Implementation of an Interdisciplinary AACN Early Mobility Protocol

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BACKGROUND Increasing mobility in the intensive care unit is an important part of the ABCDEF bundle.
OBJECTIVE To examine the impact of an interdisciplinary mobility protocol in 7 specialty intensive care units that previously implemented other bundle components.
METHODS A staggered quality improvement project using the American Association of Critical-Care Nurses mobility protocol was conducted. In phase 1, data were collected on patients with intensive care unit stays of 24 hours or more for 2 months before and 2 months after protocol implementation. In phase 2, data were collected on a random sample of 20% of patients with an intensive care unit stay of 3 days or more for 2 months before and 12 months after protocol implementation.
RESULTS The study population consisted of 1266 patients before and 1420 patients after implementation in phase 1 and 258 patients before and 1681 patients after implementation in phase 2. In phase 1, the mean (SD) mobility level increased in all intensive care units, from 1.45 (1.03) before to 1.64 (1.03) after implementation ($P < .001$). Mean (SD) ICU Mobility Scale scores increased on initial evaluation from 4.4 (2.8) to 5.0 (2.8) ($P = .01$) and at intensive care unit discharge from 6.4 (2.5) to 6.8 (2.3) ($P = .04$). Complications occurred in 0.2% of patients mobilized. In phase 2, 84% of patients had out-of-bed activity after implementation. The time to achieve mobility levels 2 to 4 decreased ($P = .05$). Intensive care unit length of stay decreased significantly in both phases.
CONCLUSIONS Implementing the American Association of Critical-Care early mobility protocol in intensive care units with ABCDEF components in place can increase mobility levels, decrease length of stay, and decrease delirium with minimal complications. (*Critical Care Nurse*. 2020;40[4]:e7-e17)

CE 1.0 hour, CERP B

This article has been designated for CE contact hour(s). The evaluation tests your knowledge of the following objectives:
1. Describe the implementation of the American Association of Critical-Care Nurses early mobility protocol.
2. Identify the improved outcomes of early mobility of critically ill patients as part of the ABCDEF bundle.
3. Develop a plan for a successful early mobility protocol in your own intensive care unit.

To complete evaluation for CE contact hour(s) for test C2043, visit www.ccnonline.org and click the "CE Articles" button. No CE fee for AACN members. This test expires on August 1, 2022.

Increasing mobility in critically ill patients in the intensive care unit (ICU) is a priority of national organizations involved in critical care.[1-3] These organizations support the ICU Liberation model through implementation of the ABCDEF bundle, which includes Assess, prevent and manage pain; Both spontaneous awakening and breathing trials; Choice of analgesia and sedation; Delirium assessment, prevention and management; Early mobility and exercise; and Family engagement and empowerment. The ABCDE bundle was first proposed as 5 evidence-based steps to improve care of the ICU patient.[4] Family engagement was later added, and the bundle was further refined with clinical practice guidelines in 2018.[5] A recent quality improvement (QI) initiative incorporating the bundle demonstrated improvement of multiple outcomes in the first 7 days of ICU admission, including hospital death, next-day mechanical ventilation, coma, and discharge location.[6]

An early mobility program requires an interdisciplinary approach involving nurses, physical and occupational therapists, respiratory therapists, and physicians.[7] Studies have confirmed the benefits of early mobility in the ICU,[8,9] with decreased days to first time out of bed,[10,11] increased peripheral and respiratory muscle strength,[12,13] improved functional mobility,[12,14] and increased frequency and distance of ambulation.[15-18] Early mobility and decreased sedation are associated with decreased delirium[14,19-21] and may prevent post–intensive care syndrome.[20] Several studies have demonstrated a link between early mobility and decreased ventilator days[19,21,22] and ICU or hospital length of stay (LOS).[10,14,17,21-27]

Safety is a concern when mobilizing patients in the ICU. However, several studies have demonstrated the safety of increasing activity.[10,15,24,28-30] A recent meta-analysis showed a 2.6% incidence of potential safety events, with only 0.6% of events requiring medical intervention.[31]

Despite the benefits and safety, the number of ICU patients mobilized remains low.[32-35] A worldwide survey of ABCDEF bundle implementation indicated that 57% of respondents from 47 countries had implemented various components of the bundle. The majority of ICUs did not use a formal mobility scale, and most did not have a mobility team.[35] At our institution, we previously implemented ABCD and F components of the ABCDEF bundle; however, early mobility was unit based rather than patient based. We did not use a mobility scale or a protocol for advancing mobility. At baseline, only 3 ICUs—the surgical/burn/trauma ICU (SBTICU) and both cardiothoracic ICUs (CTICUs)—had dedicated physical therapists (PTs) whose primary treatment population was in the ICU. As a result of this inconsistency across units, internal data revealed that over two 4-week periods, only 16% of patients received a PT referral in the medical ICU (MICU) compared with 71% in the SBTICU, and out-of-bed activity was performed a mean of 0.85 times in the MICU compared with 1.5 times in the SBTICU. Thus a QI approach was needed to standardize early mobility for all ICU patients. The purpose of this QI project was to examine the impact of an interdisciplinary mobility protocol in specialty ICUs.

