Impact of a Mobility Team on Intensive Care Unit Patient Outcomes

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INTRODUCTION

In recent years, there has been an escalation of peer-reviewed publications, research teams, and implementation of quality initiatives around the nation and the world that reflect the prioritization of improving patient outcomes after an intensive care unit (ICU) stay. Critical illness is often catabolic and debilitating, and many survivors experience residual effects that affect long-term physical functionality and quality of life.\textsuperscript{1} ICU-acquired muscle weakness frequently occurs in this patient population and is strongly associated with the culture of immobility and bed rest that has historically been present in ICU settings\textsuperscript{2}.

Early mobilization of critically ill patients in the ICU setting has been shown to improve long- and short-term outcomes\textsuperscript{3} and has been demonstrated to be safe and attainable\textsuperscript{4} and profoundly beneficial.\textsuperscript{5} Significant evidence documents the benefits of early mobilization in ICU settings to include\textsuperscript{6,7}:

- Decreased hospital and ICU length of stay
- Decreased duration of mechanical ventilation

KEYWORDS

- Critical care
- Intensive care
- Mobility physical therapy
- Mobility team
- ICU liberation

KEY POINTS

- Mobility of ICU patients improves long-term outcomes.
- Although clinical practice guidelines are in place and benefits of mobility are well documented, a culture of immobility prevails in many ICUs.
- Challenges in mobilizing ICU patients can include lack of therapy staff and consultations.
- Use of a dedicated mobility team can increase number of patients mobilized, empower nursing staff, and improve patient outcomes.

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Greater ambulation distance
Better functional outcomes at hospital discharge

Implementation of an early mobility program, however, can present numerous challenges. In many facilities, it represents a paradigm shift in the treatment of critically ill patients because ICU patients may remain immobilized for prolonged intervals or even the entire duration of time when receiving mechanical ventilation. Achieving a culture of early mobility is also heavily influenced by issues and variability in staffing patterns and resources available for early intervention activities.

BACKGROUND

Memorial Hospital at Gulfport is a not-for-profit community hospital with 303 beds, a level II trauma center, and two ICUs. The ICU functions as one unit in terms of management and staffing, but in two separate and distinct locations within the facility. One of the ICUs supports a cardiac and cardiac surgery patient population, and the other ICU supports neurologic and medical patient populations. There are 26 total ICU beds split between the two locations supported by a staff of approximately 100 registered nurses (including full-time, part-time, and prn employees). Additionally, five intensivist physicians and six acute care nurse practitioners provide 24-hour (in person) coverage and are available at the bedside any time the nursing staff requires provider assistance along the trajectory of patient care.

In October of 2015, the ICU leadership team began meeting in an effort to implement the Society of Critical Care Medicine’s 2013 Clinical Practice Guidelines for Pain, Agitation and Delirium by using the ABCDEF bundle. At the time, none of the bundle elements were used in practice, and a 3-year plan was drafted to guide change and implement each element of the bundle separately. A culture of oversedation and immobilization prevailed, and the physical therapy (PT) and occupational therapy (OT) staff worked with only 38.4% of the ICU patient population. Moreover, therapy staffing allotments for the ICU setting were limited. This, coupled with a lack of consultations for PT/OT from the provider group caused in part by a lack of prioritization for mobility and an ICU culture that was not aggressive with mobility accounted for the low percentage of patients receiving therapy or mobilization on a regular basis. Additionally, nursing staff expressed apprehension regarding the safety of mobilizing critically ill patients because they believed there was a lack of multiskilled technicians (MSTs) to assist with turning, lack of PT/OT presence in the unit, and underutilization of the mobilization equipment available. To address this situation, an ICU liberation initiative including the formation of an ICU mobility team was approved to serve as a catalyst for changing the culture of immobility in the ICU setting, and to empower the team to provide care with the goal of improving long- and short-term outcomes for critically ill patients.

PROPOSED OUTCOMES OF MOBILITY TEAM

The long-term outcomes of creating a mobility team were to meet the early mobility element (E) of the ABCDEF bundles and create a culture of mobility within the ICUs without an increase in cost to the institution. In addition to meeting the E element, other long-term goals were to meet the element without an increase in the ICU patient fall rate.

PLANNING

Although the implementation of the early mobility and exercise component (E) of the ABCDEF bundle was one of the last elements to be implemented in practice, it was
perhaps the most positively accepted component in this bundle of evidence-based care.\textsuperscript{13} The ICU mobility team was formed and consisted of staff members that were placed in MST positions to allow for a broad scope of the position. This facilitated collaboration with all members of the interprofessional team (physicians, ICU nurses, nurse practitioners, and therapy staff) and provided autonomy for mobilizing patients.

