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Efficacy of the Adherence to an Evidence-Based Early Mobilization Protocol on Patient Outcomes Post Thoracic Surgery

Blair Eberhardt
University of Kentucky, beeb222@uky.edu

Final DNP Project Report

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Blair Eberhardt, BSN, RN

University of Kentucky

College of Nursing

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Carol Thompson, PhD, DNP, CCRN, ACNP-BC, FCCM, FAANP, FAAN – Committee Chair

Melanie Hardin-Pierce, DNP, RN, APRN, ANCP-BC – Committee Member

Esther Dupont-Vesteegden, PhD – Committee Member Clinical Mentor

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Abstract

Background: Immobilization is a commonly observed problem for adults in the intensive care unit (ICU) that may lead to ICU delirium, ICU associated weakness, increased length of hospital stay, and increased mortality[17]. Therefore, early mobilization has become an increasingly imperative priority regarding the treatment plan for patients in the ICU. Mobilization is often delayed or completed on a subjective provider basis due to scarcity of resources and outdated evidence-based knowledge[7]. This examination of adherence to an evidence-based protocol helps to assess efficiency of therapeutic outcomes regarding early ambulation of surgical thoracic patients in the critical care setting.

Objectives: The objectives of this retrospective electronic medical record review were to examine adherence to an early mobilization protocol in the University of Kentucky's cardiovascular intensive care unit (CVICU; ambulation, range of motion, sitting on edge of bed, etc.) and to identify associations between early mobilization and the number of CVICU days and hospital length of stay.

Methods: A six-month retrospective cross-sectional analysis was completed on surgical thoracic subjects who stayed inpatient in the 32-bed CVICU between January 1, 2016 through July 1, 2016. Forty electronic medical records were analyzed for this study.

Results: The percentage of surgical thoracic patients in the CVICU who exhibited adherence to the early mobilization protocol was 77.5% of the total population. The results indicated that both the length of hospital stay (P = .04) and length of ICU stay (P =.01) were significantly different between patients who were adherent vs non-adherent. Regression analysis shows that independent variables such as gender (P >.99), age (P = .90), number of co-morbidities (P =.60) and diagnosis (P =.40) did not show statistical significance in relation to adherence of the protocol.

Discussion: Adherence to the University of Kentucky cardiovascular-thoracic early mobilization protocol is associated with decreases in hospital and ICU lengths of stay of surgical thoracic patients. This study has future implications for the multidisciplinary team of nursing, physicians, hospital administration, and therapists surrounding the positive patient outcomes and cost-effectiveness associated with the adoption and utilization of early mobility initiated in the ICU. Additional studies with larger sample sizes may be warranted to assess further confounding variables and barriers that may be associated with hindrance of adherence to the protocol.

Key words: Early mobilization, thoracic, intensive care unit, ambulation, critical care, physical therapy

Background

In the United States, more than 5.7 million people are admitted to intensive care units annually[6]. Around 80% of those develop a form of neuromuscular dysfunction during the course of their stay[17,19]. In a critically ill individual, muscle wasting can be rapid and severe, beginning within hours of prolonged immobility[23,25]. Neuromuscular wasting can be minimalized with early mobilization, which will require reductions in heavy sedation, bedrest, and invasive lines[32]. Research has shown that patients who develop ICU-acquired weakness have worse in-patient morbidity outcomes (20.3% vs. 6.4%; P <.001), increased hospital costs (+30.5% + $5,881 per patient; P = 0.04), and higher mortality one year after admission to the ICU (30.6% vs. 17.2%; P = 0.02)[13-15]. Because of the large volumes and complexly ill populations who are undergoing many interventions, the ICU requires a multidisciplinary approach that optimizes every day for each patient.

