervention

My Background

- Physical Therapist since 1996
- Worked at Cox for 12 years
- Long term acute care for 9 years
- Return to Cox for the past 2 years
- Certified Geriatric Specialist by the APTA in 2002 and re-certified in 2012
Chart Review
- Reason for Referral
- Activity Restrictions
- Weight-bearing precautions
- Primary Complaint
- Admission Diagnosis
- Co-morbidities

Laboratory Values:
Disclaimer
- Normal and abnormal laboratory values change
- Different labs have different reference normals
- Look at trends
- Not a replacement for clinical judgment
- Acute vs Chronic
- Age considerations

Laboratory Values:
Electrolytes
- Sodium: 134-142 mEq/L
- Potassium: 3.7-5.1 mEq/L
- Calcium: 8.6-10.3 mg/dL
- Magnesium: 1.2-1.9 mEq/L
- Chloride: 98-108 mEq/L
- Phosphate: 2.3-4.1 mg/dL
Laboratory Values: Electrolytes

- Changes in sodium, potassium and calcium alter the excitability of neurons, cardiac, and skeletal muscles that can produce arrhythmias, weakness, and spasms/tremors

Laboratory Values: Abnormal Electrolytes

- Hypernatremia: impaired cognitive status, seizures
- Hyponatremia: impaired cognitive status, orthostatic hypotension

Laboratory Values: Abnormal Electrolytes

- Hyperkalemia: At risk for cardiac issues at over 5 mEq/L, muscle weakness
- Hypokalemia: Less than 2.5 mEq/L, at risk for cardiac issues, hypotension
**Laboratory Values: Abnormal Electrolytes**

- Hypercalcemia: Nausea, vomiting, abdominal pain, dehydration, cardiac issues
- Hypocalcemia: May look like depression or dementia, cardiac arrhythmias

---

**Laboratory Values: Abnormal Electrolytes**

- Hypermagnesemia: Hypotension, weakness, respiratory issues
- Hypomagnesemia: Arrhythmias, cramps, seizures

---

**Laboratory Values: Abnormal Electrolytes**

- Hyperchloremia: Decreased level of consciousness
- Hypochloremia: Monitor level of consciousness and motor function
Laboratory Values: Abnormal Electrolytes

- Hyperphosphatemia: Weakness, dysrhythmia
- Hypophosphatemia: impaired cognition

Laboratory Values: Complete Blood Count

- Hemoglobin: Males 14-17.4; Females 12.0-16.0
- Hematocrit: Males 42-52%, Females 37-47%
- WBCs: 5.0-10.0 $10^9$/L
- Platelets: 140-400 k/uL

Laboratory Values: Complete Blood Count

- Hemoglobin
  - Low critical < 5-7 g/dL: heart failure/death
  - High critical > 20 g/dL: capillary clogging
  - < 8 g/dL symptoms based approach
Laboratory Values: Complete Blood Count

- Hematocrit:
  - Low critical < 15-20% cardiac failure or death
  - High critical > 60% spontaneous blood clotting
  - < 25% systems based approach, collaboration with team

Laboratory Values: Complete Blood Count

- White blood cells
  - Leukocytosis (trending upward): > 11.0 $10^9$/L
  - Leukopenia (trending downwards): < 4.0 $10^9$/L
  - Neutropenia: < 1.5 $10^9$/L; neutropenic precautions

Laboratory Values: Complete Blood Count

- Platelets
  - Thrombocytosis/thrombocytopenia: > 450k/uL
  - Clinical Implications: Venous Thromboembolism
  - Thrombocytopenia: < 150 k/uL
  - Fall risk/hack for hemorrhage
Laboratory Values:

Coagulation Profile

- International Normalized Ratio (INR)
  - Normal range: 0.8-1.2
  - Higher risk for bleeding: > 3.6
- Partial Thromboplastin Time (PTT)
  - Normal range: 21-35 seconds
  - > 70 seconds: increased risk for spontaneous bleeding
- Prothrombin time
  - Normal range: 11-13 seconds
  - > 25 seconds: high risk for bleeding

Laboratory Values

- Glucose
  - 70-100 mg/dL
  - Hyperglycemic: > 200 mg/dL: decreased activity tolerance
  - Hypoglycemic: < 70 mg/dL: May not tolerate therapy

