I LIKE TO MOVE IT, MOVE IT!

The implementation of an early progressive mobility algorithm and protocol for hospital-acquired delirium reduction in critically-ill adults

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2013-2014 pilot study, 2015 data analysis
What is delirium?

* Delirium can be defined as **an acute confused state that is characterized by compromised cognition, psychomotor disorders, inattention, and a fluctuating course.**¹

* Delirium can worsen a patient’s prognosis and recovery, prolong their length of stay, increase their chance of needing a long-term care or a transitional facility stay post-hospitalization, and elevate healthcare costs.²

* The United States’ healthcare system is faced with charges of **greater than $150 billion dollars** each year due to hospital-acquired delirium.³

* While the exact susceptibilities for developing delirium are not completely clear, it has been noted that the incidence of delirium is higher in elderly patients, those who are critically ill, those who suffer cognitive impairments, and those who have experienced orthopedic trauma.⁴
Studies of mobility in hospitalized clients have shown that 72.9-83% of hospitalizations are spent lying in bed, and there was no documented clinical indication for bed rest in 60% of the cases.\(^5,6\)

Many adverse physiological changes transpire when patients are retained on bed rest, even as early as the first day.

Furthermore, immobility or limited mobility is included as one of the ten clinical factors that are thought to contribute to hospital-acquired delirium.\(^8\)

Complications during the first week of bed rest include but are not limited to:

- Contractures
- Skeletal muscle atrophy
- Pressure sores
- Sarcopenia 1-3% per day
- Plasma volume decreases by 8-10%
- Increased cardiovascular workload
- Increased heart rate
- Decreased stroke volume
- Decreased cardiac output
- Orthostatic hypotension
- Insulin resistance
- Micro-vascular dysfunction
- And bone degradation.\(^7\)
In a recent study, less than 10% of hospitals who responded to the survey noted having specific criteria in place to guide the timing of physical therapy interactions with critically ill.9

Documented barriers to early mobility include:

- lack of specific protocols or policies to address mobility in the ICU setting
- fragmented care among the interdisciplinary team,
- culture of the ICU staff (mobility not seen as a priority intervention and staff perceptions of patients as too ill to mobilize)
- lack of education on complications of immobility
- delirium
- staff resistance to change.10
The institution at which the early progressive mobility protocol was employed was **OSF Saint Francis Medical Center in Peoria, Illinois**. This is a greater than 700 bed level-one trauma center which serves as the flagship facility for a large hospital system.

IRB approvals were granted through the UICOMP/OSF research teams & also through Chamberlain College of Nursing where this author was completing a doctor of nursing practice degree.
To elucidate the clinical question, the **population** of interest was patients over age eighteen who were residing in the medical intensive care unit (MICU) or medical intermediate nursing unit (MINT).

The **intervention** was a formal early mobility protocol implementation.

The **comparison** was the incidence of delirium prior to the early mobility protocol (data obtained via retrospective chart review).

The desired **outcome** would be that the incidence of delirium in the ICU setting would decrease post-initiation of the early mobility protocol.

**Secondary measures** from this intervention that will be reviewed include the incidence of bed rest order upon admission to the units, ICU length of stay, and the number of physical therapy sessions per patient.
The research question was:

Does the implementation of an early progressive mobility protocol compared to standard care practices reduce the incidence of delirium in critically-ill patients?

Critically-ill will be defined as patients who are residing on one of the intensive care or intermediate nursing units.

Patients who receive a positive score on the Confusion Assessment Method ICU (CAM-ICU) tool, the screening instrument that has been in use since 2012 within the facility for delirium identification, will be deemed to have delirium.
CAM-ICU Screening Tool

1. Acute Change or Fluctuating Course of Mental Status:
   - Is there an acute change from mental status baseline? OR
   - Has the patient’s mental status fluctuated during the past 24 hours?
   - YES

2. Inattention:
   - “Squeeze my hand when I say the letter ‘A’.”
     Read the following sequence of letters: S A V E A H A R T
     ERRORS: No squeeze with ‘A’ & Squeeze on letter other than ‘A’
   - If unable to complete Letters → Pictures
   - > 2 Errors

