

Let's Move It: Progressive Mobility in the Cardiac Intensive and Acute Care Environment

Darla K. Topley, DNP, APRN 3, CCNS

Clinical Nurse Specialist TCV Service, Clinical Assistant Professor of Nursing, University of Virginia Health System, Charlottesville, USA.

*Correspondance:

Darla K. Topley, Clinical Nurse Specialist TCV Service, Clinical Assistant Professor of Nursing, University of Virginia Health System, Charlottesville, VA 22908, Tel: 434-465-8312, E-mail: Dkf7a@virginia.edu.

Received: 07 July 2017; Accepted: 02 August 2017

Citation: Darla K. Topley. Let's Move It: Progressive Mobility in the Cardiac Intensive and Acute Care Environment. Nur Primary Care. 2017; 1(3): 1-4.

ABSTRACT

A nurse-driven progressive mobility protocol was developed and implemented in a thoracic cardiovascular intensive care, coronary intensive care and thoracic cardiovascular acute care unit, evaluating the impact on ventilator associated pneumonia, ventilator days, pressure ulcers, venous thromboembolism, discharge placement, length of stay and the number of patient falls. A multidisciplinary team approach was used to develop progressive mobility guidelines, protocol, education and interventions for 3 different patient care units. Several techniques were used to educate unit staff and implement the protocol. In-services, demos and hands on methods were used for education. In addition, mobility champions, laminated charts, incentives and a physician champion were approaches used for implementation. Research on immobility has found muscle weakness and wasting to be the most prominent complications responsible for disability in patients evaluated after discharge. Up to 60% of discharged critically ill patients may have long-term complications inhibiting them from complete functional recovery. In fact, critically ill patients who are on strict bed-rest have a decline of 1% to 1.5% per day and up to 50% of total muscle mass in 2 weeks. Prolonged immobilization of patients in intensive care contributes to the risk of ventilator associated pneumonia; weaknesses associated with immobility have been associated with deep vein thrombosis, falls, and pressure ulcers. Studies have been published demonstrating that early mobilization contributes to an improvement in patients' quality of life, endurance, and facilitated early weaning from the ventilator. Exercising patients may be challenging, but with a dedicated interprofessional team and protocols, early mobility has been found to be safe.

Introduction

Estimates from the U.S. Bureau of Census predicts that one in five United States citizens will be elderly by 2030 (69.4%) and 50 million by 2019 [1]. More than 5 million patients are admitted to intensive care units (ICUs) every year, with survival rates now approaching 80-90% [2,3]. One of the highest acuity hospitalized patient reside in the thoracic cardiac intensive care, coronary care and their acute care environments. These patients can undergo complex surgical and non-surgical procedures that require highly trained nursing staff and close observation to ensure utmost patient outcomes. Cardiac patients that are admitted to hospitals today would have not survived just a few years ago due to their co morbidities, but yet today these are some of the routine patients heart centers take to the operating room for surgery or extensively

monitoring. Cardiac patients are at great risk for hospital problems due to pre-hospital comorbid illnesses such as peripheral vascular diseases, hypertension, heart disease, diabetes mellitus, lung disease, and malignancy [4]. According to the Centers for Disease Control heart and lung disease are the reside in the top ten sources of all deaths in the United States [5].

Growing evidence reveals that upon discharge from an ICU, patients may experience muscle weakness due to bed rest [6-8]. The effects of bedrest can follow a patient through the care continuum starting in the ICU to hospital discharge. This muscle weakness is exhibited through a generalized weakness that impairs not only return to spontaneous breathing but mobilization in general. The patient can have such a profound weakness not

