
- “…what I see these days are sedated patients, lying without motion, appearing to be dead, except for the monitors that tell me otherwise”

- “…when we first started our unit in 1964, patients who required mechanical ventilation were awake and alert. By being awake and alert, these individuals could interact with their family, friends, and the environment.”

• ... patients with respiratory failure ... are needlessly predisposed to muscular and skeletal wasting, thromboembolism, decubitus ulcers, and to at least some degree of despair concerning their eventual rehabilitation.

• ... the concept of early ambulation is clinically useful and rests on a sound physiologic basis ... weaning has been facilitated and hastened, and the problems of prolonged bed and chair rest minimized.

If we can provide early, more aggressive intervention and mobilization for patients in the ICU, why can’t we do the same in other settings with medically complex patients? ....

Impaired Function in Older Adults Following Hospitalization

• Clinical sequelae of medical deconditioning (Krumholz HM 2013; Kortebein P 2009; Kortebein P 2008)
  – Loss of muscle strength
  – Impaired cognitive function
  – Impaired functional mobility and ADLs
  – Fatigue
  – Decreased appetite

Impaired Function in Older Adults Following Hospitalization

Can be modified, reversed, or delayed by rehabilitation and mobility interventions.

KEY: Appropriate dose!
Impaired Function in Older Adults Following Hospitalization

- During hospitalization older adults spend ~83% of time in bed and 12% of the time in a chair. (Brown CJ 2009)
- 68% of patients discharged from the hospital are below pre-hospitalization level of function. (Gill TM 2009)
- Hospitalized older adults are 61 times more likely to develop a disability compared to those who are not. (Gill TM 2004)
- Older adults with medically deconditioning have higher rates of readmission and lower rates of discharge to the community. (Kortebein P 2008)

Medical Deconditioning: A Phenotype of Frailty?

- Frailty can be defined as a loss of homeostatic reserve
  - Similar to that observed in deconditioned older adults

Objectives

- Understand how hospital-associated deconditioning in older adults impairs functional mobility
- Appreciate current barriers to changing practice patterns for deconditioned older adults following hospitalization
- Recognize strategies that better target deconditioning across the continuum of care from hospital to home settings

Barriers for implementation of optimal practice patterns

1. Reimbursement-Based vs Evidence-Based Practice
2. Limited incentives for high quality transitional care (few ACO’s)
3. Fear of litigation
4. Current emphasis is on returning patient to prior level of function (which is often low)
5. Lack of awareness of more effective clinical care strategies

1. Reimbursement-Based vs Evidence-Based Practice

- Reimbursement guidelines drive decisions and care
- Productivity standards drive decisions and care
- Limited incentives to implement evidence-based practice
- 48% of participants used standardized outcome measures
- 90% of participants who use such measures believed it enhanced patient communication
- 22% used “home-grown” measures
- Of 52% that do not use, 49% had not interest in future use
And then came......

- Functional Limitation Reporting
  - G-codes and severity modifiers

**Reimbursement Based Practice**

- Acute Care:
  - Payment system incentivizes quicker discharges
  - Resulted in marked functional loss and referrals to post acute care
  - Now...more penalties for re-hospitalizations, thus more conservative discharge recommendations

- Skilled Nursing Facilities
  - Length of stay is often related to reimbursement
  - Average LOS: 25 days, with many discharged immediately after 20 fully paid Medicare days
  - Therapy intensity measured by minutes of therapy (RUG levels), but therapy content is largely low intensity and often driven by staffing levels versus patient need

- Home Health Care:
  - Therapy visits are often limited by agencies to avoid scrutiny
  - Rates of 6-9 therapy visits have increased, whereas 10-13 visit episodes have decreased with new payment rules
  - "Homebound" rule strictly interpreted by HH Agencies, disqualifying many patients who still are below prior level of function and cannot access additional services.

**Barriers for implementation of optimal practice patterns**

1. Reimbursement-Based vs Evidence-Based Practice
2. Limited incentives for high quality transitional care (few ACO's)
3. Fear of litigation
4. Current emphasis is on returning patient to prior level of function (which is often low)
5. Lack of awareness of more effective clinical care strategies

**2. Limited incentives for high quality transitional care**

- Very limited coordination of care across settings
  - Hospital ➔ SNF ➔ Home Health
- Sometimes, limited coordination across providers within a setting
- Upcoming changes that may help prioritize transitional care:
  - The Improving Medicare Post-Acute Care Transformation (IMPACT) Act
  - Accountable Care Organization Models/Bundled Payments
Barriers for implementation of optimal practice patterns

1. Reimbursement-Based vs Evidence-Based Practice
2. Limited incentives for high quality transitional care (few ACO’s)
3. Fear of litigation
   - Practice of “negative defensive medicine” prevalent in many settings, esp. older adults
     - Mobility is often avoided by nursing and CNAs because it is perceived as an unnecessary fall risk.
     - Many have said:
       - “I don’t want a fall on my shift.”
4. Current emphasis is on returning patient to prior level of function (which is often low)
5. Lack of awareness of more effective clinical care strategies

Fear of Litigation

- Practice of “negative defensive medicine” prevalent in many settings, esp. older adults
  - Mobility is often avoided by nursing and CNAs because it is perceived as an unnecessary fall risk.
  - Many have said:
    - “I don’t want a fall on my shift.”

