Clinical Decision Making in Acute Care Physical Therapy

Joe Collins, PT, DPT, MS, PCS  Nicole Gotta PT, DPT, PCS
Allison Hodgson PT, DPT  Katie Hoesly PT, DPT  Sangeeta Patankar PT, DPT, PCS

What is Acute Care Physical Therapy?

...much more than ankle pumps and walking!
Objectives

1. Identify the core competencies of acute care physical therapy
2. Discuss the benefits and patient factors impacting early mobilization in the ICU
3. Understand the importance of using standardized tests and outcome measures in acute care physical therapy practice
4. Recognize recommended outcome measures to quantify patient abilities, measure components of balance, and evaluate specialized patient populations
5. Differentiate the needs of patients and role of therapy across the lifespan
6. Apply clinical decision making strategies to patient case examples
Disclosure Information

We have no financial relationships to disclose
We have no conflicts of interest to disclose

Core Competencies

Figure 1

https://www.acutept.org/page/corecompetencies
Core Competencies: Clinical Decision Making

- Know your limits
- Observation of history and environment
- Screen medical record
- Appropriate examinations and interventions
- Constantly assess patient and adjust plan as needed
- Identify impairments, activity limitations, contextual factors etc
- Develop PT POC based on experience, evidence and patient preference
- Interventions to improve function, safe mobility and quality of movement to prepare pt for d/c

https://www.acutept.org/page/corecompetencies

Core Competencies: Communication

- Adjust based on age, learning style, cognition, culture
- Clearly communicate safe mobility status, need for ongoing services acutely, referral for OP services
- Clearly communicate need for initiation, continuation, withholding or discontinuation of services
- Maintain communication with patient, family and extended care team

https://www.acutept.org/page/corecompetencies
Communication

- Safety
  - Lab values
  - Lines, tubes etc
  - Age, learning style, cognition, culture

- Patient Management
  - Patient Family Centered Care (PFCC)
  - Frequency
  - Safe mobility status, positioning, HEP (specific protocol?)
    - Direct, white board, EMR
    - Consistency

- Discharge Planning
  - Location, equipment, services
  - 3.7x higher re-admit rate if PT not advising

Kadivar 2016

Core Competencies: Safety

- Review medical records before evaluation to determine precautions
- Include subjective report and vital monitoring to determine appropriateness for intervention, activity schedule and what to monitor
- How might movement or medications affect medical stability
- Ensure safe environment
  - Examples: Locking wheels, non-skid footwear, gait belt, clearing space, prepare for minimal mobility, position bed and chairs, locate all lines and tubes
- Assess line/tube precautions and pre-position patient and lines for mobility
- Independently manage all lines and know when to ask for help
- Manage all hospital equipment
- Respond to emergencies quickly and assist if needed

https://www.acutept.org/page/corecompetencies
Lab Values Interpretation

- The patient is more than their counts
  - Always assess the patient
- Trends
  - Look back the last few days or measurements
  - What time was lab drawn?
  - Has anything happened to explain the numbers?
- Risk vs Benefit
  - What could happen if level was out of range?
    - Know what that would look like
    - Is it worth it? How much could you gain from your session?
  - Short-term and long-term
- Acute vs chronic
  - More conservative with acute changes
  - Age Consideration


White Blood Cells

- Trending High (>11 billion/L)
  - Causes: cancer, infection, trauma, surgery, chronic inflammation, obesity
  - Presentation: fever, fatigue, bleeding, weight loss
  - Implications: symptom based, note fever, consider time of day
- Normal Range (5-10 billion/L)
- Trending Low (<1.5 billion/L and/or <1500 neutrophils/μL)
  - Neutrophils are infection fighting white blood cells
  - Causes: infection, radiation, stem cell disorder
  - Presentation: low grade fever, pneumonia
  - Implications: neutropenic precautions (esp with fever)
    - <500: severe risk
    - <1000: moderate risk
    - <1500 low risk
Platelets

- **Trending High (>450k/μL)**
  - Causes: inflammation, cancer, stress, infection
  - Presentation: weakness, headache, dizziness, chest pain
  - Implication: can lead to DVT

- **Normal Range (140-400k/μL)**

- **Trending Low (<150k/μL)**
  - Causes: infection, cancer, chemo, radiation, liver disease
  - Presentation: bruising, fatigue, risk for bleeding
  - Implications: significant risk for bleeding with falls
    - <50k/μL: no resistance exercise
    - <20k/μL: ADLs and AROM only

Hemoglobin(Hb)/Hematocrit (Hct)

- **Trending High**
  - Causes: CHD, dehydration, CHF, COPD, burns, high altitude
  - Presentation: orthostatics, dizziness, seizure, TIA, MI, headache, fever, fatigue
  - Implications: clogging capillaries, spontaneous blood clotting

- **Normal Range**
  - Hb: Male (14-17g/dL); Female (12-16g/dL)
  - Hct: Male (42-52%); Female (37-47%)

- **Trending Low**
  - Causes: hemorrhage, cancer, renal disease, sickle cell
  - Presentation: pallor, headache dizziness, cold hands/feet, SOB, dec endurance, tachycardia
  - Implications: Significant risk for syncopal episode
    - Hb<7 or <8 in hem/onc and Hct< 25% may need transfusion prior to mobilization
    - Hb<5-7 and Hct<15-20 is significant risk for cardiac failure and death
International Normalized Ratio (INR)

- Bleeding ratio/viscosity
  - Higher number → blood takes longer to clot
- Results vary based on your condition and which meds you’re on
- INR is a ratio to ensure consistency across different labs such as:
  - Prothrombin Time (PT)
    - Effectiveness of coumadin
  - Partial Thromboplastin Test (PTT)
    - Assess effectiveness of heparin
  - Anti-factor Xa assay
    - Effectiveness of lovenox

<table>
<thead>
<tr>
<th></th>
<th>Normal</th>
<th>Therapeutic for stroke prophylaxis</th>
<th>Therapeutic for DVT, PE, atrial fib</th>
<th>Therapeutic for prosthetic heart valve</th>
<th>Patients at higher risk for bleeding</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.8 - 1.2</td>
<td>2.0 - 2.5</td>
<td>2.0 - 3.0</td>
<td>2.5 - 3.5</td>
<td>&gt;3.6</td>
</tr>
</tbody>
</table>

Role of PT in Lab Values Interpretation

- Communication
  - Patient, family and nursing should know your recs
  - Patient tolerance to therapy (HB, HCT)
- Safety
  - Risk vs benefit
    - What could happen and is it worth the risk?
  - Fall risk
    - Greater during your session, or outside session if you don’t work with the patient?
- Patient Management
  - Mobility and HEP recs within precautions
- Discharge Planning
  - HEP recs based on levels
Lines, Drains, and Tubes

- **Lines**
  - IVs
  - Central lines and ports
  - Peripherally Inserted Central Catheter (PICC)
  - Hemodialysis access
  - **Pulse-oximetry**
  - **Telemetry**
  - **BP cuff**
  - Arterial line
  - Swan-Ganz (pulmonary artery)
  - Codman
  - Epidural

Lines, Drains, Tubes continued

- **Drains**
  - Jackson-Pratt (JP) drains
  - Subdural
  - Ventriculostomy
  - Lumbar drain
  - Urinary catheters
    - Foley
    - Suprapubic
    - Condom
Lines, Drains, Tubes continued

- Tubes
  - Chest tubes
    - with suction
  - Wound VAC
  - Feeding tubes (dobhoff, PEG, etc)
  - Orogastric tube (OG)
  - Ventilator/tracheostomy
  - ECMO

Cases

Vital Signs during treatment: What would you do?