The ICU staff enthusiastically welcomed the mobility team and supported their valuable addition and contribution to the interprofessional team. The recruitment of these team members occurred in-house and included staff that were previously employed in transporter and various technician positions that required patient contact on many and varied units (including ICU) and some limited assistance with patient mobility. Thus, the new mobility team staff were knowledgeable about transporting patients, familiar with patient positioning, and comfortable in the ICU environment.

Orientation began with classes for MSTs on the mobility team offered by the professional development department to include training for documentation in the electronic health care record (EHR); back safety and patient positioning in-services; and training on safe management of catheters, use of patient lift devices, and safe patient handling. On completion of these classes, MSTs job shadowed with PT and OT staff to establish familiarity with workflow and patient load and advanced training in functional mobility and use of assistive devices. Job shadowing also occurred with ICU nurses for familiarization and safe practice with a wide variety of tubing, lines, and devices commonly used in the ICU patient population. The mobility team also received in-depth in-services on patient positioning by the wound care nursing staff. This training included proper positioning to offset pressure on the bony prominences, side-to-side position changes, repositioning to avoid shearing injuries, and optimal positioning to prevent patient being too close to side rails. Demonstration of techniques, such as floating extremities at the proper angle, proper techniques for bending knees, and correct technique for floating arms and heels were also used. The wound care nursing staff also highlighted having empathy for patients that are unable to reposition themselves and an in-depth discussion on awareness of all bony prominences.

Orientation to use of the bedside monitoring systems, ICU specialty beds, safe handling of ventilated patients, and the supine cycle equipment were also provided. The supine cycle was purchased for the ICU in early 2016 to assist with implementation of the E bundle for the ICU mobility team initiative. Before formation of the mobility team, the supine cycle was not used since purchase. The portable supine cycle is used with patients confined to the bed and allows them to participate in physical activity while spending time in bed immobilized or tethered to lifesaving mechanical systems. The supine cycle is mounted on an adjustable table that slides over the patient bed for use and provides several activity modes to accommodate fluctuations in ICU patient participation.

This structured orientation occurred over approximately a 4-week period with ongoing updates and refreshers provided as needed.

**Data Collection and Analysis**

The Acute Physiology and Chronic Health Evaluation (APACHE) tool was used for data collection and outcomes measurement during the implementation of the ICU liberation project. APACHE is a tool that serves as an adjunct to the EHR and provides clinicians with decision support and performance management. The APACHE system includes risk-adjusted outcome measures, built-in and ad hoc reporting capabilities, and comparative reporting solutions. APACHE data were analyzed using descriptive statistics. Additionally, a performance improvement analyst was used to aggregate and interpret data outcomes.
IMPLEMENTATION

In December of 2016, the ICU mobility team was formally operationalized and staffed in both ICUs Monday to Friday. This team of five MSTs became responsible for assisting the PT/OT staff in meeting patient needs with direct supervision provided by the acute therapy manager (a physical therapist) that also supervises all acute PT, OT, and speech therapy staff. The ICU bedside nurse was tasked with direct communication with the mobility team about the patient’s status, assistance with mobility, and assessment of tolerance of mobility activities.

Daily Workflow

The ICU mobility team consists of five MSTs that work in collaboration with physical therapists and occupational therapists (Fig. 1). Two of the MSTs on the team are assigned to each ICU Monday through Friday from 0630 to 1415. On arrival to their work area, a chart review is conducted of each ICU patient. Patients are individually assessed for mobility appropriateness in collaboration with PT/OT by using the facility’s provider-approved list of exclusion criteria for ICU mobilization (Box 1).

The ICU mobility team coordinates with ICU nursing staff to establish a plan of care and workflow for each individual patient. The mobility team identifies patients that have planned procedures and new patients in the ICU, and adapts to unexpected changes that occur during their workday. The PT/OT team prioritizes ICU patient consultations and evaluations early in their shift to better collaborate and integrate care with the ICU mobility team, and the team assists PT/OT with mobility during their evaluations as needed. The team also communicates with the acute therapy manager regularly during their work day to provide updates.

Patients are assisted with functional mobility throughout the shift by the mobility team to include such activities as toileting, meal assistance, sitting, standing, and
ambulation. Postoperative mobility orders for surgical patients are implemented by the mobility team, and passive range of motion exercises are performed on patients that meet exclusion criteria for mobility or are otherwise unable to be mobilized. All documentation of activities of daily living completed with each ICU patient is recorded in the EHR by team members.

