TRAUMA IN ELDERS: APPLYING EVIDENCE TO ACUTE CARE PRACTICE

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DISCLOSURES

- The presenters have no potential conflicts of interest to report.

INPATIENT REHABILITATION SERVICES
BETH ISRAEL DEACONESS MEDICAL CENTER
BOSTON, MA
LEARNING OBJECTIVES

- Recall how the aging process leads to physiological changes that compromise the ability of elders to respond to the stress of injury.
- Explain the PT’s role in reviewing medications and their potential impact upon health, impairments, functional limitations, and disabilities.
- Apply a hypothesis-driven examination strategy to initial evaluation of an elder after trauma in the hospital setting.
- Appreciate the risk factors for development, tests for screening and interventions to treat hospital-acquired delirium.
- Create therapeutic interventions of proper intensity to address a variety of common impairments in elders who have been hospitalized after trauma.
- Recognize the value of utilizing standardized tests and outcome measures to help drive clinical decision-making.

WHY GERIATRIC TRAUMA?

EPIDEMIOLOGY

- Those aged 65 or over.
- The most rapidly growing segment of the population.
- By 2050, this number of geriatric individuals is expected to grow to 2 billion.
- Living longer and leading more active lifestyles.

(Tieland, 2017)
GERIATRIC TRAUMA

- Elders are more susceptible to injury.
- Pre-existing comorbidities
- Pre-existing impairments in body structure and function
- Leading Causes:
  - #1 Falls
  - #2 Motor vehicle accidents
- Traditional trauma outcomes are not applicable to elders.
- Under-triage: Elders are less likely to receive care in trauma centers.
- 9th leading cause of death amongst the elderly, BUT:
  - 35% of trauma healthcare expenditures

(Gaebel, 2017; Brooks, 2017)

WHAT HAPPENS AS WE AGE THAT MAKES US VULNERABLE?

PHYSIOLOGICAL CHANGES

- Connective Tissue Changes
  - Decreased water content
  - Increased stiffness
  - Decreased strength
  - Decreased cross-sectional area and volume

- Joint Structure and Function Changes
  - Limited healing
  - High load activities/occupations = OA
  - Decreased water content in discs
  - Increased stiffness and decreased ROM

(Guccione, 2011)
Boney Changes
- Increased osteoclast activity, decreased osteoblast activity
- Decreased ability to absorb load
- Increased risk of fracture with age

Muscular Changes
- Atrophy of muscle mass and strength
- Muscle mass replaced with fat mass
- Slowing of contractile properties
  - Type II fast twitch atrophy faster than Type I slow twitch
- Decreased force production
  (Guccione, 2011)

Cardiovascular Changes
- Loss of heart rate variability
- Cardiac function declines by 50% by the time we are 80
- Stiffer myocardium = Decreased pump effectiveness
  - Decreased cardiac output

Pulmonary Changes
- Anatomic, muscular and connective tissue changes
  - Ineffective pulmonary system
  - Decreased ability to fight off post-operative complication

Neurological Changes
- Cortical atrophy
- Plaque build up
  (Sharma, 2006; Vigorito, 2014)

Other Changes
- Endocrine Changes
  - Decreased Vitamin D
  - Decreased Estrogen and Testosterone
  - Increased Insulin resistance
  - Malnutrition
  - Altered Drug Metabolism
  (Guccione, 2011)
SO WHAT DOES THIS MEAN FOR ELDERS?

PHYSIOLOGICAL FRAILTY PHENOTYPE

- Weight Loss
- Exhaustion
- Physical Activity
- Walk Time
- Grip Strength

(Bellal, 2014; Fried, 2001)

APPLICATION TO PT
ICF MODEL

- Impairments in body structure and function:
  - ROM
  - Strength/Force Production
  - Joint/Mobile/Injury
  - Posture
  - Endurance
- Activity Restrictions
  - Impaired balance
  - Impaired gait
  - Impaired ADLs
- Participation Restrictions
  - Family roles
  - Occupational roles
  - Leisure roles
  - Loss of independence

MRS M.