related to any delirium that causes quadriplegia requiring an extensive examination for a decrease in neuromuscular function [7]. These patients are often confined to the bed, sedated, and fairly immobile, which in addition to their acute illness contributes to the deconditioning of multiple organ systems. Deconditioning during bed rest triggers a flow of responses such as decreased protein synthesis, increased proteolysis and increased apoptosis altering skeletal muscle morphology. These responses lead to diaphragmatic atrophy 18 hours after mechanical ventilation initiation [9]. This atrophy causes some critically ill patients to lose up to 25% peripheral muscle strength within 4 days when mechanically ventilated and lose 18% in body weight by the time of discharge [10,11]. Early mobility has been linked to decreased morbidity and mortality effecting the brain, skin, skeletal muscle, pulmonary and cardiovascular systems [7]. These effects range from depression, decubitus ulcers, muscular atrophy and deconditioning due to atelectasis, pneumonia, orthostatic hypotension and deep venous thrombosis [6,12]. Early mobilization of patients in an ICU can enhance functional status, increase recovery time, and decrease hospital stay as they progress through their hospitalization [9,13]. A focus on interdisciplinary collaboration throughout a patient's hospital stay is key to improve functional capacity [14].

Adverse Effects from mobility

Research on immobility has found muscle weakness and wasting to be the most prominent complications responsible for disability in patients evaluated after discharge [11]. Patients with failure of 4 organs show a muscle loss of more than 15% by the end of the first week of hospitalization due to inflammation reducing protein synthesis where by increasing breakdown [15]. Up to 60% of discharged critically ill patients may have long-term complications inhibiting them from complete functional recovery. In fact, critically ill patients who are on strict bed-rest have a decline of 1% to 1.5% per day and up to 50% of total muscle mass in 2 weeks [16].

Another complication due to muscle weakness is ventilator associated pneumonia. Adverse effects of prolonged bed rest include atelectasis, pneumonia, and decreased maximal inspiratory pressure and forced vital capacity [16]. Ventilator associated pneumonia (VAP), occurs in 9 to 27 % of ventilated patients; mortality rates range from 33 to 55 % in affected patients [18]. Moreover, the presence of muscle weakness is positively associated with the duration of mechanical ventilation [15]. Mechanical ventilation for greater than 1 week has been shown to be an independent risk factor for ICU acquired muscle weakness [3]. Current literature has demonstrated that patients can be safely and feasibly be mobilized, even while requiring mechanical ventilation [2,16-18]. Several studies show that initiating physical therapy early during a patient's ICU stay can decrease length of stay in the ICU and hospital, lower medical cost, lower depression, increase exercise capacity, and reduce protein loss [2,19-21]. One study demonstrated that only 27% of ICU patients receive any physical therapy with treatments occurring in only 6% of ICU days [22]. Early mobility has been linked to decreased morbidity and mortality [4]. A recent systematic review identified exercise and

physical therapy as the only intervention that improved long-term physical function in critically ill patients [23]. Early mobilization of ICU patients can help increase activity, possibly counteracting the morbidity and mortality associated with immobility [9,13,23].

In addition to muscle weakness, mechanically ventilated trauma patients are also at risk for venousthromboemboli (VTE). The deep vein thrombosis (DVT) rate for patients who are on mechanical ventilation greater than 7 days is up to 23.6% despite prophylaxis. In trauma patients, approximately 60% will develop a DVT within 2 weeks of hospital admission [28,36]. This complication is of specific importance in the intensive care environment. A recent article reported that the total annual cost for a VTE ranges from \$7,594 to \$16,644 [6]. In addition, hospital VTE readmission is associated with a 14.3% increase in cost for hospitalization [25]. The general surgical population rates of VTE are as high as 40% in patients who have an absence of prophylaxis [6].

Research and quality improvement projects are being published on early mobility, leading to protocols being developed and used in the acute and intensive care environment (Figure 1) [19,20,29]. Studies reflect that early mobility protocols are safe and practical [23]. In addition, a group of clinical experts published mobility guidelines using road signs to designate patient safety regarding different hospital activities [30]. In 2010, an evidence based guide for a multidisciplinary approach to patient care called the ABCDE bundle was developed. This guideline continues to be revised and incorporated into ICU standard work. The bundle is a set of evidence-based practices that together can improve patient outcomes. The bundle includes awakening and breathing trials, delirium assessment and management and early mobility that are adopted into everyday practice [31]. Recently, Balas et al. 2014 conducted a study instituting an ABCD bundle into daily practice with nurses being a critical partner assessing patients daily for bundle implementation. The study patients spent one third of their ICU days out of bed [31]. Exercising ICU patients may be challenging, but with a dedicated interprofessional team and protocols, early mobility has been found to be safe.