3. Altered Level of Consciousness
   Current RASS level
   - RASS = zero

4. Disorganized Thinking:
   1. Will a stone float on water?
   2. Are there fish in the sea?
   3. Does one pound weigh more than two?
   4. Can you use a hammer to pound a nail?
   Command: “Hold up this many fingers” (Hold up 2 fingers)
              “Now do the same thing with the other hand” (Do not demonstrate)
              OR “Add one more finger” (If patient unable to move both arms)
   - > 1 Error
   - 0 - 1 Error

CAM-ICU negative
NO DELIRIUM

CAM-ICU negative
NO DELIRIUM

CAM-ICU positive
DELIRIUM Present

CAM-ICU negative
NO DELIRIUM
The goal of this project was to implement an evidence-based, early progressive mobility protocol and algorithm in our ICU settings as the **new standard of care** in hopes of decreasing the incidence of hospital-acquired delirium.

It was a **quality improvement, pre-intervention and post-intervention comparison** that required retrospective chart **auditing** in the electronic medical record, EPIC, and the program that interfaces with EPIC for data auditing, CLARITY.

To be included in the project, the subjects must have been hospitalized on the MICU or MINT nursing units at OSF Saint Francis Medical Center and be over age 18.
## EARLY PROGRESSIVE MOBILITY ALGORITHM FOR CRITICALLY ILL PATIENTS

<table>
<thead>
<tr>
<th><strong>Level 1</strong></th>
<th><strong>Level 2</strong></th>
<th><strong>Level 3</strong></th>
<th><strong>Level 4</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Unconscious patient</td>
<td>Conscious patient</td>
<td>Conscious patient</td>
<td>Conscious patient</td>
</tr>
<tr>
<td>Bed- level activity</td>
<td>PROM/ AROM 3x daily</td>
<td>PROM/ AROM 3x daily</td>
<td>PROM/ AROM 3x daily</td>
</tr>
<tr>
<td>PROM 3x daily</td>
<td>Every 2 hour turning/ repositioning</td>
<td>Every 2 hour turning/ repositioning</td>
<td>Every 2 hour turning/ repositioning</td>
</tr>
<tr>
<td>Every 2 hour turning/ repositioning</td>
<td>Active resistance therapy (assess upper extremity strength against gravity)</td>
<td>Active resistance therapy (Assess lower extremity strength/ ability to bear weight by applying pressure to thigh/ lower leg and have them resist against the pressure)</td>
<td>Sitting position minimum of 30 min 2x daily (1st prior to 0700), progressing to &gt;60 minute sessions (\rightarrow) HOB 45 degrees (reclined position) to 65 degrees (sitting position)</td>
</tr>
<tr>
<td>HOB @ 30 degrees (unless contraindicated)</td>
<td>Sitting position minimum of 20 min 2x daily (1st prior to 0700) (\rightarrow) HOB 45 degrees (reclined position) to 65 degrees (sitting position)</td>
<td>Sitting position minimum of 30 min 2x daily (1st prior to 0700), progressing to 60 minute sessions (\rightarrow) HOB 45 degrees (reclined position) to 65 degrees (sitting position)</td>
<td>Sitting on edge of bed with feet on floor (egress position)</td>
</tr>
</tbody>
</table>

### Key
- PROM = passive range of motion
- AROM = active range of motion
- HOB = head of bed
- OOB = out of bed

**PT service consult commonly warranted beginning at level 2.**

**Ambulation**

(Adapted from King, 2012, & Ross & Morris, 2010)
Elements of my protocol

ASSESSMENT:

1. Evaluate/ re-evaluate the patient every 8 hours to assess for readiness for progression of their activity level using the “Early Progressive Mobility Algorithm for Critically Ill Patients” algorithm (see attachment).

