Why Mobilizing Patients is Important

Latest Research on Complications of Immobility

Presented by:
Teresa Boynton, MS, OTR, CSPHP
Renée Kielich RN, CSPHP

Objectives
1. Describe how prolonged, as well as short-term, bedrest affects the human body.
2. Discuss how using a standardized approach to patient screening and assessment can impact complications of immobility, risk of postural hypotension and a patient’s fall risk.
3. Explain how SPHM practices can be used to safely mobilize patients, as well as impact the effects of bedrest and risks of immobility.

History of Bedrest
• 450 BC – periods of prolonged bedrest prescribed to facilitate healing
  • But potential harm recognized: loss of muscle, bone and tooth
• Prior to 19th Century: bedrest to aid with recuperation was rare
• 1860’s through the mid-1950’s: use of bedrest increased
• Late 1960’s: prescribed bedrest was still common practice
  - 4 weeks following a myocardial infarction
  - 3 weeks after hernia surgery
  - 2 weeks following childbirth
1st Lieutenant
Adeline E. Baukol
Army Nurse Corp – WWII
1942-1945
26th General Hospital
Stationed overseas in a
tent hospital in
North Africa and in Italy

My Momma!

History of Bedrest

Hazards of Bed Rest
Bedrest

- Today, patients aged 65 and older can spend 71–83% of their time in hospital lying down.

- Bedrest Dependency:
  - Limited upright activity
  - Compulsion to return to bed quickly
  - Refusal to get up

- End “pajama paralysis” – UK hospitals’ initiative
  - Get inpatients out of their beds and nightwear and into their day clothes = speed recovery

Potential Complications of Immobility


Respiratory System
Prolonged Bedrest on the Respiratory System

- Increased weight on ribcage restricts breathing movement
- Reduced tidal volume, residual volume, and forced vital capacity
- Less effective coughing reflex

Increased pooling of mucus and damage to cilia, escalator

Increased respiratory tract infections

Cardiovascular System

Effects of Immobility on the Cardiovascular System

- About 1L fluid shift from legs to abdomen, thorax, head
- Increase in urine output
- Reduction in blood volume
- Increased hematocrit and blood viscosity
- Reduced venous return to the heart = reduced stroke volume

Cardiac Deconditioning

Orthostatic/Postural Hypotension on Remobilisation
Haematological System

Effects of Immobility on the Hematological System

- Plasma volume loss
- Loss of muscle lower limbs = reduction in O₂ demand
- Increased venous stasis and mechanical damage to the endothelium

DVT

Potential for Embolization

Virchow’s Triad

- Endothelial damage
- Hypercoagulable state
- Blood flow stasis
- DVT

SUMMARY of the Effects of Prolonged Bedrest on the Respiratory, Cardiovascular and Hematological Systems

- Restricted breathing
  - 1 Liter fluid shift to abdomen, thorax, head
  - Loss of muscle in legs
- Reduced tidal volume, residual volume, forced vital capacity; less effective coughing
- Increased urine output, reduction in blood volume, increased hematocrit, increased blood viscosity
- Increased venous stasis, damage to endothelium
- Increased pooling of mucus, damage ciliary escalator
- Reduced venous return to heart = reduced stroke volume
- Increased respiratory tract infections
- Cardiac deconditioning
- Potential for embolization
- Orthostatic Hypotension on remobilization

**Orthostatic Hypotension**

When moving from Supine/Sitting to Standing

Gravity = blood and lymph rush downwards into legs

Valves in veins and lymphatic vessels close

Arteries don't have valves = rapid drop in arterial blood pressure

Unless quickly corrected, risk that blood flow to the brain is reduced

Dizziness and fainting characteristic of OH

**Risk of Orthostatic Hypotension**

Healthy, mobile individuals

Rapid drop in BP on standing is immediately detected by aortic arch and carotid sinus baroreceptors = quickly relay this information to:

Cardiac center = increasing sympathetic stimulation of the heart = increasing cardiac output and raising BP

Vasomotor center = increasing sympathetic stimulation of the blood vessels in the legs = partial vasoconstriction = reduces downward movement of blood

Help maintain BP and cerebral circulation

Reduces the risk of OH
Orthostatic Hypotension

- One of the first problems observed in patients confined to bed
- Recorded after as little as 20 hours of bedrest
- Reductions in plasma volume play a key role in OH
- Cardiac deconditioning exacerbates the problem
  - Predisposes patients to OH
- Often becomes apparent when they first remobilize.
  - Become dizzy or faint = increased risk of falling.