3. Fear of litigation
   - Have we taken the “above all else...do no harm principle” to an extreme?
     - Falls are more quantifiable and are more likely to result in “fault” than deconditioning.
     - Therefore, we avoid supervised and unsupervised mobility to decrease the risk of falls...at risk of deconditioning.
   - Would more concrete evidence-based guidelines in individual patient populations help decrease litigation fear?

4. Current emphasis is on returning patient to prior level of function
   - **Current paradigm**: return patient to prior level of function (i.e. the absence of physical dependency)
   - Disregards where the level a patient is or was functioning relative to threshold
   - Patients may be discharged with unaddressed low function or frailty indicators—biomarkers for adverse health outcomes such as re-hospitalization

Threshold of Independence
Evidence across studies...

Barriers for implementation of optimal practice patterns
1. Reimbursement-Based vs Evidence-Based Practice
2. Limited incentives for high quality transitional care (few ACO’s)
3. Fear of litigation
4. Current emphasis is on returning patient to prior level of function (which is often low)
5. Lack of awareness of more effective clinical care strategies

Are current physical therapy interventions delivered at the appropriate intensity?

Don’t prescribe under-dosed strength training programs for older adults. Instead, match the frequency, intensity and duration of exercise to the individual’s abilities and goals.

Other disciplines concur....nursing

Don’t let older adults lay in bed or only get up to a chair during their hospital stay.

Are current physical therapy interventions delivered at the appropriate intensity?

• Survey of Home Health Physical Therapist Practices
Are current physical therapy interventions delivered at the appropriate intensity?

- Physical Therapy in Skilled Nursing Facilities

<table>
<thead>
<tr>
<th>%Time during Patient’s 24 Hour Day</th>
<th>% of Total Day Spent with PT</th>
<th>% of Total Day Active with PT</th>
<th>% Remainder Time in Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>62.13%</td>
<td>37.87%</td>
<td>19.13%</td>
<td></td>
</tr>
</tbody>
</table>

% Inactive vs Active During PT Session

Objectives

- Understand how hospital-associated deconditioning in older adults impairs functional mobility.
- Appreciate current barriers to changing practice patterns for deconditioned older adults following hospitalization.
- Recognize strategies that better target deconditioning across the continuum of care from hospital to home settings.

Updating Practice Patterns for Older Adults Following Hospitalization

- Shift from conservative, low-intensity interventions → high-intensity interventions
- Based on American College of Sports Medicine (ACSM) Guidelines and the American Geriatrics Society (AGS)

Current Rehabilitation Hierarchy for Older Adults Following Hospitalization

- Resistance Training
- Low Intensity Aerobic Training
- Motor Control based gait, balance, and ADL training
- General Conditioning Activities
- Moderate Intensity Aerobic Training
- Moderate to high intensity motor control based gait, balance, and ADL training
- High-Intensity Resistance Training

Observed Allotment of Physical Therapy Interventions in SNFs

- % Active Time on Specific PT Interventions
  - % Total Active Gait/Motor Control
  - % Total Active ADL/Transfers
  - % Total Active Aerobic
  - % Total Active Weight Bearing
  - % Total Active Manual Therapy
  - % Total Active Pt Education
  - % Total Active Time Stretching

Updated Rehabilitation Hierarchy for Older Adults Following Hospitalization
Training Principles: **Overload**

- Once tissues adapt to a physical stress, then a stronger or different stimulus must be applied to produce further adaptations
  - **Intensity**: amount of effort
  - **Duration**: span of time
  - **Frequency**: number of times performed
  - **Power**: speed of movement
  - **Specificity**: training improves parts being trained

- **Dose-response**
  - Low intensity produces less of an increase in strength (Dudzinski, A 1988; Larsson, L 1982; Mazzeo, RS 1998)
  - High intensity produces greater effects (Dudzinski-Zylka 2008)

**Training Principles: Tissue Adaptation**

- **Dose-response**:
  - Low intensity produces less of an increase in strength (Aniansson, A 1981; Larsson, L 1982; Mazzeo, RS 1998)
  - High intensity produces greater effects (Chodzko-Zajko, 2009)

High Intensity Strength Training: **Evidence for conditions which benefit**

- Congestive Heart Failure (Malorano, Odriscoll, 2000, Ades, 2003; Savage, 2010; Pu, CT)
- Osteoarthritis (Chodzko-Zajko, 2009, ASCM Bone Health)
- Frailty (Chodzko-Zajko, 2009, ASCM Position Statement on HTN)
- Chronic Obstructive Pulmonary Disease (Chodzko-Zajko, 2009, ASCM Position Statement on HTN)
- Chronic renal disease (Chodzko-Zajko, 2009, ASCM Position Statement on HTN)
- Dementia, impaired cognition (Chodzko-Zajko, 2009, ASCM Position Statement on HTN)
- Cancer (Chodzko-Zajko, 2009, ASCM Position Statement on HTN)

**Home Health Progressive Multi-component Intervention**

Patients with these conditions are commonly seen in post-acute care settings! Identify which patients benefit the most. High potential for improved outcomes.