The intervention of early mobilization of critically ill patients is an increasingly utilized practice showing improvements in clinical outcomes. Evidence supporting patient outcomes on long-term effects of ICU-acquired weakness is still limited due to the shift of mentality in practitioners surrounding early mobility of patients in the ICU. Many providers including nurses and physicians hesitate to adopt new early mobilization practices due to scarcity of evidence regarding fear of harm to the patient from artificial airway dislodgment, hemodynamic instabilities, etc[7]. However, there is evidence of improvements in long term clinical outcomes when a patient in the ICU is mobilized as early as possible. One study performed a randomized control trial in five university surgical ICUs, showing that early goal-directed mobilization decreased both ICU length of stay (group difference -3.0, 95% CI -6.0 to -1.0; P =0.005) and hospital length of stay (-6.5, CI -11.0 to -1.5; P =0.01). This study also suggested that early

mobilization increased functional independence at time of discharge (OR 2.6 (CI 1.4 to 4.8; *P* = 0.003)[28]. An additional study completed in a medical intensive care unit showed a reduction in intensive care unit days (6.9d vs 9.9d; *P* =.001) and mechanical ventilator days (4.7d vs 7.5d; *P* <.001)[18]. The *American Journal of Medicine* published another study that provided evidence regarding the implementation of a mobility team associated with reductions in hospital readmission rates (17.1% to 11.5%; *P*= .0010)[1]. A prospective cohort study completed at Wake Forrest also suggested that early ambulation was directly associated with decreased ICU length of stay (5.5d vs 6.9d; *P*=.025) and hospital length of stay (11.2d vs 14.5d; *P*= .006; data adjusted for BMI, APACHE II, and vasopressors)[23]. Small sample sizes proved to be limitations in a few of these research studies[1,18]. These studies were not blinded because the clinicians could not be masked for the patient group assignments[1,18,23,28]. Therefore, there may have been biases associated with the application of intervention from the multidisciplinary team. In order to adjust for this some of the assessors were masked during the analyzation process of the outcome measurements[23].

A designated early mobilization protocol has also been associated with improvements in nursing-associated clinical outcomes. Nurse sensitive quality-of-care outcomes are developed and upheld by the Agency for Healthcare Research and Quality, carefully chosen to measure hospital healthcare performance[22]. Outcomes include pneumonia, central line associated bloodstream infections (CLABSI), and catheter associated urinary tract infections (CAUTI). One study showed that hospital acquired pneumonia rates in mobilized patients decreased significantly (10% vs. 3.6%; *P* < .0001)[30]. Another study also showed a significant decrease in pneumonia rates between the intervention and control groups (RR=0.79, 95% CI = 0.66 – 0.93; *P* <.01)[5]. The *American Journal of Nursing* suggested that early mobilization decreased CAUTI

rates significantly in the ICU population (18.2% vs. 1.5%; P <.001)[10]. Another study revealed a reduction in both urinary catheter and central line days, with statistical significance in the unit catheter-associated UTI rate of 61% (2.72 ± 1.17 vs. 1.07 ± 1.67; P = 0.11)[31]. Improvements in nursing sensitive indicators have not only showed enhanced clinical outcomes but positive implications on population health along with fiscal reductions[22].

Many complications and associated factors may contribute to a post-operative patient's course of stay beginning in the ICU including pre-existing comorbidities, nausea, vomiting, bowel obstructions, stress-induced organ dysfunction, pain, and malnutrition[20,21]. Therefore, the perioperative period of a patient's stay in the hospital is a critical time for healing, rehabilitation, and optimization of care. In order to improve healthcare efficacy and quality, a postoperative management system, known as fast track surgery, notifies the multidisciplinary team to immediately address sedation optimization, early ambulation, improvements in fluid management, and pain control[21]. This is increasingly utilized in the patients undergoing thoracic surgery in order to improve clinical outcomes[8]. Encouraging early ambulation and resumption of ordinary activities of daily living has been shown to prevent common respiratory complications (pneumonia, atelectasis, respiratory failure, mucous plugging, acute respiratory distress syndrome, etc.) that have been associated with increased morbidity and mortality with surgical thoracic patients[21,33]. These post-operative pulmonary complications (PPCs) occur in 15-59% of patients undergoing thoracic surgery[12]. Recent evidence shows that patients who participate in fast track surgery show a reduction in the incidence of PPCs. One study exhibited a significant reduction of PPCs in the intervention group (36% vs 7%; P= 0.009)[24]. Another study showed a reduction of incidence rates of pneumonia, falling from 2.6% to 1.6% one year after implementation of an early mobilization protocol (1542 cases; P=.09)[4]. One study analyzing fast

track surgery management in pneumonectomy patients showed a decrease in length of hospital stay (18.1 ± 1.4 versus 27.4 ± 6.6 days; P< 0.0001)[8]. This fast track modality has evolved quite recently, therefore additional benefits and risks are still being researched in order to assess the best practice for thoracic patients[2].