Methods

The project was conducted at a 1200-bed, university-affiliated level I trauma medical center in the Midwest with 132 ICU beds at project initiation. A staggered QI preintervention-postintervention design was used. The institution's human research protection office deemed the project nonhuman subjects research. The American Association of Critical-Care Nurses (AACN) early progressive mobility protocol was used.[36]

Baseline data were collected for 2 months in each unit. The presence of in-room ceiling lifts and a dedicated PT varied. A staggered approach with initiation in 2 ICUs every 2 to 4 months allowed for education of staff. One MICU and the SBTICU implemented the program in March 2015. The second MICU and both CTICUs implemented the program in May 2015. The last 2 units, the cardiac unit and the neurology/neurosurgery unit

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Early progressive mobility protocol, medical ICU

Step 1: Screen for safety; evaluate every 12 hours

M Myocardial stability
- ☐ No active cardiac ischemia within past 12-24 hours
- ☐ No dysrhythmia requiring new antidysrhythmic agent or electrical therapy within past 12-24 hours

O Oxygenation stability
- ☐ F_{IO_2} <0.85 on mechanical ventilation
- ☐ PEEP <15 cm H_2O
- ☐ No unsecured airway (no unstable airway or difficult airway)

V Vasopressor use/vascular access
- ☐ No new or increase of any vasopressor x2 hours

E Engages to voice
- ☐ Responds to verbal stimulation
- ☐ RASS <+3

N Neurological stability
- ☐ ICP <15
- ☐ No acute or uncontrolled intracranial event
- ☐ Spine stability

Early progressive mobility protocol, surgical/burn/trauma ICU

Step 1: Screen for safety; evaluate every 12 hours

M Myocardial stability
- ☐ No active cardiac ischemia within past 12-24 hours
- ☐ No dysrhythmia requiring new antidysrhythmic agent or electrical therapy within past 12-24 hours

O Oxygenation stability
- ☐ F_{IO_2} <0.85 on mechanical ventilation
- ☐ PEEP <15 cm H_2O
- ☐ No unsecured airway (no unstable airway or difficult airway)
- ☐ ET depth unchanged and capnography waveform present

V Vasopressor use/vascular access
- ☐ No new or increase of any vasopressor x2 hours (for any questions about pressor level, ask fellow or attending physician)
- ☐ No femoral sheath/introducer

E Engages to voice
- ☐ Responds to verbal stimulation
- ☐ RASS <+3

N Neurological/ortho/wound stability
- ☐ No ICP monitor in place
- ☐ No acute or uncontrolled intracranial event
- ☐ No spine instability
- ☐ No unclamped lumbar drain (do not clamp for mobility)
- ☐ No pelvic/lower extremity fractures that are non–weight-bearing (weight-bearing status confirmed)
- ☐ No unstable surgical incision

Figure 1 Modified AACN screening criteria examples.

Abbreviations: AACN, American Association of Critical-Care Nurses; ET, endotracheal tube; F_{IO_2}, fraction of inspired oxygen; ICP, intracranial pressure; ICU, intensive care unit; PEEP, positive end-expiratory pressure; RASS, Richmond Agitation-Sedation Scale.
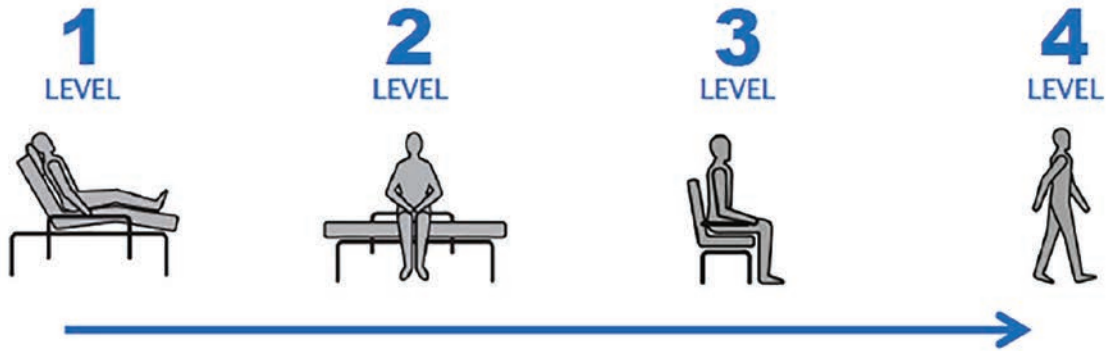
Adapted with permission from the American Association of Critical-Care Nurses.[36]

(NNSICU), implemented the program in August 2015. The staggered approach provided time to add a PT dedicated to each ICU immediately before implementation.