Increased Risk of Orthostatic Hypotension

Patients in bed – Effects of bedrest

Mechanisms are impeded by:
- Reduced blood volume due to increased diuresis = may lead to greater drop in BP on standing
- Blunting of baroreceptor reflexes mainly due to reduced blood volume = less of a stretch stimulus = progressive decrease in sensitivity of stretch receptors
- Reduced venous return and stroke volume
- Cardiac deconditioning and associated myocardial thinning = limits effectiveness of the heart as a pump

Recovering sufficient orthostatic function to eliminate susceptibility to orthostatic hypotension is a slow process, particularly in older people, but, even young, fit and healthy adults may take several weeks after they start mobilizing again to fully recover.
In hospital settings, better preparation for moving and handling patients, can help to reduce anxiety.

Knight J, et al. *Nursing Times*. 2018; 114(12):54-57

Musculoskeletal System

- Disuse leads to atrophy and loss of muscle strength:
  - Rate of about 12% per week
- After 3-5 weeks of bedrest, almost half the normal strength of a muscle is lost
- Atrophy can occur after only a short period of immobility
- First muscles to become weak:
  - Lower limbs - normally resist gravitational forces in the upright position
  - Skeletal muscles lose tone when the feet no longer bear weight
- Extensors atrophy to a greater extent than flexors
- When immobilized, muscles shorten
- Takes about 4 weeks to recover from atrophy caused by immobility
- Disuse weakness reversed at rate of only 6% per week
- Detrimental effects on neuromuscular function.
Connective Tissue and Contractures

My Dad!!

Effects of Immobility on Neurological Function

- Delirium¹
  - Acute, fluctuating change in consciousness and cognition
  - Develops over a brief time period
  - Hyperactive or hypoactive (most common)
  - Often an ICU complication
- Depression²
- Anxiety²
- Forgetfulness²
- Confusion²

**Relationship Between ICU-Acquired Delirium and Weakness in a Patient With Sepsis**

Cognitive and Functional Impairment, Institutionalization, and Mortality

**ABCDE Bundle**
To Mitigate ICU-Acquired Delirium and Weakness

- ABCDE bundle = Awakening and Breathing Coordination, Delirium monitoring, and Exercise/early mobility
- ABCDE is designed to:
  - Promote collaboration among clinical team members
  - Standardize care
  - Break the ICU ventilation-sedation-delirium-weakness cycle

**SCCM and ACCN Practice Guidelines to Address this Cycle**
- Society of Critical Care Medicine: Clinical Practice Guidelines for the Management of Pain, Agitation, and Delirium in Adult Patients in the ICU
  - Delirium is associated with increased mortality in adult ICU patients, prolonged ICU and hospital LOS in adult ICU patients, and the development of post-ICU cognitive impairment in adult ICU patients
  - Recommend performing early mobilization of adult ICU patients whenever feasible to reduce the incidence and duration of delirium
- AACN Practice Alert: Delirium Assessment and Management
  - All ICU patients should be assessed for delirium using validated tools
  - Strategies to decrease delirium risk factors should be used, including early exercise

---

The two primary agitation and sedation scales that can be used to determine patient changes over time.

### Understanding RASS & SAS

<table>
<thead>
<tr>
<th>Riker Agitation-Sedation Scale (RASS)</th>
<th>Sedation-Agitation Scale (SAS)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Score</strong></td>
<td><strong>Description</strong></td>
</tr>
<tr>
<td>+4</td>
<td>Combative</td>
</tr>
<tr>
<td>+3</td>
<td>Very agitated</td>
</tr>
<tr>
<td>+2</td>
<td>Agitated</td>
</tr>
<tr>
<td>+1</td>
<td>Restless</td>
</tr>
<tr>
<td>0</td>
<td>Alert and calm</td>
</tr>
<tr>
<td>-1</td>
<td>Drowsy</td>
</tr>
<tr>
<td>-2</td>
<td>Light sedation</td>
</tr>
<tr>
<td>-3</td>
<td>Moderate sedation</td>
</tr>
<tr>
<td>-4</td>
<td>Deep sedation</td>
</tr>
<tr>
<td>-5</td>
<td>Unarousable</td>
</tr>
</tbody>
</table>