1. Assist a patient to sit up at the edge of the bed and they report feeling lightheaded. BP 92/54 mmHg.
2. While starting to mobilize at edge of bed, patient reports dyspnea, with visible increased work of breathing, SpO2 is 85%.
3. Patient is resting in bed with HR 120 bpm. As they start to mobilize to edge of bed it increases to 146 bpm.
4. Patient with a head injury is intubated/sedated and unable to rate pain. During PROM and tone assessment, ICP is 26 mmHg.
Core Competencies: Patient Management

- Determine appropriateness for therapy and clearly communicate recommendations either way
- Thorough review of EMR
- Documentation that details your session and justifies treatment and is completed right after session
- Communicate session outcomes to patient and staff to carry over PT POC
- Use clinical judgement to know when more than documentation is needed to pass on information
- Perform re-evaluations as needed to update POC
- Need for Interventions based on length of stay, d/c destination, rate of expected improvement, does it require expertise of a PT

https://www.acutept.org/page/corecompetencies

Frequency Determination

- Do they need PT to clear for discharge?
- Are they at their functional baseline?
- What is the discharge plan and what support do they have?
- How quickly are they expected to recover?
- Are they likely to lose skills/function without skilled PT?
- How long will they be admitted (medical management)?
- How much education to they/caregivers require?
- Why not just see everyone, everyday?
Frequency Determination

<table>
<thead>
<tr>
<th>Consult  (1-2 Visits Total)</th>
<th>Occasional  (1-2 Visits Per Week)</th>
<th>Regular  (3-4 Visits Per Week)</th>
<th>Frequent  (5 Visits Per Week)</th>
<th>Intense  (6+ Visits Per Week)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients who present with:</td>
<td>Patients who present with:</td>
<td>Patients who present with:</td>
<td>Patients who present with:</td>
<td>Patients who present with:</td>
</tr>
<tr>
<td>Chronic impairments, medical conditions, and/or limited ability to participate in functional activities for those who are admitted for non-rehabilitation needs.</td>
<td>New or chronic impairments, medical conditions, and/or functional limitations.</td>
<td>Acute loss of functional skills due to new illness/injury and are making significant gains in functional status.</td>
<td>Acute loss of functional skills due to new illness/injury and are making significant gains in functional status.</td>
<td>Excellent potential for daily progress toward functional goals, recovery of functional mobility skills, and/or risk throwing skills if seen at a lower frequency.</td>
</tr>
<tr>
<td>No new documented loss of skill or new impairments, with little feasible potential for progress toward functional goals.</td>
<td>A potential for dally/weekly progress toward functional goals.</td>
<td>A high risk for deconditioning and loss of mobility without direct, skilled PT intervention.</td>
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<td>A high risk for deconditioning and loss of mobility without direct, skilled PT intervention.</td>
</tr>
<tr>
<td>Little to no risk for loss of skills due to pre-existing condition.</td>
<td>A risk for loss of skills due to prolonged hospitalization if not followed by a skilled PT.</td>
<td>A need for extensive family education on newly acquired loss of functional skills.</td>
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</tr>
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<td>A discharge status that is not dependent on PT training, intervention, or clearance.</td>
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<td>A possible need for assistance with referral to outpatient services or clinic to meet long-term needs, e.g., family/companion education, equipment recommendations, home modifications, referrals to resources in the community.</td>
<td>Currently receiving or will most likely be recommended for early intervention or outpatient services in the community upon discharge from the hospital.</td>
<td>A potential to be recommended for inpatient rehabilitation, day hospital, or high-frequency outpatient services upon discharge from the hospital.</td>
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Mobility Progression: Considerations Before you Begin

- **Communication:** Clearance for activity
  - Activity orders are in place
  - RN has given OK when applicable

- **Safety**
  - Move all lines and drains to the side you will be getting out of bed when able
  - Consolidate when you can, unplug when you can
  - Ask for assistance when appropriate
  - Gait belt, non-slip footwear, extra hands when needed, assistive devices
  - Body mechanics

- **Patient Management:** is the patient safe to proceed?
  - Strength/propricception assessment
  - Patient can follow commands or cues, if not, extra precautions are in place
General Mobility Progression

- Bed mobility
  - Rolling
  - Supine to sit/Sit to supine
  - Seated balance
- Transfers
  - Sit to stand/Stand to sit
  - Standing balance
  - Bed to chair (squat pivot, stand pivot, slide board, hover mat)
- Gait
  - Need for an assistive device
  - Dynamic balance assessment
- Stairs

Equipment

- Safety Equipment
  - Footwear: grip socks or shoes, orthotics, required bracing, prosthetic limb
  - Gait belt
- Ambulatory/Transfer devices
  - Walkers
    - 2 wheeled walker
    - 4 wheeled walker
    - Standard walker
    - Hemi walker
    - Platform walker
    - Knee scooter
  - Crutches
    - Axillary (standard or Mobilegs)
    - Platform crutch
  - Canes
Equipment continued

- Transfer devices
  - Sara Stedy (non mechanical sit to stand device)
  - Sara Plus (mechanical sit to stand device)
  - Slide Board
  - Pivot disk
  - Hover Mat
  - Hoyer lift/Ceiling lift

- Wheelchairs
  - Standard
  - Lightweight
  - Tilt in space
  - Power

Safe Patient Handling

- Physical Therapists and Physical Therapist Assistants are at high risk for work-related musculoskeletal injury
  - Some studies report rates as high as 90% over a career
  - Other disciplines rely on recommendations by PT and PTA as to safe transfer techniques

- New research dispels the myths that use of safe patient handling equipment (sit to stand, ceiling lifts, pivot disk, etc) can impede a patient’s rehabilitation

- Some studies have even demonstrated improved patient mobility outcomes with use of SPH equipment as compared to manual patient handling in certain populations

Darragh 2014
Core Competencies: Discharge Planning

- Decide on where they go, amount of support needed and need for PT
- Is patient safe based on cognition and function
- Equipment needs: walker, wheelchair, hospital bed, crutches, ramp etc
- Specific patient needs: PLOF, age, home set-up, caregiver support, risk for re-admit
- Outside influence from family, MDs, insurance etc.

Discharge Planning

- Goal is to enhance high quality care by ensuring patients discharge to settings that support their health and social needs.
- Therapists must consider:
  - Prior level of function vs current level of function
  - Social situation and home setup
  - Therapy goals and prognosis vs patient goals
- Appropriate discharge planning may improve efficiency of care and reduce costs
- Physical therapists make accurate discharge recommendations

Smith 2010
Discharge Disposition: Adults

- Inpatient (Acute) Rehab
  - Willing and able to participate in at least 3 hours of therapy/day (PT, OT, speech)

- Long Term Acute Care Hospital (LTACH)
  - Patients are medically complex
  - Can receive PT/OT/speech but frequency varies

- Skilled Nursing Facility (SNF)
  - Patient is not safe to d/c home and requires ongoing therapy

- Home
  - Home Health PT
    - Requires a skilled PT need
    - Frequency is intermittent, typically 1-3x/week
  - Outpatient PT
    - Safe to d/c home but not back to baseline level of function
    - Requires specialty PT offered only in clinic (vestibular rehab, specialized gait analysis)

Discharge Disposition: Pediatrics

- Outpatient vs Home Health vs Birth to 3
  - Recommendations for f/u therapy should be based on the need, medical acuity, caregiver ability

- School based services
  - IEP vs 504

- Inpatient Rehabilitation
  - Same rules that apply for an adult rehabilitation programs