Project team members met with each unit's nursing, therapy, and physician leadership to review and modify the AACN screening criteria specific for their patient population (Figure 1). Each ICU developed an implementation plan. The AACN 4-level mobility protocol was implemented with minor modifications (Figure 2).[36] Education about the project occurred over a 2-week period in the second month of preimplementation data collection. Unit champions helped with education, served as a resource, and assisted with overcoming barriers. Bedside data collection included morning and evening mobility goal, complications, and reasons the goal was not achieved.

The nurse performed the safety screen during daily spontaneous awakening and breathing trials. If screening criteria were met, the patient began at mobility level 2. The goal was written on the goals board at the entrance

Figure 2 AACN 4-level mobility protocol with modifications to activities.

Abbreviations: MV, mechanical ventilation; NIV, noninvasive ventilation; PT, physical therapist; ROM, range of motion; RT, respiratory therapist; TID, 3 times per day.

Adapted with permission from the American Association of Critical-Care Nurses.[36]

to each room to facilitate team communication. Level 1 activities were performed by nurses for patients who could not advance to level 2. Physical and occupational therapists communicated with nurses if patients progressed in mobility levels during treatment sessions.

Members of the project team rounded daily initially and then several times per week over the first 2 months of implementation. Team members met regularly to discuss issues and make adjustments in implementation using the plan-do-study-act method. Snapshots of results were provided at unit meetings after the first and second months of implementation to discuss progress, barriers, and opportunities for improvement and any process changes.

> An early mobility program requires an interdisciplinary approach involving nurses, physical and occupational therapists, respiratory therapists, and physicians.

Data were collected for 12 months after protocol implementation to ensure sustainment. Updates on outcomes continued to be shared as part of the QI process; however, after the first 2 months, minimal changes were instituted. In phase 1, data were collected on all patients in the ICU for 24 hours or more for 2 months before and 2 months after implementation; in phase 2, data were collected monthly on at least 20 randomly selected patients or 20% of patients in the ICU for 3 days or more for 2 months before and 12 months after implementation (Tables 1 and 2).

Process measurements from bedside data collection sheets were entered by 2 research team members. Additionally, data were extracted from the electronic medical record (EMR). Mobility level achieved was based on completion of the activity at least once per day. Preadmission mobility was extracted using the following definitions: community ambulators could ambulate at least 300 feet with or without an assistive device; household ambulators could ambulate at home but needed a wheelchair or scooter in the community; wheelchair individuals needed a wheelchair or scooter for all activity; bed-bound individuals were restricted to bed. All data were entered into REDCap (Research Electronic Data Capture) by 3 team members. The individual extracting data was different from the individual entering data.

Instruments

The Richmond Agitation-Sedation Scale (RASS) score was documented at least every 4 hours. Highest

Table 1 Measurements in phase 1 and phase 2

Phase 1	Phase 2
Daily frequency of ROM	ICU day achieve level 2, dangle legs from the side of the bed or lift to chair
Daily frequency of HOB elevation	
Daily frequency of dangling legs at the side of the bed	ICU day achieve level 3, stand and transfer to chair
Daily frequency of lift to chair	
Daily frequency of standing and transferring to chair	ICU day achieve level 4, ambulate
Daily frequency of ambulation	Preadmission mobility status
Daily PT/OT visit (yes or no)	
Twice daily CAM-ICU (positive or negative)	ICU day PT order entry
Lowest RASS score in 24 hours	ICU day first PT visit
Highest RASS score in 24 hours	Total ventilator days
Daily highest mobility goal set	ICU Mobility Scale
Daily goal met (yes or no)	Hospital length of stay
Daily reason goal not met	ICU length of stay
ICU length of stay	Discharge location
Discharge location	
Complications	

Abbreviations: CAM-ICU, Confusion Assessment Method for the Intensive Care Unit; HOB, head of bed; ICU, intensive care unit; OT, occupational therapy; PT, physical therapy; RASS, Richmond Agitation-Sedation Scale; ROM, range of motion.

and lowest RASS scores were extracted for each day. The Confusion Assessment Method for the Intensive Care Unit (CAM-ICU) results were documented twice per day. If at least 1 of the 2 assessments was positive, a delirium-positive day was entered. A RASS score of −4 or −5 does not allow for CAM-ICU assessment and thus was documented in the research report. Both the RASS and the CAM-ICU are validated instruments recommended in the ABCDEF bundle.[1,5]

The ICU Mobility Scale (IMS) quantifies a patient's maximum level of mobility.[36] The patient is scored on the highest mobility in the previous 24 hours from 0, indicating no activity, to 10, indicating independent ambulation without an assistive device. Interrater reliability reported for the IMS between PTs and ICU nurses ranged from 0.72 to 0.69 (weighted κ),[37] and the IMS was shown to be a valid method of measuring ICU mobility.[38,39] The IMS score was determined on the basis of retrospective review of EMR documentation by PTs and nurses of highest mobility level achieved.