### Adverse Outcomes of Immobility

**Short Term**
- Ventilation associated pneumonia
- Delayed weaning
- Muscle de-conditioning/dysfunction
- Pressure injuries

**Long Term**
- Increased mortality/morbidity
- Decreased functional capacity
- Dependency for activities of daily living
- Increased cost of care
- Markedly impaired quality of life

### Ventilation-Sedation-Delirium-Weakness Cycle: Long-term Impacts

- Patients with acute respiratory distress syndrome lose up to 18% total average body mass
- Only 49% returned to work or activities of daily living 1 year post ICU
- Muscle dysfunction remains after 1 year in up to 60% of patients
- Up to 78% of ICU survivors experience neurocognitive impairments
  - 46% neurocognitive impairment prevalence at 1 year
  - 25% neurocognitive impairment prevalence at 6 years

Research on Early Mobility

- Fewer cases of ventilator associated pneumonia
- Fewer pressure injuries
- Fewer cases of delirium and shorter durations of delirium for those with an early mobility intervention
- Shorter length of stay in the ICU and the hospital
- Fewer unplanned readmissions
- And even decreased mortality

1. Stiller K. Physiotherapy in the ICU. An updated systematic review. CHEST. 2013

Research on Early Mobility

- 38% reduction in hospital LOS
- 13% reduction in ICU LOS
- 3% ventilator associated pneumonia (VAP) rate
- 18% reduction in healthcare associated infections (HAI)
- Fewer days to first exercise
- Fewer days of ICU LOS
- Fewer ventilator days
- Fewer days to first exercise
- Fewer days of ICU discharge


Methods:
- The Cleveland Clinic assessed the impact of an early mobility protocol in 637 Neuro ICU patients.

Results
- 36% reduction in ICU LOS, and 33% reduction in overall hospital LOS.
- 46% reduction in ventilator days.
- 30% reduction in overall hospital costs.

Early Mobility Clinical Evidence

Clinical & Financial Outcomes Data

<table>
<thead>
<tr>
<th>Method</th>
<th>Baseline (Pre-Intervention)</th>
<th>Post-Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICU LOS</td>
<td>9.8</td>
<td>6.0</td>
</tr>
<tr>
<td>Hospital LOS</td>
<td>10.2</td>
<td>7.0</td>
</tr>
</tbody>
</table>
It’s financially responsible
Average ICU costs

Potential Cost Savings if 1 Day Reduced ICU LOS: (with no mechanical ventilation in an ICU with an average of 500 patients annually)

<table>
<thead>
<tr>
<th>Reduced ventilator days</th>
<th>Incremental cost/day</th>
<th>Ventilator cost/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 day</td>
<td>$1,522</td>
<td>$1,522</td>
</tr>
<tr>
<td>2 days</td>
<td></td>
<td>$3,044</td>
</tr>
</tbody>
</table>

Early mobility has the potential to help reduce ICU LOS for non-vented and vented patients, creating the potential for significant savings.

Potential Cost Savings if 1 Day Reduced ICU LOS: (with mechanical ventilation in an ICU with an average of 200 vent patients annually)

<table>
<thead>
<tr>
<th>Reduced ventilator days</th>
<th>Incremental cost/day</th>
<th>Ventilator cost/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 day</td>
<td>$1,522</td>
<td>$1,522</td>
</tr>
<tr>
<td>2 days</td>
<td></td>
<td>$3,044</td>
</tr>
</tbody>
</table>

The Economic and Clinical Impact of Sustained Use of a Progressive Mobility Program in a Neuro-ICU