- Long term programs
Predictors for Readmission

- 30 day readmission rate is used as a quality indicator for acute care hospitals
  - Financial penalties are associated with higher than expected rates
- Communication has been identified as a major barrier for readmission
- PT recommendations for d/c are often considered specifically for disposition
- Safety with mobility or need for assistance with ADLs is not communicated
- Information on PT reported outcome measures is not looked at
- Hospital acquired deconditioning can often be a cause for readmission
- Children with CHD and ASA
  - Physical status class ≥ 3 (relate to presence of systemic disease), inpatient status at the time of surgery, and at least 1 postoperative complication of any system were at greatest risk for 30-day postsurgical readmission
- Patients are 2.9x more likely to be readmitted when PT recommendations are not implemented or recommended follow-up services were not received (Smith 2010)

https://www.asahq.org/standards-and-guidelines/asa-physical-status-classification-system
Discharge Equipment Considerations

- Ensure that you choose the least restrictive assistive device to allow a patient to access their home environment while adhering to all restrictions and recommendations
- Acute vs Chronic
  - May indicate a rental item versus a purchase item
- Understand how a patient’s insurance or financial burden may limit options
  - Convenience vs Necessity
    - Knee scooters, mobilegs, and forearm crutches are generally considered items of convenience and are not covered by Medicare
  - Out of pocket options
    - Amazon, Walgreens, Walmart, consignment stores
    - LoanClosets.org

CMS: National Coverage Determination

- Chapter 280: Medical and Surgical Supplies
  - Section 280.1 Durable Medical Equipment Reference List
    - Somewhat comprehensive list of covered or denied DME
  - Section 280.3 Mobility Assistive Equipment
    - Algorithm outlining clinical criteria for MAE coverage
    - Take home: what is the least restrictive assistive device needed when a patient has mobility limitations that significantly impact their ability to safely perform mobility-related activities of daily living in the home
  - Section 280.4 Seat Lift
  - Section 280.7 Hospital Beds
Discharge: Insurance Implications

- Importance of timely and accurate documentation
  - Insurance plans may require therapy notes within 24 hours of discharge
  - Need to continually justify the need for ongoing skilled Physical Therapy
- Appealing an insurance decision
  - Generally requires a face to face with the MD
- Implications of Bundled Payments
- Financial Responsibility

Car Seat Considerations

- All children under 4’9” require a child passenger restraint
- Need to be 13+ y/o to sit in the front passenger seat
- Special needs:
  - Spica cast → Hippo car seat or EZ-On vest
  - Unable to be upright → car bed or modified EZ-On vest
  - Angle tolerance test recommended with a change in respiratory status or new need for oxygen

Resources:
- American Academy of Pediatrics: most recent policy statement Nov 2018 [https://pediatrics.aappublications.org/content/142/5/e20182460](https://pediatrics.aappublications.org/content/142/5/e20182460)
Summary

- Clinical decision making
- Communication
- Safety
  - Lab values
  - Tubes, lines and drains
- Patient Management
  - Frequency determination
  - Mobility progression
  - Equipment decisions
- Discharge
  - Disposition
  - Equipment
  - Preventing readmission

Core Competencies in Practice: ICU Liberation

ABCDEF Bundle

- A: assess, prevent, and manage pain
- B: both spontaneous awakening trials and spontaneous breathing trials
- C: choice of analgesia and sedation
- D: delirium - assess, prevent, and manage
- E: early mobility and exercise
- F: family engagement and empowerment

Every 10% increase in compliance with the ABCDEF bundle predicted:

- 15% higher chance of survival
- 15% chance of being delirium and coma free the following day
Benefits of Early Mobilization in the ICU Setting
Core Competency: (Expedite) discharge planning

- Decrease ICU and hospital LOS
- Reduce ICU-acquired weakness
  - 3% to 11% strength loss occurs for every day in bed in an ICU setting
- Improved functional recovery within hospital and at time of discharge
- Faster results and improved outcomes with earlier involvement of PT

Barriers
Core Competency: Communication (breakdowns and strategies for solution)

- Anticipated risk
- Delirium/agitation
- ETT
- Femoral lines
- Lack of communication
- Lack of time, equipment, staff, and resources
- Medical procedures/orders
- Pain
- Physiological instability
- Psychological state
- Safety
- Sedation
- Unclear expectations
- Unit culture

Facilitators

- Analgesia prior to mobilization
- Anticipated benefits
- Dedicated staffing
- Delirium screening and management
- Equipment availability and training
- Family engagement and education
- Management of physiological instability
- Mobility guidelines/protocol
- Safety criteria for ventilated patients
- Sedation protocol
- Sleep
- Staff increase, education, and upskilling
- Team meetings, planning, and communication
Contraindications to Early Mobilization
Core Competency: Safety

- Active bleeding
- Cerebral edema with *uncontrolled* ICP
- Hemodynamic instability
  - Maintain MAP>60 mm Hg
  - Hypotension SBP<90 mm Hg
  - Tachycardia HR>130 beats/min
  - Pacer dependent with transvenous temporary pacemaker
  - Require escalating dose or multiple vasopressors
  - Unstable cardiac rhythm
- Oxygenation dysfunction
  - Desaturation with positioning
  - Respiratory rate>35 breaths/min
- Unstable fractures
- Femoral access
  - Intra-aortic balloon pump on femoral artery
  - ECMO with femoral cannulation
  - Femoral arterial sheath
- Neuromuscular blockade
- Open chest/open abdomen

What Does Mobility Look Like in the ICU?
Core Competency: Patient Management

1. Untangle, create slack, and secure lines
   - Portable monitor, oxygen, suction, etc.
1. Initiate bed exercise
1. Sit the patient on the edge of the bed
   - Assess for pain and orthostatic bp
1. Assist seated patient to standing
1. Initiate walking
   - Keep a chair close to the patient
   - Utilize support staff to push wc, IV pole
1. Seat and rest the patient as needed

- In-bed mobility
  - Passive ROM exercises
  - Turning side to side/rolling
  - Sitting on the edge of the bed
  - Active strengthening exercises

- Out of bed mobility
  - Sitting in a chair
  - Standing at bedside
  - Walking
  - Biking (stationary, cycle ergometer, tricycle, scooter/push toy)

- Constant assessment of the patient, monitor, and lines
Risk vs. Benefit Analysis
Core Competency: Clinical Decision Making

<table>
<thead>
<tr>
<th>Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>Low risk of an adverse event. Proceed as usual according to each ICU’s protocols and procedures.</td>
</tr>
<tr>
<td>Yellow</td>
<td>Potential risk and consequences of an adverse event are higher than green, but may be outweighed by the potential benefits of mobilization. The precautions or contraindications should be clarified prior to any mobilization episode. If mobilized, consideration should be given to doing so gradually and cautiously.</td>
</tr>
<tr>
<td>Red</td>
<td>Significant potential risk or consequences of an adverse event. Active mobilization should not occur unless specifically authorized by the treating intensive care specialist in consultation with the senior physical therapist and senior nursing staff.</td>
</tr>
</tbody>
</table>

Fig. 1 Expert consensus color coding definitions for safe early mobilization of mechanically ventilated patients [15]

Considerations *Before* Mobilizing
Core Competencies: Putting it all together

- PLOF preceding ICU admission
- Level of alertness
- Hemodynamic stability
- Vasoactive medications
- Ventilation/oxygenation needs
- Risk vs. benefit
- Equipment needs
- Timing
Considerations *During* Mobilization

Core Competencies: Putting it all together

- Therapeutic level of activity
- Pain
- WOB
- Level of alertness
- Goal-oriented activities
- Regular, short periods of activity
- Do NOT delay or defer activity even if if extubation is planned that day
- Do NOT delay or defer activity due to agitation that can be managed