87 year old female admitted s/p fall down stairs
- Found down by her sister
- + Loss of consciousness
- Sustained several injuries
  - Non-displaced fractures of maxillary wall
  - L orbital floor fracture, small L subdural hematoma
  - L 8th and 9th rib fractures.
  - Hypotensive on admission
  - Found to have urinary tract infection

PAST MEDICAL/SURGICAL HISTORY

- Ventricular arrhythmia s/p pacemaker placement
- Mitral regurgitation
- Coronary artery disease s/p stents 2014
- Congestive heart failure (ischemic cardiomyopathy with reduced ejection fraction: 25%)
- Hypertension
- Hyperlipidemia
- Gallstone pancreatitis s/p laparoscopic cholecystectomy
- Hard of hearing in right ear
- s/p hysterectomy
- s/p back surgeries (unknown)
IMAGING

- Chest XR: L posterolateral 8th and 9th rib fractures

LABS

- WBC: 8.7
- Hgb: 8.0*
- Hct: 25.4*
- Plt: 242
- Cr: 1.3*
- BUN: 30*
- Positive Urine Culture (Klebsiella Oxytoca)

WHAT DO WE WANT TO LEARN ABOUT MRS M?
PATIENT INTERVIEW

- Social and Work History
- Living Situation
- Baseline functional and activity level
- Detailed information regarding falls: frequency, symptomatology, situational information
- Medications and management
- Screening for psychosocial considerations (depression, neglect, abuse)

SOCIAL/FUNCTIONAL HISTORY

- Retired. Previously employed in various jobs. Enjoys crafting.
- Two story home with 10 steps to enter with bilateral railings.
- Right ear (doesn't use hearing aide), no visual aids
- History of falls, usually about 2/year, but reports 2 in past 2 weeks.
APTA POSITION STATEMENT

“Physical Therapist patient/client management integrates an understanding of a patient's/client's prescription and nonprescription medication regimen with consideration of its impact upon health, impairments, functional limitations, and disabilities.”

https://www.apta.org/uploadedFiles/APTAorg/Payment/Medicare/Coding_and_Billing/Home_Health/Comments/Statement_MedicationManagement_102610.pdf

WHY IS MEDICATION MANAGEMENT AN IMPORTANT CONSIDERATION WITH ELDERLY?

<table>
<thead>
<tr>
<th>AGE-RELATED CHANGES</th>
<th>POLYPHARMACY</th>
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<tr>
<td>- Increased distribution</td>
<td>- The use of multiple medications by a patient</td>
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<tr>
<td>- Natural decline of renal and hepatic function</td>
<td>- Varying definitions of number of medications (range 5-10)</td>
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<tr>
<td>- Larger drug storage and decreased clearance = increased plasma concentrations</td>
<td>- In a 2003 survey 46% of Medicare beneficiaries were taking 5 or more medications</td>
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<tr>
<td>- Increased sensitivity</td>
<td>(Fried et al, 2014)</td>
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</table>

CONSEQUENCES OF POLYPHARMACY

- Increased health care costs
- Adverse drug reactions
- Drug interactions
- Non-adherence
- Cognitive Impairments
- Falls
- Urinary incontinence
- Poor nutrition
- Functional decline
POLYPHARMACY AND FALLS

Kojima et al, 2012:
- Followed 172 patients for two years and documented fall occurrence (by self report).
- Falls were associated with older age, osteoporosis, number of comorbid conditions and number of medications.
- Number of medications (5 or more) was an independent predictor of falls.

AMERICAN GERIATRICS SOCIETY BEERS CRITERIA POTENTIALLY INAPPROPRIATE MEDICATIONS

- Anticonvulsants
- Antipsychotics
- Benzodiazepines
- Eszopiclone, Zaleplon, Zolpidem (Non-benzodiazepine Hypnotic Agents)
- Tricyclic Antidepressant Agents (TCAs)
- Selective Serotonin Reuptake Inhibitors (SSRIs)
- Opioids (excludes pain management due to recent fracture or joint replacement)

(McKee et al, 2015

MRS M: HOME MEDICATIONS

- Plavix 75 daily
- Atorvastatin 20mg daily
- Metoprolol 100mg twice daily
- Losartan 50mg daily
- Ranexa 500mg SR q12hours
- Spironolactone 25mg daily
- Lasix 40mg daily
- Lantanoprost 0.005% eye drops, both eyes q HS
PATIENT INTERVIEW