<table>
<thead>
<tr>
<th>Neuro ICU</th>
<th>Pre Mobilization (1118 patients)</th>
<th>Immediately Post Mobilization (731 patients)</th>
<th>2 years following mobilization implementation (796 patients)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case Mix Index</td>
<td>4.14</td>
<td>3.8</td>
<td>4.26 (Higher than both periods)</td>
</tr>
<tr>
<td>Total Cost to Treat</td>
<td>$40,201</td>
<td>$33,370</td>
<td>$38,547</td>
</tr>
<tr>
<td>HLOS</td>
<td>11.3 days</td>
<td>8.6 days</td>
<td>8.8 days</td>
</tr>
<tr>
<td>ICU LOS</td>
<td>6.5 days</td>
<td>5.8 days</td>
<td>5.9 days</td>
</tr>
<tr>
<td>Ventilator Associated Pneumonia (per 1000 vent days)</td>
<td>1.6</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>CAUTI rate (per 1000 Foley days)</td>
<td>6.4</td>
<td>3.6</td>
<td>3.3</td>
</tr>
<tr>
<td>Hospital Acquired Infections (per 1,000 Foley/CVL/vent days)</td>
<td>3.5</td>
<td>2</td>
<td>2.1</td>
</tr>
</tbody>
</table>

“Overall, these differences translated to an approximately $12.0 million reduction in direct costs from February 2011 through the end of 2013.”


How do we make an impact?

We go from this…

To this…

To Impact These…

To Improve These…

HAC – Hospital Acquired Conditions
TPS – Total Performance Score
10-Day Readmission Penalty

CMS.gov
Hospital Value-Based Purchasing

NTI 2017. HRC Sunrise Session. May 23, 2017
Key Performance Areas Impacted by Immobility

There is a significant % of missed mobility opportunities that directly impact functional decline, deconditioning, and adverse events and penalties.

<table>
<thead>
<tr>
<th>Hospital Acquired Conditions</th>
<th>Total Performance Scores</th>
<th>30 Day Be-Admit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure Ulcers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infection Related</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Readmissions Rate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Readmission Rate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Readmission Rate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sepsis Rate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medicare Spending/Case</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Potential Barriers to Early Mobilization

- Heavier patients
- Patients receiving vasopressors
- Patients receiving a paralytic agent at least once
- Trauma patients with multiple fractures or high intracranial pressure
- Fear of line dislodgement
- Heavy sedation
- Patient comfort
- Human and technological resources
- Fear of further decreases in oxygenation or hemodynamic parameters

Barriers to Implementation

- Nervous or skeptical clinicians
- Minimal resources allocated
- Inadequate equipment
- Late involvement of Physical therapy
- Unclear/unavailable protocol
- Variations in practices
If Mobility is Medicine, WHY do we Fail to Promote Mobility?

Background:

- 2007: CMS identify conditions that increase costs
- 2008: CMS enacted new payment provisions; no longer reimburse diagnosis resulting from HACs, including falls with injuries
- 2010: ACA established program to reduce HACs – levied fines on hospitals ranking in lowest quartile for HAC measures

Promoting mobility in the hospital may actually help to prevent injurious falls, thus calling into question the practice of immobilizing patients for the sake of fall prevention.

Although hospital falls can lead to harm, treating them as ‘never events’ has led to over-implementation of measures with little efficacy for falls yet profound contribution to immobility.

Prevention of hospital falls need not come at the expense of promoting mobility.

Back to BMAT

What systems are we impacting?

1. Sit and Shake
2. Stretch
3. Stand
4. Step
Summary

• Essentially, every single body system is affected when patients remain immobile—even for short periods of time.

• Orthostatic hypotension and postural intolerance is one of the first problems observed in patients.

• Patient need to be mobilized frequently and appropriately in order to counter the impacts of bedrest.

• SPHM Practices can assist Nurses to safely and better address complications of immobility.

• Mobility programs can positively impact financial goals.

• Mobility is Medicine; Mobility Matters

Contact:

Teresa Boynton, MS, OTR, CSPHP
SPHM and BMAF Clinical Consultant
teresa.boynton@gmail.com
(970) 214-0182

Renée Kielich, RN, CSPHP
SPHM Program & Services Director
renee.kielich@hill-rom.com
Hill-Rom/Liko
(414) 412-7033