**Strength Training: Intensity**

<table>
<thead>
<tr>
<th>% 1RM</th>
<th>Number of reps</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>1</td>
</tr>
<tr>
<td>85</td>
<td>2</td>
</tr>
<tr>
<td>70</td>
<td>3</td>
</tr>
<tr>
<td>55</td>
<td>4</td>
</tr>
<tr>
<td>40</td>
<td>5</td>
</tr>
<tr>
<td>35</td>
<td>6</td>
</tr>
<tr>
<td>30</td>
<td>7</td>
</tr>
<tr>
<td>25</td>
<td>8</td>
</tr>
<tr>
<td>20</td>
<td>9</td>
</tr>
<tr>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>5</td>
<td>12</td>
</tr>
</tbody>
</table>

Target 8-15 reps to failure

Modified from Essentials of Strength Training and Conditioning, 2nd Ed. Baechle & Earle, Table 18.7

**Strength Continuum**

- Strength
- Power
- Hypertrophy
- Muscular endurance
- Muscular strength

Repetition maximum continuum
STRENGTH Muscle Function ➔ Neuromuscular Function

Key: using neuromuscular re-education during high intensity training

**Training Principles: Tissue Adaptation**

- Neuromuscular adaptations account for 10-15% strength gains per week in first ~8 weeks (Evans 1990; Bemben 2001; Phillips 2000)

**Neuromuscular Re-education**
- Incorporate strengthening into functional activities

**Aerobic Intensity: Rate of Perceived Exertion (RPE)**
- Associate with physiological adaptation to exercise 12-16 “somewhat hard” to “hard”
  - RPE 12-13 equates to ~60% heart rate max
  - RPE 16 equates to ~85% heart rate max
  - RPE 13-15 recommended for those on beta-blockers
  - ACSM recommends RPE 13-16 with initial intensities of 11-12 for deconditioned individuals
- Correlated to VO2 max, CO2 production, lactate accumulation, heart rate max and body temperature

<table>
<thead>
<tr>
<th>RPE Number</th>
<th>% of Effort</th>
<th>Description of Effort</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>20% Effort</td>
<td>No Exertion At All</td>
</tr>
<tr>
<td>7</td>
<td>30% Effort</td>
<td>Very, Very Light</td>
</tr>
<tr>
<td>8</td>
<td>40% Effort</td>
<td>Very Light</td>
</tr>
<tr>
<td>9</td>
<td>50% Effort</td>
<td>Fairly Light</td>
</tr>
<tr>
<td>10</td>
<td>60% Effort</td>
<td>Moderately</td>
</tr>
<tr>
<td>11</td>
<td>70% Effort</td>
<td>Somewhat Hard — Steady Pace</td>
</tr>
<tr>
<td>12</td>
<td>80% Effort</td>
<td>Hard (Strong, Heavy)</td>
</tr>
<tr>
<td>13</td>
<td>90% Effort</td>
<td>Very Hard (Very Strong)</td>
</tr>
<tr>
<td>14</td>
<td>100% Effort</td>
<td>Very, Very Hard (Extremely Strong)</td>
</tr>
</tbody>
</table>

**Activity Outside of Rehabilitation Interventions**
- Patients in SNFs are ~80% less active compared to community-dwelling, older adults (Perisi 2012, 2013; Grant 2010)
- When active, do not engage in activity at an intensity adequate for systemic adaptations (Perisi 2012, 2013; Grant 2010)
- Patients work in therapy for ~6-13% of their day (Munin, Jette 2004, Mallinson 2014)
- Coordination with other disciplines is a great opportunity to impact patient outcomes by promoting increased activity.
Rehabilitation Involvement in Care Transition Models

- Integrating rehabilitation therapists (PT/OT/SLP) as a part of the transition team
- Optimizing therapeutic interventions through increased intensity and use of multi-component approaches
- Promote coordinated, interdisciplinary delivery of message that “mobility matters”

Future Directions

- Implementation of progressive rehabilitation strategies in post-acute settings (home health, outpatient, skilled nursing facilities, acute rehabilitation)
  - Identify patient populations that benefit most
- Evaluate the sustainability of progressive interventions for:
  - Patient functional status
  - Changes in post-acute practice patterns
- Explore the role of mobility in re-hospitalization risk and health care utilization
  - Can progressive interventions reduce risk and decrease health care utilization?

Acknowledgements

Muscle Performance Laboratory