Objectives

Early mobilization can be defined as any activity excluding basic range of motion, carried out by a health care provider (nurse, physician, physical therapist, etc.) within 48 hours of initiation of mechanical ventilation[16]. Despite the evidence that supports early mobilization is beneficial to critical care patients, little research has examined the effectiveness of multidisciplinary early mobilization protocols in the ICU utilizing the team of nurses, nursing technicians, physical therapist, occupational therapists, and physicians[26]. The University of Kentucky CVICU currently has an early mobility protocol in place regarding the care of their patients from the moment of admission to the ICU until discharge of a patient to a general care area. This is a multidisciplinary protocol that is to be utilized by nurses, nurse technicians, physicians, physical therapists, and occupational therapists and was adopted from a previous prospective cohort study developed at Wake Forest University for medical ICU patients[23]. The purpose of this retrospective electronic medical record review was to evaluate the feasibility of adherence to the current early mobility protocol and examine the efficacy of adherence on the patient outcomes. The specific aims of the project are:

1. Examine adherence to early mobilization protocol (ambulating, range of motion, sit on edge of bed, etc.)
2. Identify associations between early mobilization and number of ICU day, hospital length of stay, catheter associated urinary tract infections (CAUTIs), central line

associated & bloodstream infections(CLABSIs), and ventilator associated pneumonia (VAPs).

Methods

Context

The University of Kentucky CVICU is a 32-bed unit at a 900-bed academic teaching hospital in the mid-eastern region of the United States. The clinical providers include 10 Cardiothoracic surgeons, 4 fellows, 10 nurse practitioners and an additional consulted anesthesiology team with 10 attending physicians and 8 nurse practitioners. The therapy team includes 8 primary physical and occupational therapy teams and 6 physical therapy technicians. The CVICU unit employs ~150 bedside nurses and 15 nursing technicians. The unit provides a 24-hour nursing, respiratory, and physician team available 365 days/year and the beds stay 95+% occupied. Many devices are available to increase efficacy of adherence to the protocol, such as Stryker InTouch Critical Care beds with a one-touch cardiac chair position feature. The staff also has access to Guldmann ceiling lift systems and VitalGo total lift beds to enhance the ability to mobilize patients with debilitations and devices (mechanical ventilators, chest tubes, ECMO, etc.). Inclusion criteria were patients admitted to the thoracic surgery team in the cardiovascular intensive care unit between January 1, 2016 to July 1, 2016, greater than 18 years old, and pre/post-surgical intervention. This study excluded thoracic patients admitted to rooms outside of the cardiovascular intensive care unit, patients who received hospice or comfort care during their inpatient hospitalization in the CVICU or whose status changed from active treatment to hospice/comfort care during inpatient CVICU hospitalization. The study also excluded pregnant women, children (< 18 yrs), and prisoners.

Intervention

The University of Kentucky CVICU serves many populations; however, only postoperative thoracic patients were examined in this study. As part of a quality improvement effort to enhance clinical outcomes, a mobility protocol was established to deliver optimal therapy to cardiothoracic patients. Around one year prior to this retrospective analysis, the physical therapy team collaborated to discuss the utilization of an appropriate protocol for all patients admitted to the CVICU. A uniform protocol was instilled in order to provide systemic expectations for all staff members regarding the feasibility of all types of patients with various diagnoses, procedures, and devices (coronary artery bypass graft, valve replacement, lobectomy, video-assisted thoracoscopic surgery, extracorporeal membrane oxygenation, left ventricular assistive device, Total Artificial Heart, Tandem Heart, etc.). The designated mobilization protocol was distributed to the entire team as well as posted in common areas around the unit (break rooms, lunch rooms, bathrooms, etc.). To sustain early mobilization adherence, the protocol was added into the orientation curriculum of new nurses. The multidisciplinary team (nurse, physical therapist, nurse technician, physician) is able to perform a needs assessment and implement therapy with the patient in order to meet the guidelines of the protocol. Daily requirements are expected for each member of the multidisciplinary team, yet the patient's registered nurse is primarily responsible for staff collaboration and adequate documentation in order to meet adherence to the protocol. Physical and occupational therapists round on every patient with an ordered consult. Additionally, every patient with a consult has a physical therapy technician round daily to assess feasibility and availability of the patient. There is also a daily mobility team (one to two nursing care technicians) to assist physical therapy and nursing staff with mobilization of patients. This large mobilization team was installed around the time the early mobilization protocol was introduced.