2. Determine if the patient’s activity level needs restricted using the criteria listed below.
   a. Criteria warranting restriction from progression in the mobility algorithm (which indicates patient would undergo only level I activities) include the following:
      i. Acute coronary syndrome/ MI within 24 hours
      ii. Open abdomen
      iii. Injuries in which mobility is contraindicated (unstable fractures, unstable spinal cord injury)
      iv. Receiving therapies that restrict mobility (e.g. ECMO, CRRT, femoral access)
      v. Acute neuromuscular diseases (e.g. ALS, active DTs, status epilepticus)
      vi. RASS less than -3
      vii. FiO2 greater than 60%
      viii. PEEP greater than 10cm H2O
      ix. Requires 2 vasopressors or needing to increase vasopressor dose within 2 hours of mobility session
      x. Increased ICP
   b. Criteria warranting the suspension of an activity session include the following:
      i. MAP less than 60 or symptomatic drop in mean arterial pressure (MAP)
      ii. SBP greater than 200 sustained for 5 minutes (unresolved with rest)
      iii. HR greater 165 bpm sustained for 5 minutes (sinus tachycardia only, not resolving with rest)
      iv. RR greater than 40 sustained for 5 minutes (not resolving with rest)
      v. Pulse oximetry less than 85% sustained for 5 minutes OR symptomatic shortness of breath (not resolved with rest)
      vi. Acute onset of patient distress during activity AEB non-verbal cues, gestures, or agitation
      vii. New onset dysrhythmia
      viii. Concern for myocardial ischemia
      ix. Concern for airway device integrity
INTERVENTIONS

3. Implement appropriate activities according to patient status and corresponding level of activity in “Early Progressive Mobility Algorithm for Critically Ill Patients” attachment.

4. Place patient’s activity level on white board in patient’s room as a part of the plan of care.
   a. Facilitates communications to the patient and family in addition to other members of the interdisciplinary team (e.g. PT, OT, respiratory).

5. Consider consult to physical therapy services if any of the following criteria are met:
   a. Required an assistive device / assistance with ambulation prior to admission
   b. Meets level 2 on mobility algorithm (so patient able to do more than only PROM or positioning)
   c. Patient/ family needs to have a reasonable expectation of improvement (recovery of function) or prevention of functional decline

6. Obtain order for activity if an appropriate order has not been provided.

REPORT TO PROVIDER

7. Contact provider if patient does not have an appropriate activity order, has an order for bed rest that is unwarranted, or if during activity session meets criteria to suspend the session due to clinical deterioration.

PATIENT / FAMILY TEACHING

8. Instruct patient and/or family that early mobility is necessary in all hospital settings to prevent physiological complications (e.g. muscle wasting, pneumonia, blood clots), shorten hospital stays, and improve disposition and long-term outlook upon discharge.

DOCUMENTATION

9. Document the patient’s activity level according to the mobility algorithm within 8 hours of admission and every 8 hours thereafter in the musculoskeletal (MSK) “additional documentation” section of Adult Patient Care Summary.
Screen shot of where nursing staff documented the mobility level in EPIC (the electronic medical record)
Baseline, or pre-protocol, data was collected for patients admitted to MICU and MINT between November 1, 2013 and December 31, 2013 and the pilot study, or post-protocol, data was collected for patients admitted between November 1, 2014 and December 31, 2014.

Where patient-level data was available, patients with a discharge disposition of expired, hospice-home, or hospice-medical facility were excluded resulting in 359 patients in the baseline group and 464 in the pilot study group.

The total number of patients included in this study was 823.
**Proportion of patients with delirium**

A Pearson’s chi-square analysis was used to compare the proportion of patients with hospital acquired delirium in the baseline and pilot periods. The proportion of patients with hospital acquired delirium decreased 4.55% from 8.64% in the pre group to 4.09% in the post group. This decrease was statistically significant, $\chi^2 (1, N = 823) = 6.54, p = 0.01$. 