Statistical Analysis

All data were downloaded from REDCap into IBM SPSS Statistics, version 22. Outliers were examined and verified or corrected in REDCap. Data were downloaded again for analysis. Descriptive statistics were calculated. Means and SDs were calculated for continuous variables, and frequencies and percentages were calculated for

Table 2 Sample sizes in phase 1 (≥24 hours in ICU) and phase 2 (random sample of patients ≥3 days in ICU)[a]

	Phase 1		Phase 2	
	Before implementation	After implementation	Before implementation	After implementation
Total	1266	1420	258	1681
No baseline dedicated PT	785	789	140	986
Medical ICU (24 beds, lifts in all rooms, no dedicated PT at project start)	184	205	43	267
Medical ICU (10 beds, 2 lifts, no dedicated PT)	112	138	18	217
Cardiac ICU (15 beds, 2 lifts, no dedicated PT)	299	224	40	251
NNSICU (20 beds, 2 lifts, no dedicated PT)	190	222	39	251
SBTICU (36 beds, lifts in each room, dedicated PT)	304	354	49	294
CTICU (21 beds, 2 lifts, dedicated PT)	119	206	43	220
CTICU (6 beds, 1 lift, dedicated PT)	58	71	26	181

Abbreviations: CTICU, cardiothoracic intensive care unit; ICU, intensive care unit; NNSICU, neurology/neurosurgery intensive care unit; PT, physical therapist; SBTICU, surgical/burn/trauma intensive care unit.

[a] Values indicate number.

Table 3 Results for ABCDEF bundle components and length of stay in phase 1 and phase 2[a,b]

	Before phase 1	After phase 1	P
Sedation, lowest RASS score	-1.54 (1.3)	-1.53 (1.2)	NS
Sedation, highest RASS score	-0.056 (1.1)	-0.054 (1.0)	NS
Delirium, CAM-ICU positive days, all ICUs	1.65 (3.68)	1.37 (3.47)	NS
Days to first PT visit	3.65 (1.82)	3.22 (1.67)	.01
Mobility level during first 7 ICU days, all ICUs	1.45 (1.03)	1.64 (1.03)	<.001
ICU LOS, all ICUs	6.6 (7.3)	6.1 (6.5)	NS
ICU LOS, no dedicated PT at baseline	6.6 (6.9)	6 (6.5)	.02
	Before phase 2	**After phase 2**	
Days to first PT visit	4.6 (3.4)	3.8 (2.9)	.01
Initial IMS score	4.4 (2.8)	5 (2.8)	.01
ICU discharge IMS score	6.4 (2.5)	6.8 (2.3)	.04
Hospital discharge IMS score	7.2 (2.5)	7.3 (2.3)	NS
Days receiving mechanical ventilation	3.5 (6.3)	2.9 (5.6)	NS
ICU LOS	7.8 (7.3)	6.8 (5.9)	.03
Hospital LOS	16.3 (12.2)	15.0 (11.1)	NS

Abbreviations: CAM-ICU, Confusion Assessment Method for the Intensive Care Unit; ICU, intensive care unit; IMS, ICU Mobility Scale; LOS, length of stay; NS, not significant; PT, physical therapist; RASS, Richmond Agitation-Sedation Scale.

[a] Values indicate mean (SD).
[b] Phase 1, all patients ≥24 hours in ICU; phase 2, random sample of 20% of patients with LOS ≥3 days from each unit.

dichotomous, nominal, and ordinal variables. Analysis of variance was used to test differences in mobility outcomes between before and after implementation of the protocol. Level of significance for preimplementation-postimplementation differences was set at $\alpha = 0.05$.

Results

In phase 1, we analyzed 1266 ICU admissions before protocol implementation and 1420 after implementation. Table 2 displays sample sizes for each unit. Overall, 44.9% (range, 19%-64%) of patients had a mobility goal set during their ICU stay, with the lowest rates in the CTICUs, which had the longest history of a dedicated PT. The mean (SD) number of days a goal was set was 1.24 (2.17), and the mean (SD) goal set was a mobility level of 2.39 (1.1). The mean (SD) mobility level achieved did not differ significantly by whether a goal was set or not set (1.7 [1] vs 1.6 [1], respectively). Reasons a goal was not achieved included medical issues (6.3%), procedure or test (3.2%), fatigue (1.7%), refusal (1.5%), equipment lacking (0.2%), nurse staffing (0.1%), PT staffing (0.3%), and multiple reasons (18%).

Time to the first PT visit decreased significantly, with 20% of patients not receiving a PT visit before implementation and 15% after implementation.