The staff are required to refer to the protocol in order to assess the level of mobility the patient is able to reach each day. The protocol exhibits four levels of mobilization therapy (Figure 1). When patients are still unconscious, passive range of motion (PROM) should be initiated on all four extremities three times a day as appropriate after surgery (level I). PROM includes flexion, extension, supination, pronation, abduction, and rotation of the fingers, wrists, elbows, shoulders, toes, ankles, knees, and hips. As patients become more conscious and increase strength after analgesics and paralytics diminish systemically, physical therapy is initiated (level II). The patient must be conscious and able to follow commands to reach level II and participate in order to participate in active resistance therapy. Patients then progress to levels III and IV where functional activities are completed such as transfer to edge of bed, seated balance activities, standing activities, and ambulation with the mobility team (MT) or physical therapy (PT). Within the thoracic population, most people progress to level IV either the day of surgery or the day after, depending on the time of extubation and associated complications such as wound dehiscence or aspiration[15]. If mobility was withheld from patients due to complications, the patients were reevaluated the next day to check for stability. According to the patient's feasibility, the protocol was reinitiated according to the appropriate level of mobility.

Study of the Intervention

A six-month retrospective cross-sectional analysis was completed on 40 patients who were admitted into the CVICU January 1, 2016 through July 1, 2016. Adherence was assessed from the admit date to the CVICU until the transfer to a different inpatient unit within the hospital. Patient information was accessed via the University of Kentucky Center for Clinical and Translational Science (CCTS). Data collection continued from the time of admission to the CVICU to either discharge from the ICU or transfer out of the ICU. Patient data included

demographics, admission and discharge dates, procedure, age, gender, comorbidities, mobility scores, symptoms noted during mobilization, days in the ICU, hospital length of stay, and vital signs.

Measures

The primary outcome was the percentage of patients whose care adhered to the protocol during their stay in the CVICU. Secondary outcomes included ICU length of stay, hospital length of stay, and rates of CAUTIs, CLABSIs, and VAPs. Additional data collected from the electronic health records were age, sex, number of comorbidities, procedure, days in the CVICU, and hospital length of stay. The clinical and demographic data were manually extracted personnel employed at the University of Kentucky CCTS by a systematic electronic medical record review. Hospital-acquired infection data (VAP, CAUTI, & CLABSI) were regularly collected as part of the Nursing Quality Indictors submission to the Agency for Healthcare and Research Quality. These were defined by the Center for Disease Control's National Healthcare Safety Network[23]. Co-morbidities encompassed in the *number of comorbidities* parameter included chronic obstructive pulmonary disease, obesity, hypertension, hyperlipidemia, lung cancer, diabetes mellitus, coronary artery disease, myocardial infarction, chronic heart failure, and chronic kidney disease. Adherence was measured by assessing the level of the ability of the patient (I-IV) each day and comparing the therapy criteria met each day. Mobility scores (1-8) (Table 1) were acquired from patient electronic medical records and converted to levels on the protocol chart (MS 0 =Level I; MS 1-2= Level II; MS 3-5= Level III; MS 6-8 = Level IV). These scores were adopted and modified based on the Independent Mobility Validation Evaluation (I-MOVE) discharge tool developed at Mayo Clinic. In a study performed by Santiago Romero-Brufau et al., I-MOVE displayed content validity and inter-observer reliability, with easy

administration by the overseer[28]. The patient was required to meet all criteria every day in order to be considered "adherent" to the protocol. For example, if the patient had reached level IV, or a mobility score of 6-8, the patient would be adherent if they were turned every 2 hours, received passive ROM three times a day, active resistance therapy, sat on the edge of the bed with physical therapy or the mobility team (if patient can move arms against gravity), and participated in an active transfer to the chair for at least 20 minutes two times a day.