- Social and Work History
- Living Situation
- Baseline functional and activity level
- Detailed information regarding falls: frequency, symptomatology, situational information
- Medications and management
- Screening for psychosocial considerations (depression, neglect, abuse)

DEPRESSION

- > 1 in 10 elders in the US has depression.
- This frequency increases in elders with chronic illness. (Steffens, 2009)
- Association with poor physical performance
- 970 non-depressed elders in Italy, followed for 4 years
- Associated identified between poor performance at baseline and the development of depression (Veronese et al, 2017)

ATTITUDES AND BELIEFS ABOUT DEPRESSION IN ELDERS

- 58% believe it is a normal part of ageing.
- 38% believe it is a health problem.
- 42% would seek help from a health professional.
HYPOTHESIS-DRIVEN EXAM

- Targeted impairment-level testing
- Standardized outcome measures

Goals:
1. Make a clear connection from Pathology to Activity to Participation.
2. Determine etiology of falls.

WHAT ARE THE PRIORITIES OF HER PHYSICAL EXAM?
IMPAIRMENT LEVEL TESTING: COGNITION

- Alert and oriented to self, birthdate, place, date and situation.
- Follows all simple and 2 step commands with single verbal cue.
- Hard of hearing.

Is this good enough?

IMPAIRMENT LEVEL TESTING: COGNITION

- Increased age
- Sensory deprivation (visual/hearing impairment)
- Sleep deprivation
- Social isolation
- Physical restraint
- Use of bladder catheter
- Polypharmacy (>3 new meds added)
- Use of psychoactive drugs
- Malnutrition and low serum albumin

- Pain
- Co-morbidities
- Severe illness (especially infection, fracture or stroke)
- Prior cognitive impairment
- Temperature abnormality (fever or hypothermia)
- Dehydration
- Pre-fracture ADL functional impairment

(INouye, 1996; National Institute for Health and Clinical Excellence, 2010; Leslie, 2008)

DELIRIUM: DEFINITION

DSM-IV criteria for a formal diagnosis of delirium:

- Disturbance of consciousness with reduced ability to focus, shift or sustain attention
- Change in cognition or perception that is not explained by a pre-existing, established or evolving dementia
- Acute onset and fluctuating course
- Evidence of an underlying general medical cause

3 Types

- Hyperactive
- Hypoactive
- Mixed
DELIRIUM: CONSEQUENCES

- Mortality
- Duration (Belizaire, 2014)
- Discharge to location other than home including admission to long-term care (Busse, 1998)
- Emotional distress for caregivers and patients (Brodaty, 2002)
- Prolonged cognitive impairment (>1 year) (Weiner, 1998)
- ICU delirium has been closely associated with and loss in independence in ADLs for up to one year following hospitalization (Brummel, 2014)
- Poor functional outcomes in post acute care settings (Kaye, 2006)

DELIRIUM: DIAGNOSIS

- Delirium diagnoses are missed in up to 46-50% of cases. (Ryan, 2013; Kishi, 2007)
- Detection rates are even lower in hypoactive cases. (Fang, 2008; Voyer, 2007)

DELIRIUM: ROLE OF PT IN EARLY IDENTIFICATION

- Months Backwards Test
  - Pass
    - Under 60 years old: state all months without omission/within 30 seconds
    - Over 65 years old: state all months without omission/within 60 seconds
  (Meagher, 2015)
IMPAIRMENT LEVEL TESTING: HEMODYNAMIC RESPONSE CONSIDERATIONS

- Goal directed: What are you looking for?
- Positional Tolerance
- Activity Tolerance
- Pulmonary Tolerance
- Assessing a baseline is crucial.
- Consider the position of the patient.