Results for components of the ABCDEF bundle are shown in Table 3. We found no significant difference in lowest or highest RASS score between before and after protocol implementation. The mean (SD) number of delirium-positive days in the ICUs overall decreased nonsignificantly, although the SBTICU and the 10-bed MICU had significant decreases, from 3 (4.7) days to 2 (3.8) days ($P = .01$) and from 0.65 (2) days to 0.43 (1.7) days ($P = .01$), respectively. Days to first PT visit in units without dedicated baseline PT decreased significantly. Both MICUs had a 1-day decrease in time to first PT visit, from 4.5 (1.76) days to 3.5 (1.77) days ($P = .01$).

The average LOS was approximately 7 days during both periods; therefore, we analyzed the mobility level achieved for the first 7 days and the subsequent days separately. Figure 3 shows the mean mobility level achieved in the first 7 days. The overall mean mobility level achieved increased significantly. We observed the biggest improvements in the units without dedicated PTs at baseline. The smallest unit, a CTICU, had a decrease in mean mobility level achieved after implementation; however, the mean mobility level achieved at baseline was
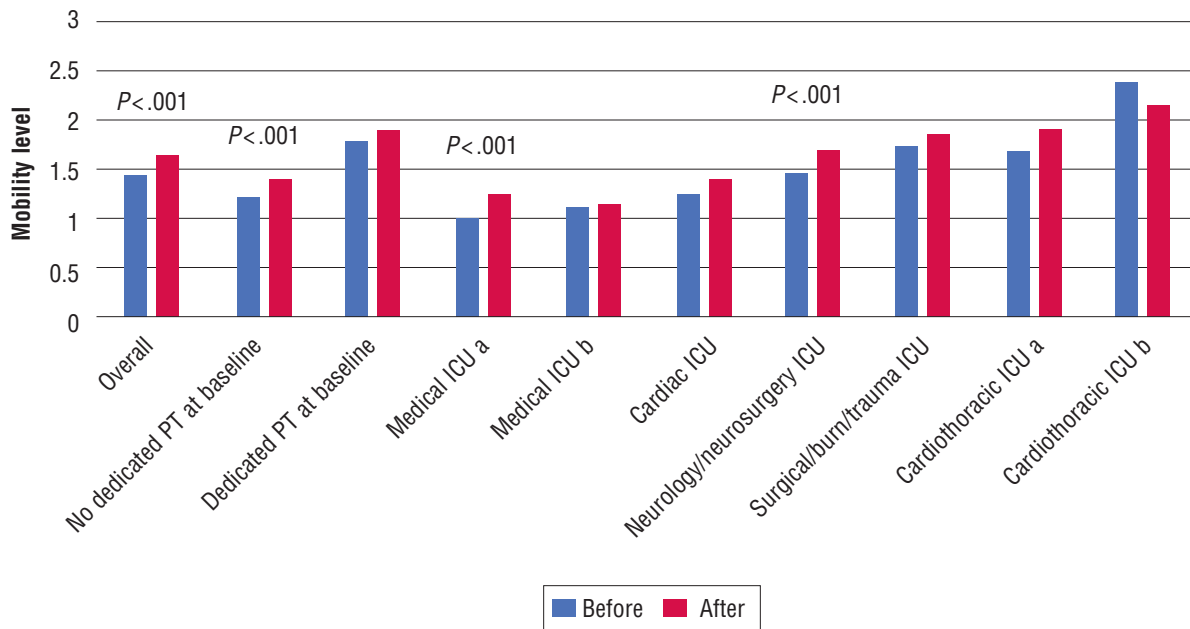
Figure 3 Mean mobility level achieved in the first 7 days in the ICU in phase 1.
Abbreviations: ICU, intensive care unit; PT, physical therapist.

higher than for the other ICUs, and that achieved after implementation remained higher. Mean mobility levels achieved increased with an increase in number of days that patients achieved mobility level 1 ($P = .01$) and level 4 ($P = .01$). Mean number of days achieving level 2 and level 3 did not change significantly. The NNSICU had the greatest increase in number of days that patients ambulated in phase 1 (Figure 4). Beyond the first week, mean mobility level increased nonsignificantly from 1.80 to 1.92 in units with dedicated PTs and from 1.23 to 1.41 in units without dedicated PTs.

In phase 1, most patients were discharged home (52%) or to rehabilitation (14%) before and after project implementation. Intensive care unit LOS decreased nonsignificantly overall and decreased significantly in the ICUs without dedicated PTs at baseline (Table 3). Of the units with dedicated PTs, the SBTICU had a mean (SD) decrease in LOS of more than 1 day, from 6.26 (6.05) to 5.00 (5.15) ($P = .01$). The frequency of major complications during mobilization was 0.02%, with 1 loss of airway, 1 loss of an arterial catheter, and 1 cardiac arrest (1 hour after patient was transferred to a chair; the patient was quickly resuscitated). Table 4 shows the changes in vital signs with mobilization in phase 1, which were most frequent in the CTICU population.
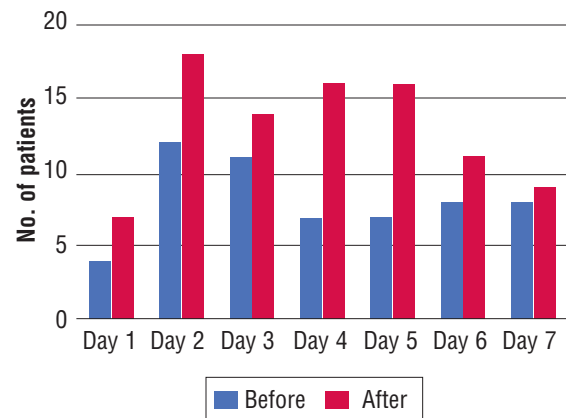