Analysis

Descriptive statistics (means and standard deviations or frequency distributions) were used to summarize the sample. Comparisons of demographic and clinical characteristics were made using the two-sample t-test for continuous variables, or the chi-square test of association for categorical variables. Because the distribution of ICU LOS and hospital LOS were right-skewed, the Mann-Whitney U test was used to determine differences between those who were adherent and non-adherent to the mobility protocol. Data analysis was conducted using SPSS, version 22. An alpha level of .05 was used to determine significance in all statistical tests.

Results

Demographics

Of the 40 patients included in this study, 31 patient's care adhered to the early mobilization protocol (77.5%). Over half (62.5%) were male and on average patients had 2.9 comorbidities. The average age was 60.6 years (SD= 10.2) and a majority (82.5%) of patients had either a video-assisted thoracoscopic surgery (VATS) or lobectomy procedure completed. There were no differences in demographic or clinical characteristics between patients who were adherent to the mobility and those who were non-adherent, as shown in Table 2. In order to determine if additional variables had effects on adherence versus non-adherence, additional

analysis was conducted. Age, gender, procedure, and the number of co-morbidities for each patient were examined in relation to the adherence to the protocol. A two-sample t test was completed to assess the effect of age and suggested no difference in adherence vs. nonadherence ($p = 0.8829$). Univariate analysis (Fisher's exact test) showed that gender was an insignificant factor ($p>0.99$). A two-sample t test indicated that gender also showed no significance on adherence versus non-adherence. A Mann-Whitney U test was completed to show no difference in the effect of the number of co-morbidities on adherence to the protocol ($p=0.6$). A Fisher's exact test showed that there was no difference in procedure between those whose care adhered and those whose care did not adhere to the protocol ($P = 0.4$).

Hospital and ICU length of stay

There was a significant difference in both ICU days and hospital LOS between patient's whose care was adherent and those whose care was non-adherent. Patient's care that was adherent had significantly shorter ICU days compared to those who were non-adherent (median=1.3 vs.6.2; p=.01, Table 3). Additionally, patients whose care was adherent also had a shorter hospital length of stay compared to those who were non-adherent (median = 4 vs. 11; p = .04, Table 3). Both CVICU and hospital length of stay were statistically significant. Other analyzed secondary outcomes such as CAUTI, CLABSI, and VAP incidence was nonexistent in this data set.

Data collected regarding mobility chart levels were right skewed. All patients analyzed reached level IV of the chart on day 0 or 1 of their ICU stay. Thirty-seven of the forty patients remained at level IV until discharge to home or another inpatient unit. The three remaining patients experienced post-operative complications such as aspiration or respiratory failure and revisited levels I-III after requiring mechanical ventilation, sedation, and/or chest tubes.

Discussion of Findings

The University of Kentucky CVICU adopted a multidisciplinary protocol that utilized the entirety of the team of providers to ensure adequate mobilization of the patients. The current protocol showed a 77.5% adherence rate with no evidence of demographic relationship of age, diagnosis, gender, or number of comorbidities. While there was no statistical significance in tested demographics, additional barriers to mobility may need to be investigated (provider knowledge, diagnoses, gender, etc.). Additional outcomes such as rates of catheter associated urinary tract infections, central line associated bloodstream infections, and ventilator acquired pneumonia were also assessed but were nonexistent in this population sample. To our knowledge, this study was one of few surrounding the benefits of early mobilization of the surgical thoracic population.

After quality improvement interventions of the instillation of an early mobility protocol from the multidisciplinary team, there is still room for improvement of adherence rates. Because this systematic approach to early mobilization showed statistical significance of positive outcomes pertaining to decreased hospital and CVICU length of stay, additional lengths should be continued to ensure higher rates of adherence. Continuous improvement could involve furthering education to all involved staff regarding benefits of early mobilization and management of barriers (time constraints, fears, invasive lines, etc.). A daily bundle could be added to the early mobilization protocol, addressing any barriers that may be inhibiting adherence. The bundle would involve the multidisciplinary team during morning rounds and acknowledge sedation, delirium, spontaneous breathing, invasive lines, and timing of mobilization. Successful implementation of protocols requires effective communication and feasibility to instill knowledge and mold the environment to provide high-quality care.