MRS. M’S VITAL SIGNS

<table>
<thead>
<tr>
<th>Activity</th>
<th>Heart Rate</th>
<th>Blood Pressure</th>
<th>Respiratory Rate</th>
<th>SpO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rest, Supine</td>
<td>80</td>
<td>112/46</td>
<td>16</td>
<td>98% 2L NC</td>
</tr>
<tr>
<td>Rest, Sitting</td>
<td>88</td>
<td>100/54</td>
<td>28</td>
<td>92% RA</td>
</tr>
<tr>
<td>Rest, Standing</td>
<td>92</td>
<td>92/48</td>
<td>28</td>
<td>92% RA</td>
</tr>
<tr>
<td>Ambulation, Standing</td>
<td>96</td>
<td>100/52</td>
<td>24</td>
<td>86% RA, 94% 2L NC</td>
</tr>
<tr>
<td>Recovery</td>
<td>80</td>
<td>110/52</td>
<td>15</td>
<td>96% 2L NC</td>
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</tbody>
</table>
INTEGUMENTARY

- Bilateral LE 2+ pitting edema distal to knee to foot
- Bilateral LE hypertrophic toe nails
- Bruising noted throughout L thorax and under chin

FUNCTIONAL PERFORMANCE

- Bed mobility: MinA with use of bed rail
- Sit to stand: minA, required multiple attempts
- Ambulation: 50' x2 with RW and CGA, seated break
  - Decreased step length and cadence with wide base of support
  - Flexed posture with inability to achieve full hip extension
- Stand to Sit: minA 2/2 poor eccentric control

MUSCULOSKELETAL FINDINGS

POSTURE
- Flexed trunk with increased thoracic kyphosis, scapular protraction

STRENGTH
- Bilateral UEs grossly 3+5, limited by pain from rib fractures
- Bilateral LEs 4/5, suspect B hip extensors weakness which were observed to be weak with both ambulation and stand to sit

ROM
- WFL bilateral UEs/LEs except bilateral ankle D/F to neutral only

SENSATION
- Denies paresthesias, bilateral great toe proprioception intact
PAIN

INTENSITY
- 7/10 rest
- 9/10 mobility/deep breaths
- 8/10 recovery

LOCATION
- L thorax

QUALITY
- Constant, worst with deep breaths and mobility
- Sharp, aching

PULMONARY EXAM

- Gas Exchange: impaired with ambulation, requires supplemental O2 via nasal cannula
- Ventilation: impaired with incentive spirometer noted to 500mL
- Thoracic Excursion: impaired, decreased excursion L > R
- Cough Strength/Effectiveness: weak, congested cough, non-productive of sputum
- Auscultation: crackles noted throughout posterior lungs, diminished L > R

WHAT DOES ALL OF THIS INFORMATION MEAN?
INITIAL INTERVENTIONS
MINIMIZE RISK OF DELIRIUM

Delirium is preventable in 30–40% of cases

(Inouye, 1999)

EVIDENCE BASED INTERVENTION:
BEST PRACTICE STATEMENT FROM THE AMERICAN GERIATRICS SOCIETY

- Sensory enhancement (utilizing glasses, hearing aids, or listening amplifiers.)
- Mobility enhancement (ambulating at least twice per day if possible.)
- Orientation protocols
  - Provision of clocks, calendars, windows with outside views, verbally reorienting patients may mitigate confusion that results from disorientation in unfamiliar environments.
- Cognitive stimulation (tailored to the individual’s interests and mental status.)
  - Regular visits from family and friends. Crossword and other puzzles. TV News.
  - Sensory overstimulation should be avoided, particularly at night.
  - Nutritional and fluid repletion enhancement.
  - Sleep (daytime sleep hygiene, non-pharmacologic sleep protocol, and nighttime routine.)
  - Medication review.
  - Minimization of restraints and tethers.

(Inouye, 2015)

INITIATE EARLY DISCHARGE PLANNING
EVIDENCE BASED INTERVENTIONS: DISCHARGE PLANNING

- 30% of patients reported having received < 1 day advance notice of discharge. (Horwitz, 2013)
- Poorly coordinated transitions of care can lead to:
  - Adverse medication events
  - Patient and caregiver dissatisfaction
  - Functional decline (Jeffs, 2017)

DISCHARGE PLANNING: PATIENT CENTERED PRACTICE

- “Physical therapists should account for patient’s sense of identity, goals, history, and social context in order to engage in a process of communication and deliberation with the patient, with the goal of maximizing patient autonomy and developing a patient-centered care plan that can be accepted.”
- For action to qualify as autonomous, a substantial degree of understanding is required. (Hunt, 2011)