Figure 4 Patients in the 20-bed neurology/neurosurgery intensive care unit achieving level 4 ambulation in phase 1.

In phase 2, we analyzed 258 ICU admissions before implementation and 1681 after implementation (Table 2). Most patients were ambulatory before ICU admission: community ambulators without an assistive device (64% before and 70% after implementation), community ambulators with an assistive device (12% before and 14% after), or household ambulators (16% before and 7% after). Only 4% were wheelchair bound before and 7% after

Table 4 Changes in vital signs with mobilization in phase 1

Change	Combined, No. (%)	Unit(s) with highest number, No. (%)
Heart rate increase >20%	47 (3.3)	CTICU, 15 (6)
Spo$_2$ decrease >5% × 3 min	41 (2.9)	CTICU, 11 (5)
		CICU, 9 (4)
SBP <80 mm Hg	25 (1.8)	CICU, 5 (2.2)
SBP >180 mm Hg	13 (0.9)	CTICU, 7 (3)
		SBTICU, 5 (1.4)
Respiratory rate >35 breaths/min	8 (0.6)	SBTICU, 4 (1.1)
Other (combination of Spo$_2$ decrease and heart rate increase)	14 (1)	CTICU, 5 (2.2)

Abbreviations: CICU, cardiac ICU; CTICU, cardiothoracic ICU; ICU, intensive care unit; SBP, systolic blood pressure; SBTICU, surgical/burn/trauma ICU; Spo$_2$, oxygen saturation as measured by pulse oximetry.

implementation, with 3% being bed bound before and 1% after implementation.

Time to the first PT visit decreased significantly (Table 3), with 20% of patients not receiving a PT visit before implementation and 15% after implementation. Significant increases were seen in the initial and ICU discharge IMS scores before and after implementation, but no significant difference was found in IMS score at hospital discharge (Table 3). With nonparametric Mann-Whitney analysis, the differences in initial and ICU discharge IMS scores remained significant whereas differences of IMS scores at hospital discharge remained nonsignificant. Time to achieve levels 2 through 4 all decreased (Figure 5), with 85% of all patients achieving out-of-bed activity after implementation.

Ventilator days decreased nonsignificantly. Intensive care unit LOS decreased significantly, whereas hospital LOS showed a nonsignificant decrease (Table 3). After implementation, more patients were discharged to home or home with home health care. In some months before implementation, only about 40% of patients were discharged home. However, after implementation, more than 50% of patients were discharged home in the first month, and the proportion remained at that level over the 12 months in phase 2, demonstrating sustainment of the results of this QI initiative (Figure 6).

Discussion

The goal of this QI project was patient-driven mobilization in units with established ABCD and F bundle component implementation to achieve full implementation of the ABCDEF bundle. Introduction of a standardized early mobility protocol increased the number of
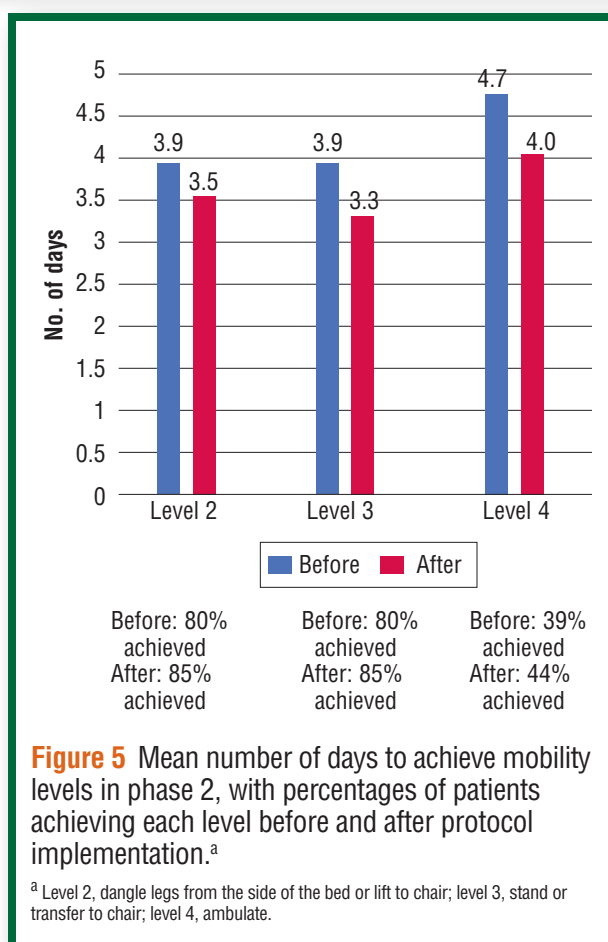