Laboratory Values

- Hemoglobin A1C
  - Normal: < 5.7%
  - Pre-diabetic: 5.7-6.4%
  - Diabetic: > 6.5%

Clinical Implications

- Monitor vitals if poorly controlled
- Educate on importance of exercise for blood sugar control
- Consider implications of wound care management
Laboratory Values

- Ammonia
  - 15-60 ug/dL
  - Encephalopathy and confusion

Laboratory Values

- Troponin: < 0.03
  - Watch trend
  - Not always heart

Laboratory Values: Arterial Blood Gases

- Normal Values
  - pH: 7.35-7.45
  - PaO₂: 80-95 mmHg
  - PaCO₂: 37-43 mmHg
  - HCO₃: 20-30 mmol/L
- Metabolic Acidosis
  - pH < 7.35, HCO₃ < 24 mmol/L
- Metabolic Alkalosis
  - pH > 7.45, HCO₃ > 30 mmol/L
Laboratory Values: Arterial Blood Gases

- Normal Values
  - pH: 7.35-7.45
  - PaO\(_2\): 80-95 mmHg
  - PaCO\(_2\): 37-43 mmHg
  - HCO\(_3\): 20-30 mmol/L
- Respiratory Acidosis
  - pH < 7.35, PaCO\(_2\) > 45 mmHg
- Respiratory Alkalosis
  - pH > 7.45, PaCO\(_2\) < 35 mmHg

Electrocardiogram

- Rate Considerations
  - Atrial Fibrillation
  - Premature Ventricular Contractions

Medication Precautions: Vasopressors

<table>
<thead>
<tr>
<th>Medication (Nor-mephrine)</th>
<th>Critical Drip for low BP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Levophed (Norepinephrine)</td>
<td>Critical Drip for low BP or GI bleeding</td>
</tr>
<tr>
<td>Vasopressin</td>
<td>Critical Drip for low BP</td>
</tr>
<tr>
<td>Phenylephrine</td>
<td>Critical Drip for low BP</td>
</tr>
<tr>
<td>Epinephrine</td>
<td>Critical Drip for low BP</td>
</tr>
<tr>
<td>Dopamine</td>
<td>Critical Drip for low BP</td>
</tr>
</tbody>
</table>

Cardiovascular Drips – Patients given medications used to increase blood pressure, slow heart rate, or increase force of heart beat should be evaluated prior to exercise.
Medication Precautions

<table>
<thead>
<tr>
<th>Medications</th>
<th>Critical Drip for High HR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardizem (Diltiazem)</td>
<td>Critical Drip for high HR or arrhythmias</td>
</tr>
<tr>
<td>Amiodarone</td>
<td>Critical Drip for high HR or arrhythmias</td>
</tr>
<tr>
<td>Dobutamine</td>
<td>Critical Drip for CHF patients</td>
</tr>
<tr>
<td>Prinol (Milrinone)</td>
<td>Critical Drip for CHF patients</td>
</tr>
<tr>
<td>Protonix Infusion</td>
<td>For acute GI bleed</td>
</tr>
<tr>
<td>Heparin Infusion</td>
<td>Critical drip for DVT/PE treatment</td>
</tr>
<tr>
<td>Fentanyl/Morphine/Hydromorphone</td>
<td>Used for vent sedation</td>
</tr>
<tr>
<td>Midazolam/Lorazepam</td>
<td>Used for vent sedation</td>
</tr>
<tr>
<td>Dexmedetomidine (Precedex)</td>
<td>Used for vent sedation</td>
</tr>
<tr>
<td>Diprivan (Propofol)</td>
<td>Used for vent sedation</td>
</tr>
</tbody>
</table>

Contraindications to Cardiac Rehabilitation

- Unstable angina
- Uncontrolled hypertension — that is, resting systolic blood pressure (SBP) >180 mm Hg and/or resting diastolic BP (DBP) >110 mm Hg
- Orthostatic BP drop of >20 mm Hg with symptoms
- Significant aortic stenosis (aortic valve area <1.0 cm²)
- Uncontrolled atrial or ventricular arrhythmias
- Uncontrolled sinus tachycardia (>120 beats/minute)
- Uncompensated heart failure
- Third-degree atrioventricular (AV) block without pacemaker
- Active pericarditis or myocarditis
- Recent embolism (pulmonary or systemic)
- Acute thrombophlebitis

Anticoagulants – not an absolute contraindication to activity, but indication for anticoagulation (DVT, PE, HIT, etc) and status of therapeutic levels should be reviewed.