ADVOCATE FOR OPTIMAL MEDICAL MANAGEMENT
EVIDENCED BASED INTERVENTION: ADVOCATE FOR OPTIMAL PAIN MANAGEMENT

- Increased pain means decreased likelihood of discharge home. (Brotemarkle, 2015)
- Scheduled acetaminophen if appropriate. (American Geriatrics Society, 2015)
- What about opioids and delirium?
  - Evidence for prescribing non-opioids only < Evidence that adequate pain control reduces delirium. (American Geriatrics Society, 2015)

INTERVENTIONS TO ADDRESS MEDICATION MANAGEMENT

- Patient/Caregiver Education:
  - Timing
  - Understanding of effects
  - Management
  - Empower to advocate for changes if indicated
- Medication Reconciliation:
  - Consider Beers Criteria and discuss high risk medications
  - Advocate for Pharmacist or Geriatrician involvement
  - (Pellegrin, 2017)
  - Communicate suspected medication effects and impact on patient presentation

EVIDENCE BASED INTERVENTIONS: ADVOCATE FOR GERIATRICS CONSULTATION

- Involvement of geriatricians has been associated with:
  - Lower rates of delirium and discharge to long term care. (Lenartowicz, 2012)
  - A reduction in hospital acquired complications such as functional decline, falls, delirium, and death. (F交错, 2006)
  - Better recovery of function over the year following injury. (Titou, 2014)
ADDRESS PSYCHOSOCIAL ISSUES

- Advocate for social work consult:
  - Emotional support and coping
  - Possible facilitation of outpatient follow up with mental health services

PHYSICAL THERAPY INTERVENTION CONT.

EXERCISE CONSIDERATIONS

- MODE
- FREQUENCY
- INTENSITY
- DURATION
**EXERCISE INTENSITY**

- Overload stimulus is key
- 80-80% of 1 rep maximum
- At least one set
- 2-3x/week
- Intersperse strengthening with aerobic exercises and motor learning activities
- Continual re-assessment
- Consider Rate of Perceived Exertion (RPE) use, especially in the hospital setting

(Guccione, 2011; Avers, 2009)

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**WHAT DOES THIS MEAN IN THE HOSPITAL SETTING?**

- Prescribe therapeutic exercise of adequate intensity
- Use RPE
- Target weak muscles that will improve function
- Utilize your rehab aides and other ancillary staff
- Empower your patients to perform their exercise programs independently

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**HOW DO WE INTERVENE FOR PULMONARY DEFICITS?**
THORACIC TRAUMA INTERVENTIONS

• Main goal is to prevent pneumonia (PNA) and other complications
• Pain control
• Pulmonary hygiene
• Splinted coughing
• Deep breathing
• Chest wall excursion
• Incentive spirometer use
• Advocate for frequent walking with nursing
  (Shulzhenko, 2017; Winters, 2009)

PATIENT PROGRESS FOLLOWING TARGETED INTERVENTIONS

FUNCTIONAL PERFORMANCE

Initial Evaluation
• Bed mobility: Min A with bed rail
• Sit to stand: Min A
• Ambulation: 50’x2 with RW and CGA
• Decreased step length and cadence with wide base of support
• Stooped posture with inability to achieve full hip extension
• Stand to Sit: Min A

Hospital Day 5
• Bed mobility: Min A (without rail)
• Sit to stand: I
• Ambulation: 150’ with RW S
• Improved but still present deviations
• Stand to Sit: I
• Stairs: Flight of stairs with step-to pattern and S
IS ASSESSMENT OF BASIC FUNCTIONAL MOBILITY ENOUGH?

ONGOING EVIDENCE BASED EXAMINATION: VALUE OF STANDARDIZED TESTS AND OUTCOME MEASURES

- Inform discharge recommendations (Bland, 2014)
- Evidence-based approach (Jette, 2003)
- Quantify observations (Potter, 2011; Sullivan, 2011)
- Improve continuity of care between settings (Thor, 2006)
- Identification of impairments (Guide to Physical Therapist Practice)
- Establish a baseline (Guide to Physical Therapist Practice)

HOW DO YOU SELECT AN APPROPRIATE STANDARDIZED TEST OR OUTCOME MEASURE?