Additionally, the mobility team is responsible for turning all ICU patients every 2 hours by using the ICU turn clock (Fig. 2), and for keeping all ICU patients on a consistent turn schedule. The team advocated for elimination of the supine position during an ICU quality improvement hospital-acquired pressure injury (HAPI) initiative and the suggestion was approved and implemented in both ICUs. The team voiced that ICU patients are often placed in the supine position for bedside procedures, such as line placement, chest radiograph, dialysis, bronchoscopies, and meals, and could remain in the supine position for more time than desirable. The mobility team believed that by eliminating supine position, it would prevent excess time on their backs and potentially prevent skin breakdown. Documentation of turning in the EHR also became the responsibility of the mobility team with nursing oversight.

<table>
<thead>
<tr>
<th>Box 1 Exclusion criteria for ICU mobilization</th>
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<tr>
<td>• Active bleeding</td>
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<td>• Active myocardial infarction</td>
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<tr>
<td>• Arctic Sun (targeted temperature management) in use</td>
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<tr>
<td>• Arterial/venous sheath</td>
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<tr>
<td>• Comfort care measures</td>
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<tr>
<td>• Cordis in groin</td>
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<tr>
<td>• External ventriculostomy drain or ICP bolt device*</td>
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<tr>
<td>• Femoral arterial line?</td>
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<tr>
<td>• $F_{O_2}$ greater than 60% and/or PEEP greater than 8</td>
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<tr>
<td>• Hemodynamically unstable requiring more than one vasoactive medication</td>
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<tr>
<td>• IABP or Impella device in place</td>
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<tr>
<td>• Leg or pelvic fractures (activity, PT/OT per orthopedics)</td>
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<tr>
<td>• Lumbar drain</td>
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<tr>
<td>• Open abdomen or chest incision</td>
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<tr>
<td>• Paralytic agent in use</td>
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<tr>
<td>• Position restrictions ordered</td>
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<tr>
<td>• Spinal precautions (activity, PT/OT per orthopedics)</td>
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<tr>
<td>• TPA administration within the last 24 hours</td>
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<td>• Tracheostomy placement within 24 hours</td>
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<td>• Traction excluding Halo</td>
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Abbreviations: $F_{O_2}$, fraction of inspired oxygen; ICP, intracranial pressure; PEEP, positive end-expiratory pressure; TPA, tissue plasminogen activator.
In addition to assistance with functional mobility and activities of daily living, responsibility for the weight accuracy and proper usage of the ICU specialty beds was assumed by the mobility team. The mobility team assesses each patient’s skin integrity with all mobility encounters, and concerns or alterations in skin integrity are immediately reported to PT/OT and nursing staff. The ICU mobility team also assists the ICU coordinators when performing weekly skin assessments for HAPI prevention.

To help ensure a continued culture of mobility when the ICU mobility team and/or PT/OT staff are not present on the unit, daily usage of the laminated ICU mobility cards was implemented (Fig. 3). These communication tools assist in the continuum of mobility care and awareness between shift and staff changes. After PT/OT and/or provider approval, the cards are marked to indicate the patient’s designated level of mobility for the oncoming shift. After the implementation of the mobility team, they assumed responsibility for updating and usage of the cards, which were rarely or inconsistently used since their creation early in 2016. Suggestions for a user-friendly design were proposed by the team and the existing cards were edited to make the change. Increased usage of mobility cards encouraged mobilization activities when PT/OT staff were not physically present, and bolstered the confidence and comfort level of the night shift nursing staff to mobilize their patients at the appropriate level.

After formation of the mobility team, the daily workflow also included assessment of appropriateness of the supine cycle (in collaboration with the PT/OT staff) with patients placed on the supine cycle when suitable. Consequently, usage of the supine cycle went from zero to approximately 10%.

Other responsibilities of the mobility team include daily assistance with patient mobility activities on the progressive care unit when needed and daily and weekly data collection to track patient outcomes. Mobility team members are rotated between ICUs on a 6-month basis to promote flexibility and familiarity with the two ICU environments and the various ICU health care team members.

OUTCOMES OF MOBILITY TEAM

Patient Outcomes

As a result of the initiation of a mobility team, PT/OT consultations for ICU patients increased from 38.4% (n = 915) in 2016 to 78.1% (n = 1862) in 2017, and then to...
86.2% (n = 1382) for first through third quarters in 2018. ICU length of stay (Fig. 4) had a statistically significant downward trend (n = 6435). The ICU length of stay before implementation of the mobility team was 3.06 days and dropped to 2.41 days and is currently (3Q18) at 2.57 days, demonstrating a significant downward trend. Furthermore, ICU readmissions (Fig. 5) also showed a downward trend (n = 422). The ICU readmission rate before implementation of the mobility team was 6.8% and trended as low as 3.5%. An increase in the readmission rate was noted in 3Q18 and will be monitored. Although this trend was not statistically significant, it was better than predicted values from the APACHE scoring system. Ventilator days had a slight (Fig. 6) decrease overall but not statistically significant. Total actual number of patients on the ventilator on Day 1 in ICU were 1146 in 2016, 1126 in 2017, and 833 in first quarter through third quarter 2018.