- Heparin Drip
- Argatroban Drip

Pain/Sedation – not a contraindication, but patients' sedation level may dictate level of activity.

- Fentanyl/Morphine/Hydromorphone Drip
- Midazolam/Lorazepam Drip
- Propofol (Diprivan)
- Dexmedetomidine (Precedex)
Contraindications to Cardiac Rehabilitation

- Aortic dissection
- Acute systemic illness or fever
- Uncontrolled diabetes mellitus
- Severe orthopedic conditions that would prohibit exercise
- Other metabolic conditions, such as acute thyroiditis, hypokalemia, hyperkalemia, or hypovolemia (until adequately treated)
- Severe psychological disorder

*ACSM

Parameters for Ambulation for Inpatient Cardiac Rehabilitation

- No new or recurrent chest pain in previous 8 hours
- Stable or falling creatine kinase and troponin values
- No indication of decompensated heart failure (e.g., resting dyspnea and bibasilar rales)
- Normal cardiac rhythm and stable electrocardiogram for previous 8 hours

*ACSM

Additional Exercise Considerations

- Heart Rate Reserve (HRR)
  - \(220 - \text{age} = \text{maximal heart rate}\)
  - \(\text{HRR} = \text{maximal heart rate} - \text{resting heart rate}\)
- Pulse Pressure
  - \(\text{Systolic} - \text{Diastolic}\)
  - Normal at rest approximately 40
- Rate Pressure Product
  - \(\text{Heart rate} \times \text{systolic blood pressure}\)
  - Peak is 25,000-40,000 in stress testing
Adverse Responses Leading to Exercise Discontinuation

- Diastolic blood pressure (DBP) ≥110 mm Hg
- Decrease in systolic blood pressure (SBP) >10 mm Hg during exercise with increasing workload
- Significant ventricular or atrial arrhythmias with or without associated signs/symptoms
- Second- or third-degree heart block
- Signs/symptoms of exercise intolerance including angina, marked dyspnea, and electrocardiogram (ECG) changes suggestive of ischemia

Disease Processes and Impact on Intervention

- DVT
- Heart Failure
- CAD/Metabolic Syndrome
- Sepsis
- Dehydration
- UTI
- Pneumonia

DVT

- IVC Filter: Mobilize
- Coumadin: INR 2-5
- Fondaparinux (Arixtra): 3 hours
- LMWH: 5 hours
- UFH: 48 hours
- NOACs: 3 hours
Heart Failure

- Prevalence increases with age
- Cardiac output does not meet metabolic needs of the body
- Valvular disease, CAD, cardiomyopathy (hypertrophic)
- Causes: Left ventricular ischemia due to CAD; HTN

Heart Failure

- Dyspnea, Tachypnea
- Peripheral edema
- Hypoxia
- Fatigue
- Orthopnea
- Activity Intolerance
- Exertional Dyspnea
- Fatigue

Coronary Artery Disease

- Higher prevalence in elderly
- Increased arterial stiffness and arterial wall thickness; endothelial dysfunction
- Can cause hypertension and subsequent heart failure
CAD
- Risk factors: inactivity and obesity increase with age
- Obesity increases: decreased activity level, caloric intake, decreased muscle mass, lower basal metabolic rate

CAD Symptoms
- Exercise intolerance
- Reports of angina
- ST depression or elevation
- Increased work of breathing
- Heart rate and blood pressure may increase
- Irregular pulse
- Tachypnea

Metabolic Syndrome
- Abdominal Obesity
- Triglycerides 150 mg/dL or greater
- HDL less than 40 mg/dL men and 50 mg/dl in women
- Systolic blood pressure 130 or greater or diastolic 85 mm HG or greater
- Fasting glucose over 100 mg/dL
Metabolic Syndrome
- Increased risk for cardiovascular events
- Increased risk for diabetes mellitus