Figure 5 Mean number of days to achieve mobility levels in phase 2, with percentages of patients achieving each level before and after protocol implementation.[a]

[a] Level 2, dangle legs from the side of the bed or lift to chair; level 3, stand or transfer to chair; level 4, ambulate.

patients achieving ambulation and resulted in additional improved outcomes, including decreased delirium days and decreased ICU and hospital LOS.

Our results provide further support for improved outcomes when all aspects of the bundle are implemented. Pun et al[6] found that bundle compliance for the first 7

Figure 6 Percentage of patients discharged to home or home with home health care in phase 2.
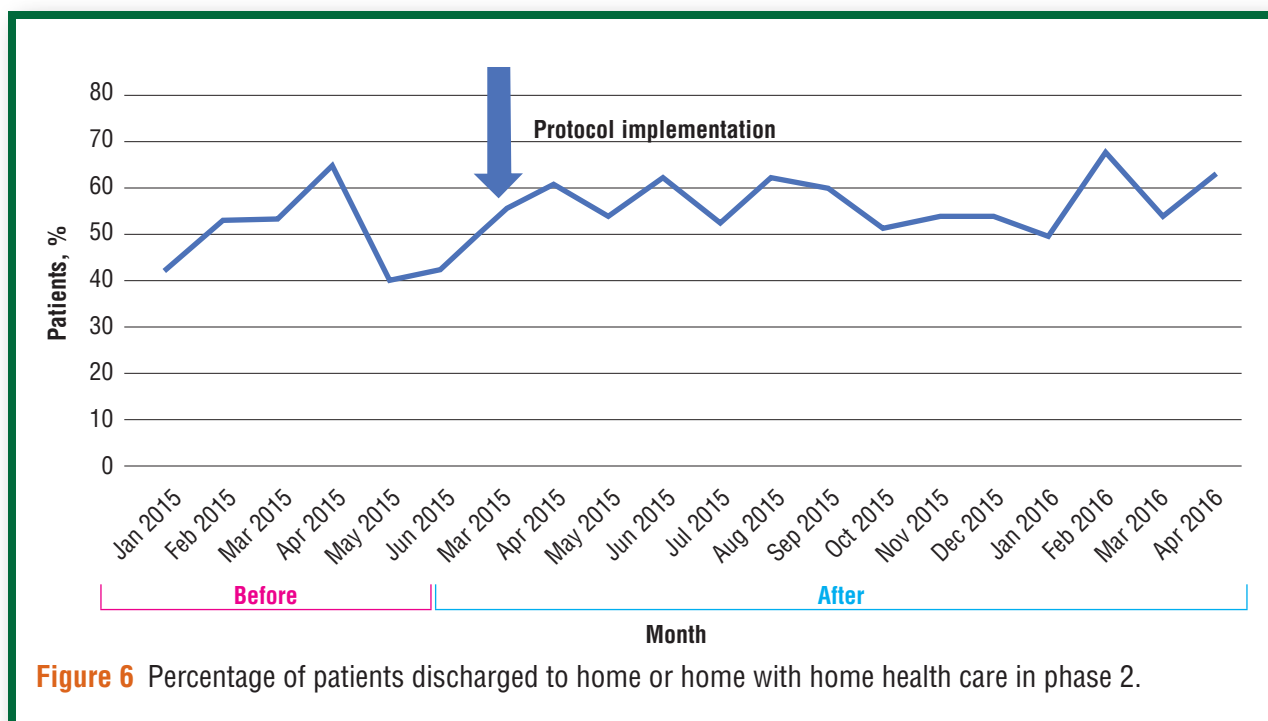
days in 68 ICUs with 15 226 patients with an LOS of more than 24 hours improved outcomes the most in patients who received all components of the bundle. Although we did not examine bundle compliance but rather the impact of standardized implementation of early mobility in units with established ABCDF components, we found similar results. The rate of ICU discharge to home remained above 50%, with some months above 60%, similar to 55% of survivors in the ICU Liberation Collaborative.[6] In addition, decreased delirium was observed.

A recent meta-analysis of early mobility in patients receiving mechanical ventilation in the ICU yielded inconclusive evidence from 4 randomized controlled trials (RCTs) on outcomes including physical function, muscle strength, and adverse events.[40] Another recent meta-analysis of 4 studies indicated that patients with early mobility had no advantage in mortality but had improved muscle strength, improved ability to walk without assistance at hospital discharge, and more days alive and out of the hospital in the first 3 months.[9] The difficulty with RCTs examining only an early mobilization intervention is separation of the impact of early mobility from other aspects of critical care in the ABCDEF bundle.