![95% Confidence Intervals Around the Proportion of Delirium Cases](image)
Proportion of patients admitted with bed rest orders

A Pearson’s chi-square analysis was used to compare the overall proportion of patients admitted with bed rest orders, to either MICU or MINT, in the baseline and pilot periods. Overall the proportion of patients admitted with bed rest orders significantly decreased by 14.62% from 37.9% in the baseline group to 23.28% in the pilot study, $c^2(1, N=823) = 20.7$, $p < 0.0001$. More specifically, the proportion of patients admitted to MICU with bed rest orders significantly decreased by 12.4% from 49.1% in the baseline group to 36.7% in the pilot study, $c^2(1, N=419) = 6.51$, $p = 0.01$. Additionally, the proportion of patients admitted to MINT with bed rest orders significantly decreased by 11.8% from 26.8% in the baseline group to 15% in the pilot study, $c^2(1, N=431) = 9.1$, $p = 0.003$. 

Findings, continued

95% Confidence Interval Around the Proportion of Overall Bed Rest Orders

- UB
- Prop
- LB

Baseline  Pilot

- 50.00%
- 45.00%
- 40.00%
- 35.00%
- 30.00%
- 25.00%
- 20.00%
- 15.00%
- 10.00%
- 5.00%
- 0.00%
Length of stay

Data was transformed using a natural logarithmic transformation and an independent sample t-test was used to compare group means. There was no significant difference between the mean total length of stay of the baseline group (5.8 days) and the pilot study group (5.66 days), \( t(821) = 0.41, p = 0.68 \). There was no significant difference between the mean MICU length of stay of the baseline group (2.61 days) and the pilot study group (2.58 days), \( t(417) = 0.12, p = 0.90 \). There was no significant difference between the mean MINT length of stay of the baseline group (2.39 days) and the pilot study group (2.52 days), \( t(429) = 0.25, p = 0.80 \).
Proportion of physical therapy evaluations

A Pearson’s Chi-square was used to compare the proportion of patients that received a physical therapy evaluation in the baseline and pilot study groups. There was no significant difference in the proportion of physical therapy evaluations between the baseline (47.35%) and pilot (48.28%) time periods. \( \chi^2(1, N=823) = 0.07, p = 0.8 \). In addition, a stepwise logistic regression found the only significant predictors of whether or not a patient received a physical therapy evaluation were age, weight and total length of stay, with gender, BMI and study period having no effect. There was a significant decrease in the proportion of patients who received a physical therapy re-evaluation form pre (5.85%) to post (1.94%), \( \chi^2(1, N=823) = 8.81, p = 0.003 \). There was no significant difference in the mean number of physical therapy sessions per patient between the baseline (\( M = 5.5 \)) and pilot (\( M = 4.6 \)) groups, \( t(392) = 1.57, p = 0.12 \).

In addition, a negative binomial regression that included study period, age, gender, weight, BMI, and total length of stay as predictors and the number of physical therapy sessions as the outcome variable found that when controlling for all other variables total length of stay was the only significant predictor of the number of physical therapy sessions a patient receives.
This author was very pleased to find that **a statistically significant reduction (8.64% to 4.09%)** in the proportional incidence of hospital-acquired delirium occurred on the nursing units where the pilot was implemented.

While always hopeful for a reduction in delirium, this author had actually **originally postulated that the incidence of delirium might increase with nursing staffs’ awareness of the project** (and therefore staff would have more awareness of delirium).

No other pilot projects focused on delirium, screening for delirium, or early progressive mobility during the time between the baseline (11/1/2013-12/31/13) and pilot (11/1/2014-12/31/14) groups that could have skewed the findings.
This author was also delighted to note that an overall proportion of patients who were admitted on bedrest declined from 37.9% pre-pilot as compared to 23.28% post-pilot.

There are a limited number of clinical indications for when the order of bedrest is actually appropriate which have been outlined in the mobility protocol, and it is vital that patients who do not meet these clinical indications be allowed and encouraged to be as active as physically and safely possible during their hospitalization.

This outcome was of particular interest to this author’s practice site, as we are working to remove the option of bedrest as a default from our general and ICU admission order sets in our electronic medical record. This author believes that having 23.28% of patients admitted to the MINT and MICU units combined is still too high of a percentage, so there is room for improvement regarding this measure.
References


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You can see this study published online at the ADVANCE Healthcare Network for NPs and PAs from June 2016.