Preparing for Implementation

Before implementing an early mobility protocol, several concerns may be identified by unit staff, such as implementing mobility protocol would increase unit workload. In a thoracic cardiac environment patients move through the care continuum very quickly, so much that one day they are on mechanical ventilation, vasopressors, temporarily paced, up to 4 chest tubes draining, urinary catheter, and sedated. The next day the patient can be extubated, sitting in a chair, urinary catheter discontinued and transferred to an acute care unit. Staff needs to be educated on how to incorporate range of motion exercises during usual nursing care and ways to enlist family help with those exercises incorporating exercise within daily care activities. Compliance can depend on patient acuity, resources, patient assignment, and staffing. One solution to increase night staff compliance with patient mobilization maybe be to encourage only range of motion exercises on night shift when baths were given, so that staff could incorporate

exercises in one of their nightly nursing routines. During day shift, each mobility activity can be carried out by the patient with nursing staff or physical therapy. Also, unit mobility champions can be identified to help teach staff how to integrate mobility protocols into daily nursing care [28,32,33]. Mobility champions model how to implement protocols, reinforce the importance of patient activity, and offer assistance helping to ensure maximal project adherence. In addition, charge nurses or shift managers on every shift can be seen as additional asset gathering equipment and personnel for patient mobilization providing the primary nurse additional help for mobility activities. Other barriers include leadership buy-in, prioritizing mobility activities, family concerns and identifying measurable outcomes.

Safe patient movement in this patient population is a challenge due to the many lines, tubes and wires used to monitor the patient's hemodynamic status. In addition, these patients have to be reminded to continue sternal precautions during mobility activities due to their post-operative procedures. Before mobilization activities begin the multidisciplinary team coordinates intravenous line, enteral feeding tubes, chest tubes, endocardial pacing wires, pulmonary and arterial catheters, and oxygen equipment lines which must have the appropriate length for mobilization activity. Monitoring equipment used for continuous assessment of important parameters such as blood pressure, respiratory rate, heart rate, end tidal CO₂, and pulmonary pressures require organization. Frequently, this organization includes placing equipment on a type of ambulatory device depending on the patient's mobility level. Hemodynamic parameters are discussed by the team before an activity, communicating when an activity needs to be halted to prevent patient complications. Mobilization goals are discussed daily along with safety issues communicating a team approach.

Another pre-implementation intervention is educating nurses, nursing assistants, nurse practitioners, residents, attending physicians, physical therapists, and respiratory therapists about the deconditioning effects of an intensive care stay and benefits of mobility. During staff meetings, physician grand rounds, journal clubs, and one-to-one meetings, mobility implementation concerns can be discussed, in addition to brainstorming new ways on how mobility can be incorporated in patient care. Physical therapy can be enlisted to teach the multidisciplinary team regarding patient's mobility level assessment with special attention to sternal precautions, readiness to progress through the protocol levels, passive range of motion exercises, and contraindications to mobilizing patients. Also, developing patient education material is crucial to enhance care expectations (Figure 2). This educational material needs to explain why mobility is important and how the patient and family can be involved in mobilization. For elective thoracic cardiac surgeries, patient and family education can be incorporated into pre-operative clinic visits. Davidson et al. reported clinical practice guidelines for support of patients and families in the ICU environment. These guidelines recommended family-centered health care delivery systems are tailored to patient and family involvement [34]. In addition, units can purchase communication boards that identify the patient's mobility progress

throughout the week and mobility equipment such as walkers, exercise bikes and range of motion items. Before implementation, several tools can be incorporated into a unit's culture; for example, developing themes, displaying banners, hanging educational bulletin boards, placing floor markings to quantify patients mobility progress and staff incentives.