Each ICU had different improvements. For example, the NNSICU had the greatest increase in ambulation during the first 7 days. These results are similar to those of 2 pre-post studies of mobility protocol implementation that showed higher mobility level achieved, decreased ICU and hospital LOS,[23,41] and greater likelihood of being discharged home after implementation.[41] However, those results were achieved with less than 12% of patients ambulating, compared with more than 50% in our NNSICU. The SBTICU outcomes of decreased delirium and LOS are similar to findings from an RCT of an early mobility protocol in 5 surgical ICUs that also found decreased delirium and LOS.[42]

An interdisciplinary approach is crucial to the success of an early mobility protocol. In phase 2 of our study, 85% of patients had out-of-bed activity, similar to the result in a study in Belgium using an interdisciplinary approach that achieved 86% of patients with out-of-bed activity.[43] In addition, those authors found that most patients received PT (61%) and that the median time from ICU admission to the first early mobilization activity was 19 hours. The majority of patients in our study had a PT session during their ICU stay (85%), and a decrease in time to first PT visit was observed. Our protocol included a PT referral for patients at mobility level 1 for 72 hours or more. The decline seen in both phases can likely be attributed to this aspect of the protocol. Therapists and nurses reviewed patients' screening criteria and collaborated regarding who would mobilize each patient. Having a dedicated PT in each unit fostered the collaboration and likely led to the improved outcomes.

However, we did not capture exact hours to first mobilization, which would have provided more specific data on improvement in time to first mobilization.

Our findings on IMS scores are similar to those of other research. After protocol implementation, patients had a significantly higher IMS score on initial PT evaluation and at time of ICU discharge. In an RCT of an early mobilization protocol with patients receiving mechanical ventilation, the authors found an average IMS score of 5.9 in control patients and 7.3 in

> An interdisciplinary approach is crucial to the success of an early mobility protocol.

the intervention group, but no decrease in LOS.[44] Although their sample was restricted to patients receiving mechanical ventilation and we used a 20% random sample of patients with an LOS of 3 days or more, the consistent improvement in IMS scores demonstrates the impact of a mobility protocol in the ICU.

Many mobility protocol studies have demonstrated significant decreases in LOS. However, some studies did not show significant LOS decreases despite increased mobility in patients receiving mechanical ventilation.[44-46] We observed decreases in ICU LOS in both phases and a nonsignificant decrease in hospital LOS in phase 2. These findings in our study and other studies[10,14,17,21-27] that included all patients may explain the difference in results.

The AACN screening criteria were individualized for each ICU. Consensus guidelines on safety screening vary and include differences such as fraction of inspired oxygen of less than 60% and positive end-expiratory pressure of less than 10 cm[46] rather than less than 85% and less than 15 cm, respectively, in the AACN criteria.[36] Vasopressors are often cited as an exclusion for mobility; however, Hodgson et al[47] could not reach consensus on mobility safety for patients receiving vasopressors. Previous research in our CTICU[48] and implementation of the AACN criteria demonstrated that mobilizing patients receiving vasopressors was safe in all patient populations at our institution. Additionally, Boyd and colleagues[49] found that out-of-bed exercise was implemented 114 times for patients receiving inotropes or vasopressors in CTICU patients, with only 1 adverse event of cardiac instability for a patient on a tilt table with a moderate level of support (0.15 μg/kg/min norepinephrine). Although we observed more vital sign instability in our CTICU

patients, most cases were likely secondary to atrial fibrillation with rapid ventricular response, although we did not capture baseline rhythm. Serious complications were rare, as reported in previous research and a recent meta-analysis.[10,15,24,28-30]

Limitations

Several limitations are inherent in QI initiatives using retrospective reviews of medical records. The opportunity for missing data was high. The data we extracted from the EMR were dependent on documentation quality. The possibility of errors in data retrieval and entry can lead to inaccuracy. Data entry in RED-Cap with predefined limits on some variables and data cleaning and validation by 3 different individuals likely minimized errors.

Another limitation is fidelity to the intervention implementation. Although advanced practice registered nurses and educator champions were based in each unit, each patient was not followed closely for implementation after the first 2 months of phase 2. The low number of days with a goal set in some units likely decreased the potential for even further gains.

Conclusion

Adding an interdisciplinary early mobility protocol and a collaborative approach in ICUs with ABCD and F bundle components in place leads to further improvement in outcomes as a result of implementation of all ABCDEF bundle components. The AACN early mobility screening criteria required minor changes for our specialized patient populations. Adverse events and vital sign changes were minimal. Thus, implementing the AACN early mobility protocol is safe and feasible in a variety of ICU patient populations. CCN

See also

To learn more about early mobility, read "No Time for Early Mobility?" by Cain in the *American Journal of Critical Care*, 2018;27(3):204. Available at **www.ajcconline.org**.

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