Additionally, holding roundtable discussions surrounding unit monthly mobilization statistics may assist in the investigation of additional barriers that may need to be added to the bundle in order to ensure further success. This may increase patient safety and efficacy for this quality improvement project. As the evidence continues to grow surrounding the post-surgical cardiothoracic patient population, data are showing that initiating patient mobility early after completion of a procedure and/or admission to the hospital improves patient outcomes[10,21,22]. This retrospective review showed similar results to other cohort studies involving instilled early mobilization protocols of surgical thoracic patients within the ICU setting[10,24,25]. Because the University of Kentucky is an academic medical center with a large cardiothoracic population, this evidence related to the adherence of early mobility will have positive patient quality and monetary implications. With evolving healthcare financial systems, early mobility will help to prevent re-admissions and post-operative complications.

Although the adherence rate of patient care was 77.5%, the data was right skewed, with thirty-seven of the forty patients reaching level IV within 24 hours' post-surgery. The surgical thoracic population typically consists of patients diagnosed with lung cancer, esophageal cancer, collapsed lung, or complications of COPD. Because this patient population is typically older (>60 years old), are current or former smokers, and present with underlying chronic diseases, they tend to have diminished physiologic reserve and are more limited to recover from postoperative complications[31]. For this reason, prompt extubation is attempted either in the operating room, post-anesthesia care unit, or upon arrival to the intensive care room. For this CVICU surgical thoracic population, extubation was achieved for 100% of patients within 24 hours' post-operative. While this population tended to have pulmonary debilitations, they had the physical ability to participate in early mobilization, walking the day of or after surgery. This is

common in the CVICU surgical thoracic patient population, ensuring feasibility of adherence. Replication of this project in other facilities may be hindered by lack of personnel (early mobilization team), lack of buy-in from hospital administration (extra staff, distinguished equipment, etc.), and insufficient knowledge barriers (doctors, nurses, etc) regarding new early mobilization practices of critically ill patient populations.

Limitations

This review had a number of limitations that hindered generalization of the results. One limitation was the small sample size included in the study which limited the strength of evidence reflected into the findings. The study was also a single-site study which could reduce power for implications of further practice. Additional studies could be completed at multiple sites on larger sample sizes of this population to increase power and statistical significance. Additionally, a limited number of confounding variables were assessed regarding the effects and demographics related to the sample size. Future studies could evaluate additional confounding variables (days of mechanical ventilation, race, delirium rates, post-op complication rates, spontaneous breathing trials, invasive lines, etc) in order to understand barriers that prevented adherence to the protocol and assess the need for change[17,19]. The study design was also a limitation of the study. The retrospective electronic medical review revealed significant evidence, but a randomized protocol intervention would have added validity. However, the multidisciplinary team wanted to create a set expectations for the staff within the ICU environment. Therefore, a retrospective design with an intervention and control group would have hindered embracement of the protocol by the staff and possibly skewed the results.

Nursing Implications for Practice and Research

As the United States population ages, an increasing number of people will continue to undergo surgical thoracic procedures. This retrospective evaluation suggests that adherence to an early mobilization protocol involving a multidisciplinary team can improve surgical thoracic patient outcomes by decreasing the length of ICU and hospital stay. The development of an early mobilization protocol is important to all hospital staff, including management, ensuring that the sustainability can demonstrate both quality and fiscal implications. There is extensive evidence surrounding the benefits of early mobilization protocols in the ICU; however, there is little research based on surgical thoracic patients. We recommend further randomized control trials with larger sample sizes to investigate the accuracy and power behind the results found in this study.

Conclusion

Patients who showed adherence to the early mobility protocol in place at the University of Kentucky CVICU showed significant differences in both hospital and CVICU length of stay. It is clear from this study and many others that early mobilization is both beneficial and feasible for ICU patients, specifically postoperatively. The instillation of an early mobilization protocol with the utilization of a multidisciplinary team highlights the advancement of patient outcomes and quality improvement success.