Considerations *to Stop* Mobilizing

Core Competencies: Putting it all together

- Patient becomes unresponsive
- Respiratory rate consistently > 10 beats/min above baseline
- Fatigued or appears pale
- Decreased muscle recruitment
- Loss of balance
- Decreased weight-bearing ability
- Diaphoresis
Example of Mobility Algorithm

Morris 2008 as cited by Society of Critical Care Medicine

Example of Mobility Algorithm

<table>
<thead>
<tr>
<th>Patient Categories</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Activity Order</strong></td>
<td>Bedrest</td>
<td>Chair 2x daily, comment cardiac chair</td>
<td>Level 2 activity, and: Dangle, other (or frequency determined with PT/OT/RN)</td>
<td>Level 3 activity, and: Lower extremity weight bearing, as tolerated</td>
</tr>
<tr>
<td>Entered in Health Link by RN</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Patient Activity</strong></td>
<td>Passive ROM QD</td>
<td>Level 1 activity, and: Active/assisted ROM Cardiac chair, sitting position minimum 30 minutes BID. Goal up to 1 hour BID.</td>
<td>Level 2 activity, and: Active ROM Cardiac chair, sitting position minimum 1-2 hours BID Sitting on edge of bed as coordinated by PT/OT/RT</td>
<td>Level 3 activity, and: OOB transfer per therapy recommendations, minimum 20 minutes as appropriate. Exercises and functional activity as recommended by therapy staff</td>
</tr>
<tr>
<td></td>
<td>(initiated by RN/NA per written program) Q 2 hour turning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Suggested Equipment</strong></td>
<td>Ceiling Lift or Air assisted lateral transfer device (HoverMatt*).</td>
<td>Ceiling Lift or Air assisted lateral transfer device (HoverMatt**).</td>
<td>Ceiling Lift with Seated Sling Gait Belt</td>
<td>Sit to Stand Gait Belt</td>
</tr>
<tr>
<td><strong>Therapist (PT and/or OT)</strong></td>
<td>MD order OT/PT consult when pt can do 1 or more of following: o open eyes and track upon command o gesture or attempt to communicate by head nod or consistent blinking o squeeze hand and/or wiggle toes consistently X3</td>
<td>PT/OT consult o active/assisted ROM, frequency individualized</td>
<td>PT/OT consulted o exercise, mobility, functional activities</td>
<td>PT/OT consulted o functional/advance with therapy treatment plan of care as appropriate</td>
</tr>
<tr>
<td><strong>Progression to Next Level</strong></td>
<td>Pt remains on Level 1 until exclusion criteria resolved or MD order</td>
<td>Pt remains on Level 2 until able to move arm against gravity or per PT/OT &amp; RN assessment</td>
<td>Pt remains on Level 3 until able to move leg against gravity or per PT/OT &amp; RN assessment</td>
<td></td>
</tr>
<tr>
<td><strong>Return to Level 1 anytime patient has exclusion criteria</strong></td>
<td></td>
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Krupp 2011
Outcome Measures

Standardized Tests and Outcome Measures (STOM)

- Hallmark of Evidence Based Practice
  - Compare patient status over time
  - Help patients to recognize changes
  - Inform CDM when making D/C recs
  - Assist with insurance reimbursement

- Without use of STOM, clinical recs and resource allocation based on
  - Excessive variability, error and bias

- Jette 2009 article
  - Survey of PTs in all practice areas
  - 47.8% of PTs use STOM
  - Only 16% of acute care PTs (lowest of any practice area)

- No more functional reporting requirement from medicare
  - As of January 1, 2019
  - PT/OT/SLP are now included in Merit-based Incentive Payment System (MIPS)
Barriers to STOM use

- Lack of time to
  - Determine which measure to use
  - Administer, score and interpret results
- Lack of financial compensation
- Lack of knowledge/training on tests
- Lack agreement on which STOM to use
- Lack access to STOM

Facilitators of STOM use

- Opinion Leaders
- Knowledge of clinimetrics
- Support in use of STOM
- Incorporate into EMR
- Active educational initiatives
- Expertise and professional support
- Mandatory reporting
- Printed materials
- “Setting-specific implementation strategies based on reported barriers and facilitators”
  Van Peppen 2008

Knowledge Translation

- Use evidence-based STOM more consistently
  - Choose correct test
    - Mandatory reporting
    - Local consensus
  - Administer correctly and efficiently
    - Printed cheat sheets
    - Local training
- Improve interpretation of STOM
  - Incorporate into medical record software
  - How does this fit in to clinical decision making?
Use STOM More: Choosing the Correct Test

- Mandatory Reporting
  - Must perform STOM on every patient
    - Perform a specific test for every patient
      - AMPAC
    - Perform appropriate test based on pt diagnosis and function
      - Given list, you decide which one
      - Perform your choice of test for every patient
- Local Consensus Process
  - Create committee to select a small set of STOM (~5-10)
  - Defined group of acceptable STOM improves efficiency
    - Captures different domains of acute care
  - Sense of ownership/stakeholder engagement
  - STOM studied in acute care setting
  - APTA Evaluation Database to Guide Effectiveness (EDGE)

Use STOM More: Administer Correctly and Efficiently

- Provide printed materials
  - Laminated pocket cards or badge backers
    - Populations, test items, other considerations
  - Easily accessible
- Interactive Educational Sessions
  - Importance of using STOM
  - List of chosen tests
    - Proper administration, clinical decision making in acute care
  - Ongoing journal clubs, case presentations etc to continue conversations
- Make time to administer and score
  - Easy to administer with minimal equipment
Improve Interpretation of STOM

- Incorporate into medical record software
  - Automatically cued to input score
  - Automatically flows into your note
  - Population norms, minimal detectable change, relevant cutoffs (fall risk etc)

- Auditing and feedback
  - Peer review > case study
  - Looking back through medical records to see
    - How often STOM was used
    - Interpretation of STOM

- How does this fit in to clinical decision making?
  - Discharge disposition
  - Change in function over time
  - Short- or long-term functional progression
  - Fall risk

STOM used in McDonnell article

<table>
<thead>
<tr>
<th>Standardized Tests and Outcome Measures</th>
<th>Advantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timed &quot;Up and Go&quot;*</td>
<td>Supported by EDGE™; Predicts fall risk</td>
</tr>
<tr>
<td>Six-Minute Walk Test*</td>
<td>Supported by EDGE and American Thoracic Society; Prognostic cutoff scores</td>
</tr>
<tr>
<td>Opington Prognostic Scale*</td>
<td>Supported by EDGE; Designed for use in acute care; Prognostic cutoff scores; Discharge disposition prediction</td>
</tr>
<tr>
<td>Physical Function ICU Test (score)*</td>
<td>Designed for use in acute care; Availability of MDC</td>
</tr>
<tr>
<td>Mobility score*</td>
<td>Designed for use in acute care; Prognostic cutoff scores; Discharge disposition prediction</td>
</tr>
<tr>
<td>Dynamic Gait Index*</td>
<td>Supported by EDGE; Applicable to large patient population; Predicts fall risk; Availability of MDCs/MCIDx</td>
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</tbody>
</table>

Activity Measure for Post-Acute Care (MMI, FAC+Clinic™)
- Applicable to any patient population
- Designed for use in acute care
- Discharge disposition prediction
- Availability of MDCs/MCIDx
- Easy conversion in C-code modifiers

Confusion assessment method ICUP®
- Designed for use in acute care
- Prognostic cutoff scores

Comfortable walking space®
- Supported by EDGE
- Applicable to large patient population
- Availability of MDCs/MCIDx
- Prognostic cutoff scores
- Discharge disposition prediction
- Valid/ reliable in acute care

Performance Oriented Mobility Scale®
- Predicts fall risk

*EDGE = Evaluation Database to Guide Effectiveness; ICU = intensive care unit; MDC = minimal clinically important difference; MDC = minimal clinically important difference; MDC = minimal clinically important difference.