The total number of patients in the ICU that were ambulated had a percentage increase of 80% from 2016 to third quarter of 2018. In 2016, 7.8% of ICU patients (n = 187) were ambulated in the ICU, and in quarters one to three of 2018, 14% of ICU patients (n = 234) ambulated while in the ICU. The ambulation distance in feet...
has also pointedly increased (Fig. 7). Additionally, the number of patients assisted to a
standing position increased from 0.17% (n = 4) in 2016 to 5.1% (n = 122) in 2017, and
then 4.7% (n = 78) in first through third quarters of 2018. The percentage of patients
receiving passive range of motion went from 58.3% (n = 1390) in 2016 to 60.3% (n = 1438) in 2017, and 67.5% (n = 1125) in first through third quarters of 2018.
The percentage dangled on the edge of the bed also increased from 2.27% (n = 54) in 2016 to 10.8% (n = 258) in 2017, and 10% (n = 167) in quarters one through
three in 2018 (Fig. 8). Also of note, before the implementation of the mobility team and
ICU adoption of ABCDEF bundle, no ventilated patients in the ICU were mobilized.

There was no significant increase in adverse events in ICU patients noted since the
implementation of the mobility team in December of 2016 through the third quarter of
2018. Fall rates have remained unchanged and at baseline, and hospital inpatient
quality reporting system events revealed no fall occurrences related to mobility
team activities. We did not see a significant change in the ICU HAPI rate during this
timeframe.
Staff Outcomes

A survey of ICU nurses used pre-implementation and post-implementation of the mobility team was performed. Results indicated that pre-implementation of the mobility team, nursing staff believed the patients were being turned every 2 hours, but did not believe the patients were out of bed as often as clinically appropriate because of a lack of time and support. Post-implementation results revealed that nurses believed turning was still a priority and agreed that patients were out of bed any time they meet appropriate criteria (did not meet exclusion criteria). Nursing staff believed they had more time and were well supported with mobilization of patients. Concerns related to patient safety and self-injury were also improved. The nursing staff surveyed strongly agreed that the addition of the mobility team increased overall nurse satisfaction and believed that mobility team staffing should be expanded to include night and weekend coverage.

Cost Outcomes

The financial impact of implementation of a dedicated mobility team resulted in positive outcomes in relation to ICU staff injuries. Since inception of the mobility team in December 2016, there have been no ICU staff injuries related to patient handling. This number represents a significant decrease from the 2 years before implementation when five injuries occurred in 2015 and 2016 (Fig. 9).

DISCUSSION

The implementation of a mobility team in the ICU was successful in meeting the E element bundle of the ICU liberation initiative. It proved to be a cost-effective way

Fig. 6. ICU ventilator days.

Fig. 7. Distance of ambulation.
to meet the early mobility element without a substantial increase in cost and offsetting
the use of costly PT units. Implementation and training were fairly simple processes,
and nursing staff felt more supported and open to mobilizing critically ill patients.
The culture of immobility in the ICU setting shifted to one that viewed mobility as med-
icine with a more positive and enthusiastic response to PT and OT presence and
participation in the continuum of patient care.

SUMMARY

Early mobility in the ICU may minimize loss of functional abilities and thereby shorten
hospital stays. Use of a dedicated mobility team in the ICU setting demands a collabor-
ative approach among members of the multidisciplinary team to coordinate care
and provide safe mobilization of patients. Patient and cost outcomes of the impact

Fig. 8. Activity summary run charts. (A) Percentage of ICU patients receiving range of mo-
tion (ROM). Data points 3Q17–3Q18 show an upward trend for percentage of patients
receiving range of motion in the ICU. (B) Percentage of ICU patients dangled. (C) Percentage
of ICU patients ambulated. (D) Percentage of ICU patients standing.

Fig. 9. ICU patient handling. ANOVA, analysis of variance; LC; UC.
of a mobility team at Memorial Hospital in Gulfport will continue to be monitored, tracked, and trended quarterly to assess effectiveness of the team long-term, and recommendations for expansion into night and weekend coverage and coverage in the progressive care unit are currently being discussed.

REFERENCES