Process Measurement

Sustainment is an important component of new projects. TeamSTEPPS® program, which includes six steps needed for sustaining a program, can be used for continuing a mobilization project. These steps include providing practice opportunities ensuring that leaders emphasize new skills, provide regular feedback, celebrate wins, measure success and update current plans [35]. Communicating compliance results through audits, chart checks, observations and patient outcomes need to become a part of the unit's culture. Staff compliance statistics can be added to monthly forums such as staff, grand rounds or shared governance meetings keeping mobility as a permanent agenda item. Another sustainment intervention is having activity orders default to a mobility protocol or activity as tolerated order and delete bedrest orders as the norm. The combination of implementing a standardized mobility protocol, removing barriers and changing unit culture improve patient clinical outcomes and provided a sustainment program [36].

Discussion

Supplying staff with tools for successful implementation is the key to a sustainable mobility implementation project. Annual hospital savings can be estimated over half million dollars analyzing cost savings generated from 22% to 19% decrease in ICU and acute care length of stay [37]. Also many unintended positive outcomes can occur regarding an increased willingness to incorporate patient mobility in daily patient care, patients ambulating in the halls, more empowered staff and "Walking Champions" who embraced role and brought change to the unit culture.

Conclusion

In conclusion, nursing and patient time for mobility activities may present a challenge for busy units. High staffing ratios, unit personnel turnover, and open staff positions can affect compliance. Family and medical personnel need to understand the importance of patient mobility in the intensive care environment. Committed education time for multidisciplinary staff, patients and families can support understanding the risk and benefits related to mobilization. Despite these limitations, mobility projects can increase hospital staff and institution's awareness of the benefits of early mobilization. Mobility projects start in one unit and can easily be spread throughout institutions from ICU to acute care settings. A protocol can be revised to fit ICU and acute care units offering units a framework for implementing early mobility in their patient population. Also, standard mobility order sets, flow sheets, care plans and shift documentation need to be standardized in patient records to help standardize computerized charting related to mobility. Continued focus for ICUs and acute care environments should be the implementation of early patient

mobility, identifying the appropriate level of patient activity that is safe and feasible, and analyzing the long-term patient outcomes from the implementation of early activity.