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Table 1

University of Kentucky Mobility Score

Mobility Score	Description
0	Patient completely immobile or prone
1	HOB less than 30 degrees
2	HOB elevated 30 to 45 degrees
3	HOB elevated 45 to 64 degrees, legs in dependent position
4	HOB elevated > 65 degrees; legs in dependent position
5	Positioned on the edge of bed (EOB); legs dangling
6	Standing/ side stepping/ marching at EOB
7	Standing- pivot or steps in chair (Reposition in chair)
8	Ambulation with assist as needed

Table 2

Adherence effects on Patient Demographics

	Total sample (N = 40)	**Adhered**	**Non-adhered**	**p**
Age, Mean (SD)	60.6 (10.2)	60.4 (8.6)	61.2 (15.2)	0.9
Sex, no. (%)				
Male	25 (62.5%)	19 (61.3%)	6 (66.7%)	>0.99
Female	15 (37.5%)	12 (38.7%)	3 (33.3%)	
Number of comorbidities, Mean (SD)	2.9 (2.0)	2.8 (2.0)	3.3 (2.1)	0.6
Procedure, no. (%)				
VATS	14 (35%)	11 (35.5%)	3 (33.3%)	
Lobectomy	19 (47.5%)	16 (51.6%)	3 (33.3%)	
Esophagectomy	3 (7.5%)	2 (6.5%)	1 (11.1%)	0.4
Hiatal hernia repair	1 (11.1%)	0	1 (11.1%)	
Pneumonectomy	1 (7.5%)	2 (6.5%)	1 (11.1%)	

Table 3

Adherence effects on Hospital and ICU length of stay

	Adherent (n = 40) Median (IQR)	**Non-adherent (n = 40) Median (IQR)**	**p**
Days in ICU	1.3 (1.1 – 3)	6.2 (1.97 – 24.2)	.01
Hospital length of stay	4 (3-7)	11 (3.5-31)	.04

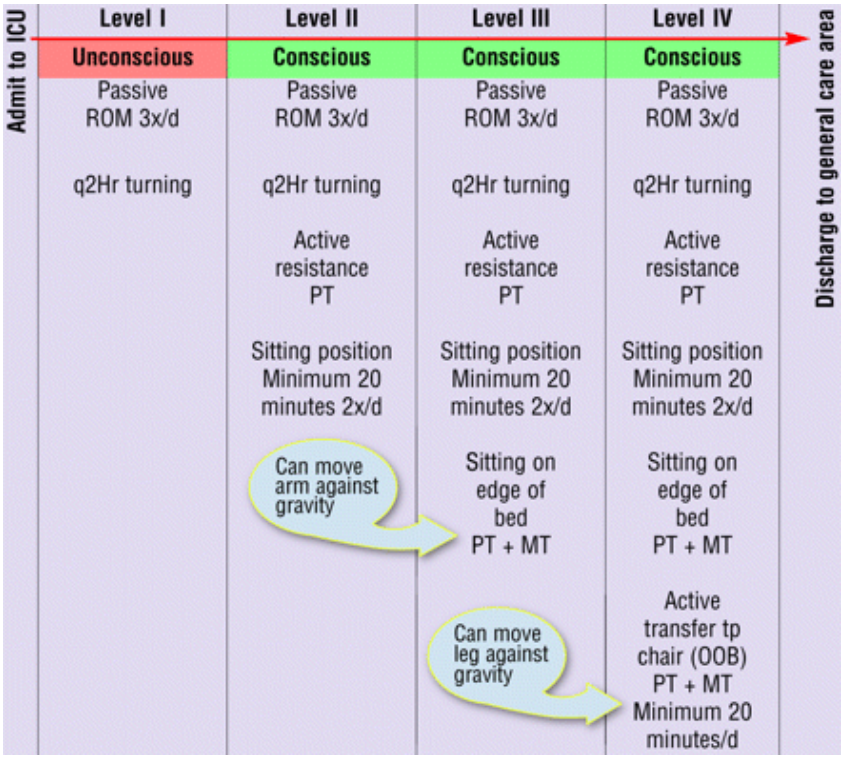

Figure 1. Early mobility protocol for the University of Kentucky CVICU. Graphic from Morris P, Morris P, Goad A, Haponik E, et al. Early intensive care unit mobility therapy in the treatment of acute respiratory failure. *Critical Care Medicine*. 2008;36(8):2240.