Metabolic Syndrome
- Increased incidence of obesity with age
- Decreased activity level
- Decreased muscle mass
- Increased visceral fat

Sepsis
- Systemic bacteremia with or without organ dysfunction
- Pulmonary and renal systems most common
- 20% of hospital deaths
Sepsis
- Fever over 101.3
- Heart rate over 90 beats/minute
- Respiratory rate over 20 breaths/min
- Probable or confirmed infection

Sepsis Progression
- Decreased urine
- Mental status changes
- Decreased platelets
- Respiratory difficulties
- Changes in cardiac function
- Progression to shock: hypotension

Dehydration
- Hypertonic: greater loss of water than sodium
- Hypotonic: equal loss of water and sodium
- Isotonic: greater loss of sodium than water

Dehydration
- Hypertonic: greater loss of water than sodium
- Hypotonic: equal loss of water and sodium
- Isotonic: greater loss of sodium than water
Dehydration
- Confusion
- Tachycardia
- Hypotension/Orthostatic hypotension
- Weight loss
- Decreased balance and strength

UTI
- Primary cause is urinary stasis
- Leads to bacterial colonization
- Catheterization
- Most common infection among older adults

UTI
- Confusion
- Fever
- Change in burning, frequency, urgency
- Flank or suprapubic pain
- Change in characteristics of urine
- Change in mental status or function
Pneumonia

- Exudative accumulation, alveolar edema, consolidation
- Third leading discharge diagnosis for individuals between 64-85
- Second leading diagnosis over 85
- More common with age
  - Decreased mucociliary function
  - Decreased oropharyngeal clearance
  - Decreased immune response
  - Increased incidence of aspiration

Pneumonia

- Typical Signs
  - Fever, productive cough, yellowish-green or rust colored sputum
  - Increased WBC count, positive sputum culture
  - Chest X-ray
- Atypical Signs
  - Mental status changes
  - Anorexia
  - Decrease activity tolerance
  - Elevated Heart Rate
- Clinical Implications
  - Monitor for tachycardia, tachypnea, hypotension, dyspnea, desaturation

Case Study: Treat or Not to Treat

Patient is a 62 year old African American obese male (BMI 31 kg/m²), day 1 post myocardial infarction. Patient has a history of hypertension and hypercholesterolemia (patient somewhat compliant with medications). Current medications in the hospital include Inderol, Ticlid, and Lipitor. At rest heart rate is normal sinus rhythm 86 bpm (2-3 PVC’s per minute), blood pressure 146/92 mmHg, respiration rate 16 bpm, O₂ saturation 90% on room air. Patient complains of mild chest discomfort radiating into left arm and ST level is depressed by 1 mm. You are to begin Phase 1 cardiac rehabilitation.
Case Study: Treat or Not to Treat

Patient is a 46 year old obese male (BMI 38 kg/m2), waist measurement 43”, with type 2 diabetes. He is being seen in the acute care hospital 2 day post right leg amputation. He has just given himself an insulin injection and his blood glucose is currently 82 mg/dL. His resting heart rate is 114 bpm, he appears somewhat confused and anxious.

Case Study: Treat or Not to Treat

Patient is a 58 year old female who is receiving a bone marrow transplant following the diagnosis of leukemia. Prior to the transplant the physicians are inducing immunosuppression and trying to kill off neoplastic cells in her bloodstream and bone marrow. Her lab values reveal white blood cell count of 2,200/mm3, Hemoglobin of 7.4 g/dL, HCT 21%, platelets 3,200/mm3. Physiological measurements reveal resting heart rate of 114 bpm, blood pressure 114/64 mmHg, oxygen saturation 92% (on room air), respiratory rate 16 bpm.

Case Study: Treat or Not to Treat

Patient is day two post-CABG. Physiological measurements reveal resting heart rate of 94 bpm, blood pressure 114/64 mmHg, oxygen saturation 92% (on room air), respiratory rate of 16 bpm. With usual activity, the patient goes into sinus tachycardia rate of 110 bpm, blood pressure of 132/70 mm Hg, oxygen saturation 94% (on room air), respiratory rate of 20 bpm.
References

- Laboratory Values Interpretation Resource. (2017) Academy of Acute Care Physical Therapy—Acute Care Task Force on Lab Values