Rehabilitation of the Poly-Trauma Patient

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Polytrauma

- No universal definition but incorporates injuries to several body regions.
- Trauma is one of the main causes of disability in adults of working age: 45 million worldwide experience moderate to severe disability secondary to trauma
- Kahn et al 2011

Medically Complex Patient

- 60 Million Americans have multiple morbidities, expected to be 81 million by 2020.
- Classified as 3 or more chronic conditions such as:
  - Obesity, Diabetes, Heart Disease, Hypertension, Cancer, OA
- Smith et al 2010

What is Polytrauma? According to the VA

- Polytrauma occurs when a person experiences injuries to multiple body parts and organ systems often, but not always, as a result of blast-related events. TBI frequently occurs in polytrauma in combination with other disabling conditions, such as amputation, burns, spinal cord injury, auditory and visual damage, spinal cord injury (SCI), post-traumatic stress disorder (PTSD), and other medical conditions. Due to the severity and complexity of their injuries, Veterans and Service Members with polytrauma require a high level of integration and coordination of clinical care and other support services.
Polytrauma

Polytrauma injuries lead to
• Physical
• Cognitive
• Psychological
• Psychosocial
• Functional Impairments

Management: Multidisciplinary team with extensive rehabilitation.

Rehabilitation Guidelines:
Extends past Acute care, re integrating the patient back to functional activities.
Typically the longest phase of their recovery, so it's important to set goals that are realistic and established by both patient and healthcare team. (Including community health professional when discharged home)
Rehab can cause emotional stress to patient, frustration with not being able to perform at the level prior to injury.

Exercise is Medicine
Lumbar Neutral

Trunk Stabilization

Pelvic/Hip Stabilization

Hip Abduction Strengthening

Postural Chain Reset

1. Open Hands
2. Extend Fingers
3. Extend Thumbs
4. Extend Wrist
5. Supinate
6. Externally Rotate
7. Extend Elbows
8. Extend Arms
9. Retract Scapula
10. Slowly return

Facilitate phase chain to reset posture by balancing postural muscles
BALANCE

Return to Functional Activities

The missing link!

Center of Gravity

- Center of Gravity (COG) –
  - The vertical projection of center of mass

Base of Support

- Base of Support (BOS) - area of the body that is in contact with the support surface
**Center of Pressure**

- Center of Pressure (COP)
  - center of distribution of total force applied to support surface

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**Limits of Stability**

Maximal angle a person's body can achieve from vertical without losing balance. How well can you control your Center of Gravity (COG) once it is outside your Base of Support (BOS)?

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**Automatic Postural Reactions (APR)**

APRs precede voluntary movement and are not modified by conscious effort.
Automatic Postural Control

- **Static** – control of COM relative to BOS under unperturbed conditions
  - Training static with balance platform:
    - Weight shift, Moving Target, Stability Training
- **Reactive** – ability to recover postural control after an unexpected perturbation
  - Training reactive with balance platform:
    - Limits of Stability, Random Motion
- **Pro-Active (Anticipatory)** – ability to modify postural control prior to a potentially destabilizing movement in order to avoid instability
  - Training pro-active with balance platform:
    - Pong, Breakout, Tilt Board

Components of Balance

- **Musculoskeletal** – the functioning of muscles and bones in moving joints to control stability
  - Range of Motion
  - Strength
  - Endurance
  - Muscle Tone
  - Alignment
  - Kinetic Chain
  - Ground Reaction Forces
Components of Balance

Central Set
- Prepares motor system for upcoming sensory input and prepares the sensory system for upcoming motor movement
  - Anticipatory mechanisms regarding change in posture
    - Expected/unexpected conditions
  - Cognitive processing
    - Attention - postural control is not wholly automatic, requires some amount of attention/Info processing
    - Dual-tasking - more than 1 task at a time (sensory processing and performance on 1 or more tasks will decline)
    - Adaptation - reactive postural control
    - Confidence/Balance - fear of falling: loss of postural control

Environmental
- Outside influences effecting our postural stability
  - Terrain
    - uneven ground, sand
  - Objects in path
    - furniture, people
  - Home environment
    - stairs, throw rugs, pets

Motor Coordination
- Gross and fine motor movement and motor planning
  - How the brain and musculoskeletal system communicate in response to changes in balance
  - Movement strategies
Movement Strategies

**ANKLE** – small displacement of COG around ankle joint

**HIP** – larger displacements of COG, and ankle motion limited

**STEP** – a large enough displacement causes a change of the BOS with step forward or backward

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Components of Balance

**Sensory Organization**

Senses position of the head in space and sudden changes in direction or movement of the head.

**SENSORY ORGANIZATION**

**VISION**

Senses light, creating images from the light and creating a multidimensional representation of the images.

Interprets signals from the peripheral sensory system to the brain to create a reaction.

Types of Patients

**Balance**

- Post-surgical, Orthopedic, Sports injuries
- Dementia, Alzheimer’s, Concussion
- Vertigo, Vision, Proprioception
- MS, Parkinson’s, Neuropathies
- Geriatric, Weekend Workers

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Exercise to prevent falls in older adults:  
An updated meta-analysis and best practice  

Recommendations:  
1. Clear evidence that falls in older people can be prevented with appropriate intervention.  
2. Exercise as a single falls prevention are comparable to those from multifaceted intervention.  
3. 42% of falls can be prevented by well-designed exercise programs  

Best Practice Recommendations  
1. Exercise must provide a moderate or high challenge to balance.  
   - Reducing the base of support: bipedal, tandem, single leg stance  
   - Movement of the center of gravity: control of the body’s position while standing, weight shift, mobility, stability platform  
   - Reduce the need for upper body support: decrease reliance on the arms, progress to one hand then one finger touching.  

2. Exercise must be of a sufficient dose to have an effect!  
   - Evidence-based research shows a bigger effect on falls from programs that involved a higher dose of exercise.  
   - Exercise needs to be undertaken for at least 2 hours per week for 6 months to show gains including both group and home-based exercises.
Best Practice Recommendations

3. Ongoing exercise is necessary.
4. Fall Prevention exercise should target the general community as well as those at high risk.
5. Fall prevention exercises may be undertaken in a group or home based setting

Clinical Test of Sensory Integration of Balance

CTSIB is an accepted test protocol for balance assessment for baseline screening for the following reasons:
1. Evidence based research supporting and accepting the CTSIB as a valid clinical assessment of balance.
2. Documented definitive correlations for mild TBI.
3. Comprehensive to address each of the systems that contribute to balance. Vision, Somatosensory, Vestibular.
4. Ease and efficiency for performing test with high inter and intra rater reliability.
5. Clinician familiarity with the test(1-11)

Weight Bearing
Questions/Answers

What can you do with this?

Thank you
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