<table>
<thead>
<tr>
<th>Considerations</th>
<th>Dynamic Gait Index</th>
<th>Comfortable Walking Speed</th>
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<tbody>
<tr>
<td>Valid and Reliable for Elders</td>
<td>(Jønsson, 2011)</td>
<td>(Fritz, 2009)</td>
</tr>
<tr>
<td>Impairment Central to Patient Presentation</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Fall Risk</td>
<td>(Wrisley, 2010)</td>
<td>(Fritz, 2009; Ostir, 2012)</td>
</tr>
<tr>
<td>Functional Prognosis/Discharge Disposition</td>
<td></td>
<td>(Ostir, 2012)</td>
</tr>
<tr>
<td>Responsiveness to Change</td>
<td>(Pardasaney, 2012)</td>
<td>(Perera, 2006)</td>
</tr>
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</table>
MRS M'S RESULTS

**DYNAMIC GAIT INDEX**
- 1. Gait level surface: 2
- 2. Change in gait speed: 2
- 3. Gait with horizontal head turns: 2
- 4. Gait with vertical head turns: 2
- 5. Gait and pivot turn: 2
- 6. Step over obstacle: 2
- 7. Step around obstacles: 2
- 8. Steps: 2

**TOTAL SCORE**: 16/24

**COMFORTABLE WALKING SPEED**
- Pt demonstrated a comfortable walking speed of: 0.46 m/s
  - With use of a RW over a 10 meter distance.

DISCHARGE PLANNING

**DISCHARGE PLANNING: HOME VS. REHAB**

- "When safety is prioritized over client-centered practice, the values of individual elders may not be adequately considered in discharge decisions." (Moats, 2017)
- "Not safe for discharge home."
  - 21% of newly admitted nursing home residents had at least one fall within 30 days. (Leland, 2012)
  - Between 16-27% of falls in nursing homes occur due to environmental hazards. (Yu, 2004)
  - 3-15% of patients at rehab facilities acquire an infection. (Smith, 2008; Flanagan, 2016)
DISCHARGE PLANNING: HOME VS. REHAB

• Therapy at skilled nursing facilities: 30-45 minutes of PT contact and 15-30 minutes of OT contact daily. (Jette, 2005)

• Scheduled therapy time may not actually be a direct indication of intensity. (Talkowski, 2009; Lang, 2009)

DISCHARGE PLANNING: HOME VS. REHAB

• Systematic reviews and meta-analysis have failed to show a significant differences between care settings regarding functional outcomes. (Boland, 2017; Ward, 2008)

• “Elders with musculoskeletal disorders who received rehabilitation in the home had equal or higher gains than the inpatient group in function, cognition, and quality of life; they also reported higher satisfaction.” (Stolee, 2011)

DISCHARGE PLANNING: VALUE OF HOME PT

• Interdisciplinary home care has been associated with;
  • reduced nursing home and hospital admissions
  • decreased falls
  • improved physical function (Beswick, 2010)

• American and British Geriatric Societies highly recommend home assessment and intervention to identify home hazards and promote safe performance of daily activities. (Kenny, 2011)

• 30-day hospital readmission reduction (Leppin, 2014)
ASSESSMENT STATEMENT AT DISCHARGE

- Pt is a 87F who presents to physical therapy during hospitalization for UTI and rib fractures. In the setting of improved pain control, treatment of infection and optimization of medical management of HTN resulting in a more appropriate hemodynamic response to position change, patient has made progress in functional mobility and balance since initial evaluation. Education was provided to patient and family regarding fall risk. Patient declines rehab at this time. As consistent with her comfortable walking speed of 0.46m/s, patient will require assist with all ADLs which patient’s family reports is possible. Patient’s Dynamic Gait Index score of <19 is consistent with increased risk for falls therefore recommend use of RW at all times and home PT to address balance impairment and make environmental changes as indicated. Pt has good potential to return to independence in ADLs given progress thus far and presuming continued improvement in pain with tissue healing.

• Inouye SK. Predisposing and precipitating factors for delirium in hospitalized older patients. Dementia & Geriatric Cognitive Disorders 1999;10(5):393-400.

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