McDonnell 2018
Where to Go From Here

- Ideas for first steps
  - Choose the correct test
    - Agree on a small number of tests to start with
    - Consider pocket cards
  - Administer correctly and efficiently
    - Printouts available?
  - Interpret accurately
    - Incorporate into EMR
Boston University AM-PAC™

- System for measuring activity limitations
  - ICF model: “difficulty in execution of a task or action by an individual”
  - Tracks changes in function across care settings
- Provides quantitative scores
- Can provide important clinical information
  - Screening for rehab services
  - Assess changes from admission to discharge
  - Use data to inform quality improvement efforts
  - Guide hospital discharge planning
- Need to purchase

AM-PAC™

- Measuring activity limitation
  - Three domains of function
  - Basic Mobility
    - Transfer, Bend/Carry/Lift, Locomotion with Device, Ambulation
  - Daily Activity
    - Feeding, Meal Preparation, Grooming/Dressing
  - Applied Cognitive
    - Communication, Print Information, Complex Instruction
- Short Forms
  - Inpatient
  - Outpatient
  - Surgical Screening
AM-PAC™ “6-Clicks” Basic Mobility Inpatient Short Form

How much help from another person does the patient currently need...

1. Turning over in bed?
2. Sitting down on and standing up from a chair with arms?
3. Moving from lying on back to sitting on the side of the bed?
4. Moving to and from a bed to a chair?
5. To walk in a hospital room?
6. Climbing 3-5 steps with a railing?

AM-PAC™ Inpatient “6-Clicks” Short Form

Scoring

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-Tot</td>
<td>Requires total A (completes &lt;25% of task), cannot do at all, requires assist x2</td>
</tr>
<tr>
<td>2-A  lot</td>
<td>Requires mod-max A ( completes &gt;25%, &lt;75% of task)</td>
</tr>
<tr>
<td>3-A little</td>
<td>Supervision, min A (completes &gt;75% of task)</td>
</tr>
<tr>
<td>4-None</td>
<td>Independent, does not require any help</td>
</tr>
</tbody>
</table>
Example of AM-PAC™ in EMR

AM-PAC™ Basic Mobility Inpatient Short Form
Henry A. Claxton was assessed today using the AM-PAC™ Basic Mobility Inpatient Short Form in the areas of bed mobility, transfers, ambulating and stair climbing. Scoring for each area is from 1 to 4.

1. Turning over in bed: Score: 3 - A little
2. Sitting down on and standing up from a chair with arms: Score: 2 - A lot
3. Moving from lying on back to sitting on the side of the bed: Score: 3 - A little

How much help from another person does the patient currently need?
4. Moving to and from a bed to a chair: Score: 2 - A lot
5. Need to walk in hospital room: Score: 2 - A lot
6. Climbing 3-5 steps with a railing: Score: 1 - Total

Total Raw Score (Calculated): 13
t-Scale Score (Calculated): 33.99
CMS % (Calculated): 57.65%

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Patients scoring above a scaled score of 42.9 on the AM-PAC™ Basic Mobility Inpatient Short Form (raw score of 17-18) are more likely to discharge to home following their acute care hospitalization.


AM-PAC™ “6-Clicks” Basic Mobility Inpatient Guidelines

- If an item was NOT observed, use clinical judgement to score
- If patient’s status fluctuates throughout the day, score based on what was observed when patient was evaluated
- Can use an assistive device for any activity and not affect score
- Cannot use rails for bed mobility
  - If unable to place HOB flat due to orders/restrictions, use clinical judgement
- Assistance required ONLY to manage medical devices (IV pole, catheter bag, etc.) is NOT considered in score
- If you do not feel comfortable turning your back on a patient and walking away, they are NOT independent
AM-PAC™ “6-Clicks” Basic Mobility Inpatient Psychometric Properties

- Reliability
  - Overall reliability ICC = .849
  - SEM = 3.16
  - MDD = 7.36

- Validity
  - Correlated AM-PAC discharge scores with FIM scores on admission to inpatient rehab, r=.69
  - SRM = 1.06
  - Internal consistency = .957

Jette 2015, Jette 2013

AM-PAC™ “6-Clicks” and Hospital Discharge Recommendations

- Scores after first visit can be useful objective measure to increase accuracy of discharge recommendations
- Basic mobility cutoff score = 42.9
  - Scores >42.9 more appropriate for discharge to home with services
  - Scores <42.9 more appropriate for discharge to rehab facility
- “Fair to good” accuracy for predicting discharge destination

Jette 2014
PEDI-CAT

- Measures ability in 3 functional domains
  - Daily activity
  - Mobility
  - Social and cognitive
- Intended age group: birth-20 y/o
- Can be used in all settings across a variety of clinical diagnosis
- Strongly linked to activity and participation component of the ICF
- Scoring
  - Normative scores based on chronological age
  - Scaled scores for current functional skills and change over time
- Applications
  - Identification of functional delay
  - Examination of improvement for an individual child after intervention
  - Evaluation and monitoring of group progress in program evaluation and research

Wee-FIM

- Direct derivative of the FIM
- 18 measurement items in 3 domains
  - Self care
  - Mobility
  - Cognition
- Rated on a 7 level ordinal scale
- 6 months - 7 years old
  - Can be used in children older than 7 y/o if their functional abilities are below 7 years of age
- WeeFim 0-3 is a parental questionnaire or report
- Excellent validity in a variety of patient populations
- Excellent interrater reliability
- Does not replace comprehensive motor, communicative or cognitive assessments

https://www.pedicat.com/
Balance: Umbrella Term

- Combination of proactive predictive and reactive mechanisms related to achieving maintaining and restoring balance
- “Foundation for all voluntary motor skills” (Huxham 2001)
- “Ability to control center of mass relative to base of support” (Sibley 2017)
- Postural control
  - Achieving and maintaining a desired body position statically and dynamically
- Equilibrium Control
  - Maintaining stability despite forces acting against the body (Verbeque 2014)
- Despite definition it is supremely relevant in acute care
  - Will your patient fall if discharged?

Acute Care Balance Tests

- Static Balance Testing
  - Basic Balance Tests
  - 4 Stage Balance Test
  - Berg Balance Scale
  - Pediatric Balance Scale (PBS)*
- Dynamic Balance Testing
  - Dynamic Gait Index (DGI)*
    - 4-Item DGI
  - Functional Gait Assessment (FGA)
- Sensory Integration
  - Modified CT-SIB
- Functional Testing
  - 5x Sit to Stand/30 second sit to stand*
  - Gait Velocity
  - Four Square Step Test
  - Timed Up and Go*
    - +Dual task
  - 6 Minute Walk Test*

*Validated in pediatrics

https://www.sralab.org/rehabilitation-measures
Balance Testing in Pediatrics

- Lack of good methodological studies
  - Lack of criterion standard to measure against for validity
- Expected changes in balance by age
- Less cut off scores established
- Not validated in all populations
- Combining balance tests for most complete evaluation
  - PBS (static)
  - TUG or DGI (dynamic)

Static Balance Testing:
Four Stage Balance Test

- Standing balance:
  - Feet together
  - Semi tandem
  - Tandem
  - Single Leg Stance
- If patient can hold the static balance position for 10 seconds without moving their feet, move onto next position
- Individuals who cannot hold tandem stance for at least 10 seconds are at increased risk of falls
- Individuals who are unable to perform single leg stand for 5 seconds are at increased risk of injurious falls