References

1. United States Census Bureau statistics. 2017.
2. Society of Critical Care Medicine Critical care statistics. 2013.
3. Engel HJ, Needham DM, Morris PE, et al. ICU early mobilization: From recommendation to implementation at three medical centers. *Crit Care Med*. 2013; 41: S69-S80.
4. Sepehri A, Beggs T, Hassan A, et al. The impact of frailty on outcomes after cardiac surgery: A systematic review. *J Thorac Cardiovasc Surg*. 2014; 148: 3110-3117.
5. Centers for Disease Control, Death and mortality. 2015.
6. Stiller K. Safety issues that should be considered when mobilizing critically ill patients. *Crit Care Clin*. 2007; 23: 35-53.
7. Schweickert WD, Hall J. ICU-acquired weakness. *Chest*. 2007; 131: 1541-1549.
8. Winkelman C. Inactivity and inflammation in the critically ill patient. *Crit Care Clin*. 2007; 23: 21-34.
9. Lipshutz AK, Gropper MA. Acquired neuromuscular weakness and early mobilization in the intensive care unit. *Anesthesiol*. 2013; 118: 203-215.
10. Morris PE. Moving our critically ill patients: mobility barriers and benefits. *Crit Care Clin*. 2007; 23: 1-20.
11. Burtin C, Clerckx B, Robbeets C. Early exercise in critically ill patients enhance short-term functional recovery. *Crit Care Med*. 2009; 37: 2499-2505.
12. Winkelman C. Inactivity and inflammation in the critically ill. *Crit Care Clinic*. 2007; 23: 21-34.
13. Bailey P, Thomsen GE, Spuhler VJ, et al. Early activity is feasible and safe in respiratory failure patients. *Crit Care Med*. 2007; 35: 139-145.
14. Ecklund MM, Bloss JW. Progressive mobility as a team effort in transitional care. *Crit Care Nurse* 2015; 35: 62-68.
15. Puthuchery ZA, Rawal J, McPhail M, et al. Acute skeletal muscle wasting in critical illness. *JAMA*. 2013; 310: 1591-1600.
16. Schweickert WD, Pohlman MC, Pohlman AS, et al. Early physical and occupational therapy in mechanically ventilated, critically ill patients: a randomized controlled trial. *Lancet*. 2009; 373: 1874-1882.
17. Truong AD, Fan E, Brower RG, et al. Bench-to-bedside review: mobilizing patients in the intensive care unit--from pathophysiology to clinical trials. *Crit Care*. 2009; 13: 216.
18. Winkelman C. Bed rest in health and critical illness: A body systems approach. *AACN Adv Crit Car*. 2009; 20: 254-266.
19. Tobin MJ, Laghi F, Jubran A. Ventilator induced respiratory muscle weakness. *Ann Intern Med*. 2010; 153: 240-245.
20. Zomorodi M, Topley D, McAnaw M. Developing a mobility protocol for early mobilization in a surgical/trauma ICU. *Crit Care Res Pract*. 2012; 2012: 964547.
21. Kayambu G, Boots R, Paratz J. Physical therapy for the critically ill in the ICU: A systematic review and meta-analysis. *Crit Care Med*. 2013; 41: 1543-1554.
22. Adler J, Malone D. Early mobilization in the intensive care unit: A systematic review. *Cardiopulm Phys Ther J*. 2012; 23: 5-13.
23. Drolet A, DeJulio P, Harkless S, et al. Move to improve: The feasibility of using an early mobility protocol to increase ambulation in the intensive and intermediate care settings. *Phys Ther*. 2013; 93: 197-207.
24. Spyropoulos AC, Lin J. Direct medical costs of venous thromboembolism and subsequent hospital readmission rates: An administrative claims analysis from 30 managed care organizations. *J Managed Care Surg*. 2007; 13: 475-486.
25. Hildreth AN, Enniss T, Martin RS, et al. Surgical intensive care unit mobility is increased after institution of a computerized mobility order set and intensive care unit mobility protocol: a prospective cohort analysis. *Am Surg*. 2010; 76: 818-822.
26. Hodgkin KE, Nordon-Craft A, McFann KK, et al. Physical therapy utilization in intensive care units: Results from a national survey. *Crit Care Med*. 2009; 37: 561-568.
27. Ayala EC, Khan BA, Farber MO, et al. Interventions to improve the physical function of ICU survivors. *Chest*. 2013; 144: 1469-1480.
28. Leeper K. Venous thromboembolism in the intensive care unit patient. 2014.
29. Needham DM, Korupolu R, Zanni JM. Early physical medicine and rehabilitation for patients with acute respiratory failure: a quality improvement project. *Arch Phys Med Rehabil*. 2010; 91: 536-542.
30. Hodgson CL, Stiller K, Needham DM, et al. Expert consensus and recommendations on safety criteria for active mobilization of mechanically ventilated critically ill adults. *Critical Care (London, England)*. 2014; 18: 658.
31. Balas MC, Vasilevskis EE, Burke WJ, et al. Critical care nurse's role in implementing the "ABCDE Bundle" into practice. *Crit Care Nurs* 2012; 32: 35-48.
32. Balas MC, Vasilevskis EE, Olsen KM. Effectiveness and safety of the awakening and breathing coordination, delirium monitoring/management, and early exercise/mobility bundle. *Crit Care Med*. 2014; 42: 1024-1036.
33. Banerjee A, Girard TD, Pandharipande P. The complex interplay between delirium, sedation, and early mobility during critical illness: applications in the trauma unit. *Curr Opin Anesthesiol*. 2011; 24: 195-201.
34. Davidson JE, Powers K, Hedayat KM, et al. Clinical practice guidelines for support of the family in the patient-centered intensive care unit: American College of Critical Care Medicine Task Force: 2004-2005. *Crit Care Med*. 2007; 35: 605-622.
35. U.S. Department of Health and Human Services, Agency for Healthcare Research and Quality, TeamSTEPS®: National implementation. 2013.
36. CDC Control and Prevention Website. The direct medical costs of healthcare-associated infections in U.S. hospitals and the benefits of prevention. 2014.
37. Lord RK, Mayhew CR, Korupolu R, et al. ICU early physical rehabilitation programs: Financial modeling of cost savings. *Crit Care Med* 2013; 41: 717-724.