Phelan 2015
Static Balance Testing: Pediatric Balance Scale (PBS)

- Aka BBS but for pediatrics
  - Very subtle differences
- Tested on kids 2-15 yo
- Kids younger than 3 had difficulty following directions
- Typical 7yo has ceiling effect
- Minimal detectable change
  - Children with CP: 1.59 points
- Minimal clinically important difference
  - Children with CP: 5.83 points

<table>
<thead>
<tr>
<th>Age range</th>
<th>Cut off</th>
</tr>
</thead>
<tbody>
<tr>
<td>2y om to 2y 5m</td>
<td>23.5 points</td>
</tr>
<tr>
<td>2y 6m to 2y 11m</td>
<td>32.7 points</td>
</tr>
<tr>
<td>3y om to 3y 3m</td>
<td>45.4 points</td>
</tr>
<tr>
<td>3y 6m to 3y 11m</td>
<td>47.5 points</td>
</tr>
<tr>
<td>4y om to 4y 3m</td>
<td>48.5 points</td>
</tr>
<tr>
<td>4y 6m to 4y 11m</td>
<td>50.4 points</td>
</tr>
<tr>
<td>5y om to 5y 3m</td>
<td>53.2 points</td>
</tr>
<tr>
<td>5y 6m to 5y 11m</td>
<td>52.8 points</td>
</tr>
<tr>
<td>6y om to 6y 5m</td>
<td>53.3 points</td>
</tr>
<tr>
<td>6y 6m to 6y 11m</td>
<td>54.6 points</td>
</tr>
</tbody>
</table>

Franjoine 2010

Dynamic Balance Testing: Functional Gait Assessment (FGA)

- Modification of DGI
  - walking around obstacles
  - + tandem walking, eyes closed, retro walking
- Cut off Scores
  - Community-dwelling older adults
    - Scores ≤22/30 are effective at predicting falls (Wrisley & Kumar, 2010; Beninato et al. 2014)
  - Parkinson’s Disease
    - Scores ≤18/30 identifies increased falls risk (Yang et al. 2014)
Dynamic Balance Testing: Dynamic Gait Index - Considerations in Pediatrics

- Same 8 items as used with adults
- Validated for kids 8 and older
- No norms
- No MDC or MCID for children
- Instruction Modifications
  - Demonstrate all items except #1
  - “Normal walking should be given a concrete goal”
  - Look to one side and then the other
  - Tell children not to use railing if they don’t have to

Functional Balance Testing: Timed Up and Go (TUG)

- Patient starts sitting in chair with back against chair back
- On the command “Go” patient stands up from chair, walks three meters at a comfortable but safe pace, turns, walks back to chair, and sits down
  - Can use assistive device
- Falls risk cutoff scores
- Addition of dual task
  - Serial subtraction
  - Naming task
  - Carry cup of water in one hand
  - Months of year backward

<table>
<thead>
<tr>
<th>Population</th>
<th>Cut-off Score Indicating Falls Risk (seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke (older)</td>
<td>&gt;14</td>
</tr>
<tr>
<td>Frail Elderly</td>
<td>&gt;32.6</td>
</tr>
<tr>
<td>LE Amputation</td>
<td>&gt;19</td>
</tr>
<tr>
<td>Community-dwelling Adults</td>
<td>&gt;13.5</td>
</tr>
<tr>
<td>Parkinson's Disease</td>
<td>&gt;11.5</td>
</tr>
<tr>
<td>Hip OA</td>
<td>&gt;10</td>
</tr>
<tr>
<td>Vestibular Disorders</td>
<td>&gt;11.1</td>
</tr>
</tbody>
</table>

Shumway-Cook et al. 2000
Functional Balance Testing: Timed Up and Go (TUG)

- Reliable in children without disability 3-9 years and with physical disability 3-19 years
- Responsive to change over time
- Must be able to follow directions

<table>
<thead>
<tr>
<th>Age</th>
<th>Male Distance (m)</th>
<th>Female Distance (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-5</td>
<td>536.5 ± 95.6</td>
<td>501.9 ± 90.2</td>
</tr>
<tr>
<td>4</td>
<td>Both 383 ± 41</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>494 ± 60</td>
<td>506 ± 39</td>
</tr>
<tr>
<td>6</td>
<td>535 ± 73</td>
<td>546 ± 51</td>
</tr>
<tr>
<td>7-8</td>
<td>520 ± 69</td>
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</tr>
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<td>9</td>
<td>516 ± 81</td>
<td>543 ± 80</td>
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<td>498 ± 74</td>
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<td>11</td>
<td>534 ± 89</td>
<td>532 ± 92</td>
</tr>
<tr>
<td>12</td>
<td>685 ± 74</td>
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<td>639 ± 49</td>
<td>622 ± 76</td>
</tr>
<tr>
<td>14</td>
<td>684 ± 81</td>
<td>622 ± 64</td>
</tr>
<tr>
<td>15</td>
<td>690 ± 71</td>
<td>626 ± 49</td>
</tr>
<tr>
<td>16</td>
<td>680 ± 55</td>
<td>629 ± 52</td>
</tr>
<tr>
<td>16+</td>
<td>726 ± 61</td>
<td>664 ± 50</td>
</tr>
</tbody>
</table>

5 years: M 6.98 ± 1.1, F 7.2 ± 1.1
6 years: M 6.8 ± 1.2, F 6.8 ± 1.1
7 years: M 6.8 ± 1.1, F 6.8 ± 1.2
8 years: M 6.1 ± 1.1, F 6.6 ± 1.2
9 years: M 5.9 ± 0.9, F 6.4 ± 1.0
10 years: M 6.1 ± 1.0, F 6.3 ± 0.9
11 years: M 6.2 ± 1.0, F 6.7 ± 0.8
12 years: M 6.7 ± 1.1, F 6.8 ± 0.8
13 years: M 7.2 ± 1.0, F 7.1 ± 1.1
14-18 years: 5.0 ± 0.9


Functional Balance Testing: 6 Minute Walk Test

- 3-18 year olds with CP, spina bifida, down syndrome, DMD
- May use back and forth pattern in hallway if 100 feet long
- IV pole, etc. limits feasibility

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Summary

- Clinical decision making
- Communication
- Safety
  - Lab values
  - Tubes, lines and drains
- Patient Management
  - Frequency determination
  - Mobility progression
  - Equipment decisions
- Discharge
  - Disposition
  - Equipment
  - Preventing readmission

- Standardized Tests and Outcome Measures
  - How to choose the correct test
  - How to interpret the results

Patient Case Examples
Case Discussion

- Communication
- Safety
- Patient management
- Frequency
- Outcome measures
- Discharge recommendations

Orthopedics: Common Conditions

Elective Procedures
- Joint replacement
- Spine: fusions, laminectomy, discectomy
- Arthroscopic repair
- Amputation
- SEMLS (pediatrics)
- VDRO (pediatrics)

Traumatic Procedures
- Lower extremity fracture
- Spinal fracture
- Strain/sprain
- Amputation
- Hip spica (pediatrics)
- SCFE (pediatrics)
Orthopedics: Precautions and Special Considerations

- Weight bearing or ROM restrictions
- Activity restrictions
- Orthotics and prosthetic recommendations
- Pediatric Considerations
  - Crutches vs walker
  - Wheelchair for school
  - Access to elevator
  - Transportation
  - Extra passing time in school

Orthopedics: Outcome Measures

- AM-PAC “6 clicks”
- 10 Meter Walk Test
- 2 Minute Walk Test
- Harris Hip Score
- Self Paced Walk Test
Orthopedic Trauma Case Example: Adult

- 63 year old female, pedestrian vs car (hit and run), -LOC
- Injuries include:
  - R tibial plateau fracture, R greater trochanter fracture
  - R distal radial/ulnar fracture
  - L humeral neck fracture
  - Facial lacerations, R thigh and distal leg abrasions (road rash)
- POC: R tibial plateau fx emergently approximated with external fixator, all other fractures unfixed due to soft tissue swelling
- Activity orders: RUE through elbow WB, LUE NWB in sling at all times, RLE NWB in knee immobilizer at all times, LLE WBAT

Orthopedic Trauma Case Example: Pediatrics

- 11 year old boy involved in a MVA
- Injuries include
  - C5-6 ligamentous injury
  - Left clavicle fracture- WBAT
  - Left radius/ulna fracture- NWB through FA
  - Right pelvic ring fracture- in external fixator, WBAT
  - Right femur fracture- s/p IMN, WBAT
- Lives in a 2 story house with 5 steps to enter
- Lives with mother but can only be of minimal assistance
- 6th grade student with classes on 2 different levels
- At initial evaluation pt. Is limited by pain and anxiety
- He was able to come to the edge of bed on day of evaluation
- You are seeing him on day 2 of his hospitalization...
Neuro: Common Conditions

- Neurosurgery
  - Craniotomy
    - Tumor resection
    - Chiari decompression
  - Aneurysms: coiling, clipping
  - Brain bleeds: SAH, SDH, ICH
  - TBI
  - SCI
  - Spine surgeries
  - Neuroendovascular stroke treatment
  - NPH: Lumbar drain trials, VP shunt
  - Selective dorsal rhizotomy
  - Intrathecal baclofen
  - Tethered cord release

- Neurology
  - Stroke/TIA
  - Multiple sclerosis flare
  - Guillain-Barre/AIDP
  - Seizures/Epilepsy monitoring
  - Parkinson’s disease
  - Amyotrophic lateral sclerosis
  - Functional neurological disorder
  - Spinal muscular atrophy

Neuro: Precautions and Special Considerations

- Craniotomy: No bending, lifting >10#, if no bone flap no lying on that side
- Ventriculostomy: RN must clamp before mobilizing, or adjusting height of bed/head of bed, ICP monitoring
- Cerebral angiogram/coiling/stenting: No lifting >10#, avoid excessive hip flexion, no vigorous activity
- Aneurysm (unprotected): Limit light/noise to patient tolerance, avoid resistive exercise or Valsalva
- Cognitive/communication considerations
  - Aphasia
  - Confusion
  - Command following
Outcome Measures for Adults with Neurologic Impairments
Clinical Practice Guideline Acute Neurologic Conditions

- Static and Dynamic Sitting and Standing Balance
  - Berg Balance Scale: Level I Evidence, Strong Recommendation
- Walking Balance
  - Functional Gait Assessment: Level I Evidence, Strong Recommendation
- Balance Confidence
  - Activities-Specific Balance Confidence (ABC) Scale: Level I Evidence, Strong Recommendation
- Walking Speed
  - 10 Meter Walk Test: Level V Evidence, Best Practice Recommendation
- Walking Distance
  - 6 Minute Walk Test: Level V Evidence, Best Practice Recommendation
- Transfers
  - 5 Times Sit to Stand: Level V Evidence, Best Practice Recommendation

Neuro: Outcome Measures continued

- EDGE Acute Care Recommendations
  - Stroke
  - Multiple Sclerosis
  - Traumatic Brain Injury
  - Parkinson's Disease
  - Spinal Cord Injury
  - Vestibular
- Pediatrics
  - Pediatric Balance Scale
  - WeeFIM
  - PEDI-CAT

Moore 2018

http://www.neuropt.org/professional-resources/neurology-section-outcome-measures-recommendations
Neuro Case Example

- 85 year old male admitted with acute onset R-sided weakness and aphasia
  - CT revealed L internal carotid artery (ICA) occlusion, L MCA stroke with vasogenic edema
- PMH: Transient ischemic attack (TIA), carotid stenosis, COPD
- Currently in ICU
- s/p L ICA stenting and angioplasty
- PLOF: Lives alone, son lives down the street.
  - One story house, 4 STE, has a cane he’s “supposed to use”
  - History of multiple falls without injury

Oncology: Common Conditions

- Initial dose of chemo for new diagnosis when already hospitalized
- High dosage Cisplatin
- High-dose MTX protocols
- Intraperitoneal chemotherapy
- Induction therapy for acute leukemia
- High-dose chemo +/- SCT/BMT
- Severely emetogenic chemo
- Ifosfamide therapy
- Radiation + chemo combo
- Comorbidities
- Certain treatment programs or protocols
Oncology: Precautions and Special Considerations

- Bone METS
- Infection risk
- Lab values
- Low grade fevers
- Contraindications to therapy
  - Hgb $\leq 7$ (functional activities in room only)
  - New and/or active bleeding
  - Low platelets with hypertension
- Side effects
  - Cancer related fatigue
  - Chemotherapy induced cognitive impairment
  - Chemotherapy induced peripheral neuropathy
  - GVHD
  - Lymphedema
  - Medication side effects
  - Radiation fibrosis syndrome

### Chemotherapy Agent

<table>
<thead>
<tr>
<th>Chemotherapy Agent</th>
<th>Rehab Related Toxicities and Side Effects</th>
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<tbody>
<tr>
<td>Anthracycline antibiotics (e.g. Doxorubicin, Daunorubicin, Idarubicin, Mitoxantrone)</td>
<td>Cardiotoxicity, myelosuppression, N/V, mucositis, severe tissue damage with extravasation, radiation recall reactions</td>
</tr>
<tr>
<td>Asparaginase (PEG, E- asparaginase)</td>
<td>Anaphylaxis, neutropenia, immunosuppression, malaise, hyperglycemia, thrombosis or PE, renal dysfunction, CNS complications including somnolence, weakness, lethargy, coma, seizures</td>
</tr>
<tr>
<td>Cisplatin</td>
<td>N/V, appetite loss, hearing loss</td>
</tr>
<tr>
<td>Clofarabine</td>
<td>N/V, anemia, neutropenia, thrombocytopenia, abdominal pain, edema, fatigue, rigors, arthralgia, myalgia, dizziness, tremor, confusion, anxiety, depression, irritability, respiratory distress, hyper or hypotension, tachycardia, transient ventricular systolic dysfunction, multi-organ failure</td>
</tr>
<tr>
<td>Corticosteroids (e.g. Prednisone, Prednisolone, Dexamethasone, Hydrocortisone, Methylprednisolone)</td>
<td>Acute: infection, emotional instability, insomnia, increased appetite, weight gain, hyperglycemia, Na+ retention, HTN, bone damage, muscle disease</td>
</tr>
<tr>
<td>Long term: eye problems, Cushingoid state, compression fracture, growth suppression, adrenocortical and pituitary unresponsiveness, osteoporosis, osteonecrosis, muscle wasting</td>
<td></td>
</tr>
<tr>
<td>Cyclophosphamide</td>
<td>Marrow suppression, cardiac toxicity, N/V, immunosuppression, pulmonary fibrosis, SIADH, anaphylaxis, secondary neoplasm</td>
</tr>
<tr>
<td>Cytarabine</td>
<td>Myelosuppression, leukopenia, thrombocytopenia, N/V, mucositis, liver dysfunction, fever, muscle and bone aches, sudden respiratory distress</td>
</tr>
<tr>
<td>Etoposide</td>
<td>Myelosuppression, N/V, mucositis, hypotension, fever, anaphylaxis, peripheral neuropathy, secondary leukemia</td>
</tr>
<tr>
<td>Methotrexate</td>
<td>BM suppression, severe diarrhea, acute nephrotoxicity, N/V, blisters, photosensitivity, anaphylaxis, encephalopathy, pneumonitis, vasculitis</td>
</tr>
<tr>
<td>Rituximab</td>
<td>Allergic reaction, reactivation of infections</td>
</tr>
<tr>
<td>Thioguanine</td>
<td>Myelosuppression, N/V, hyperuricemia</td>
</tr>
<tr>
<td>Vinca alkaloids (e.g. Vinoreistine, Vinblastine)</td>
<td>Neurological: stomach pain, gastroparesis, ptosis, vocal cord paralysis, weakness, jaw pain, abdominal pain, peripheral neuropathy, loss of DTR, foot drop, muscle pain, myelosuppression, hypotension, visual disturbances, auditory damage, acute SOB or bronchospasm</td>
</tr>
</tbody>
</table>
Oncology: Outcome Measures

- **Balance**
  - Fullerton advanced balance scale
  - Pediatric balance test
  - SLS

- **Functional testing**
  - Timed up and go
  - Timed up and down stairs
  - 6MWT

- **Musculoskeletal**
  - Foot alignment
  - Gastroc length
  - Hand grip, core, quadriceps, and dorsiflexors strength

- **Chemotherapy induced cognitive impairment**

- **Chemotherapy induced peripheral neuropathy**

- **EDGE task force**

- **Lymphedema CPG**

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Oncology Case Example

- 10 y/o with PMH significant for chronic ITP with new diagnosis of T-cell ALL

  - **Initial encounter**
    - Lab values: WBC 6.7, RBC 4.1, Hg 11.1, Hct 32, platelets 356
    - Lines: new PICC line in RUE, patient holding RUE in mid guard position due to pain
    - Social: parents are divorced and do not get along, patient splits time between both homes, mom pulls PT aside prior to entering patient’s room crying, states family hasn’t told patient yet about diagnosis

  - **Treatment course**
    - ~3 years including IT chemo, high dose MTX, steroids, and Vincristine
    - Due back for inpatient treatment in 4 months
Oncology Case Example continued

- Admitted 1 month after diagnosis for vomiting
  - Lines: no longer has PICC, now with Hickman catheter
  - Mobility and balance unable to assess due to spinal headaches and patient on contact isolation precautions

- Admitted 3 months later for scheduled chemo
  - Multiple tripping episodes and one “obvious” fall when wearing Ugg boots
  - Has not been able to attend school or participate in extracurricular activities
  - Lab values: WBC 3.9, RBC 3.3, Hg 9.6, Hct 27, platelets 45
  - Having hallucinations due to MTX toxicity
  - Due back for inpatient chemo every 2 weeks x 4 cycles

Cardiopulmonary: Common Conditions

- Adult conditions and procedures
  - Congestive Heart Failure
  - Angio/Stenting
  - CABG
  - Valve Replacements
  - Lung Resection
  - Lung Transplant
  - Heart Transplant
  - LVAD
  - Arrhythmias/Pacemaker placement

- Congenital conditions and procedures
  - Single ventricle physiology
    - Norwood procedure
    - Glenn procedure
    - Fontan procedure
  - BT shunt
  - Hypoplastic left heart syndrome
  - Tetralogy of Fallot
  - Transposition of great arteries
  - Holes in the heart
    - ASD
    - VSD
    - PDA
Cardiopulmonary: Precautions and Special Considerations

- Sternal
- Pacemaker
- LVAD
- Thoracotomy
- Hemodynamic status
- ECMO
- Cardiac rehab

Cardiopulmonary: Outcome Measures

- 6MWT
- Additional outcome measures as appropriate
Cardiac Surgery Case Example

- 62 y.o male admitted in cardiac arrest
  - 30 minutes CPR
    - Resultant bilateral rib 4-8 fractures
  - Immediately to cath lab, demonstrated severe CAD with 4 vessel involvement
- s/p emergent CABG x4
- PMH: DM 2, CAD, +smoker, COPD, obese
- Social History
  - 250# with large body habitus
  - Sedentary lifestyle
  - Lives with wife, but on disability for back injury

Geriatric: Common Conditions

- Infection (Pneumonia, UTI)
- Dyspnea
- Failure to thrive (weakness)
- Influenza
- Altered Mental Status
- Congestive Heart Failure
- COPD exacerbation
Geriatric: Precautions and Special Considerations

- Delirium
- High fall risk

Geriatrics: Outcome Measures

- Self Selected Walking Speed - Strong evidence
- Six Minute Walk Test - Strong evidence
- Timed Up and Go - Strong evidence
- 5 Time Sit to Stand Test or 30 Second Sit to Stand - Stronger evidence for 5TSTS, but both are valuable
- Sitting Balance Scale - Limited evidence, but better for low level patients
- Berg Balance Scale - Strong evidence
- Fullerton Advanced Balance Scale - Good evidence, higher level patients
- Elderly Mobility Scale - frail or homebound patients
- Fall Efficacy Scale - Strong evidence
Geriatric Case Example

- 92 year old female, admitted for weakness/malaise (1 fall at home, no obvious injuries), found to have a UTI
- PMH/PSH: osteoarthritis, bilateral TKAs from 20 years ago, HOH (wears hearing aids at baseline)
- Patient is oriented to person but not to place, situation, or time
- Social History: Lives in independent living (w/c accessible), meals are provided, has a cleaning person, uses a 4WW all the time
- Objectives: Strength 3+/5 in bilateral LEs, daughter reports recent neuropathy in feet (pt unable to follow instructions for MMT or sensory/proprioception assessment)

Infant: Common Conditions

- Congenital anomalies/conditions requiring observation for routine procedures
- Congenital heart disease
- Failure to thrive
- Feeding difficulty
- Hyperbilirubinemia
- Hypoxic ischemic encephalopathy (HIE)
- Neonatal Abstinence Syndrome (NAS)
- Non-accidental trauma
- Prematurity
- Respiratory distress
  - RSV bronchiolitis
- Seizures
- Surgery
Infant: Precautions and Special Considerations

- Prolonged hospital stays
  - Negative impact on development
  - Parents value focus on development during a prolonged admission
- Head shaping
  - Deformities caused by mattress, respiratory interface, infant containers, lack of tummy time
  - Long term developmental implications
- Role of providers
  - Maximise functional ability and sense of well being
  - Maximise developmental potential and quality of life
  - Multidisciplinary approach
  - Create optimal environment to promote development
- NICU
  - Developmental age
  - No stretching/ROM for premature infants due to developing tone
  - APTA practice guidelines recommend 2 years of pediatrics experience first

Infant: Outcome Measures

- General Movement Assessment (GMA)
  - Pre term, term, and 3 months
- Test of Infant Motor Performance (TIMP)
  - 34 weeks to 4 months
- Peabody developmental motor Scale (PDMS)
  - Birth to 5 years
- Alberta Infant Motor Scale (AIMS)
  - Birth to 18 months
  - Norm referenced observational measure
  - 4 positions: supine, prone, sitting standing
  - Can be used for screening, assessment, treatment guidance
  - Has been shown to detect motor delay in infants term through 18 months of corrected age
Infant Case Example

- 6 month old baby admitted for failure to thrive, evaluation of need for G tube
- Mother does not have any developmental concerns, not receiving any services. Family is Hmong speaking
- On initial exam, baby appears very hypotonic, also with brachycephaly
- Baby is unable to roll or sit independently

Fast forward 6 months...
- Multiple admissions for respiratory illness
- Admitted to the PICU
- Unable to extubated and requires tracheostomy
- On f/u re evaluation, ongoing hypotonia, developmental delay

Thank You!
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