CE 2.0 ANCC Contact Hours

Preventing Secondary Complications in Trauma Patients With Implementation of a Multidisciplinary Mobilization Team

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ABSTRACT

Management of the trauma patient is complex. Immobility or bed rest has detrimental effects on multiple body systems. Early mobilization, especially in the multi-injured patient, can be challenging requiring a multidisciplinary team effort. Health care team members' and patient's understanding and perceptions of bed rest greatly influence successful early mobilization. Integrating a multidisciplinary mobility program in the acute care setting can decrease secondary complications and hospital length of stay ultimately improving patient outcomes. Using the strategy for translating research into evidence based practice by incorporating the 4 "Es" of Engage, Educate, Execute, and Evaluate will assist in creating a culture of mobility.

Key Words

Mobility perceptions of staff and patients, Multidisciplinary mobility team, Pathophysiologic effects of immobility, Translating evidence into practice

A 45-year-old male patient involved in an all-terrain vehicle rollover was admitted to the trauma service with a flail chest, pneumothorax, and hemothorax. He was successfully weaned from the ventilator and transitioned from the Intensive Care Unit to the Progressive Care Unit, and then transferred to the Medical-Surgical Unit (MSU) on hospital day 7. His chest tubes had been removed, and he was being closely monitored for residual hemothorax. The Progressive Care Unit staff was aggressive in pain management, mobilization, and pulmonary toileting. He had been transitioned to oral narcotics and anti-inflammatory medications. When the patient requested pain medication on the first evening on the MSU, he was administered intravenous (IV) hydromorphone rather than oral medications and slept soundly. When he awoke he was in severe discomfort and the IV hydromorphone was repeated. He continued to receive the IV hydromorphone, slept most of the next day, developed a low-grade fever, and his pulse oximetry (SpO_2) readings decreased. He required supplemental oxygen later in the evening. He had not been mobilized except to walk to the bathroom and was too drowsy to use the incentive spirometer. The next morning he developed an oral temperature of 102°, confusion and required an increase in supplemental oxygen to maintain adequate Spo_2 levels. There had been some question of alcohol abuse prior to hospital admission, and the MSU staff, not associating the confusion to hypoxemia and fever, called the trauma surgeon conveying concerns for alcohol withdrawal and received a phone order for IV lorazepam. His pulmonary status continued to deteriorate, and he was transferred back to the Intensive Care Unit in respiratory failure requiring intubation.

This patient scenario describes examples of errors in clinical judgment that led to the patient's physiologic decline, secondary complications, and increased length of stay. The issues included over sedation, lack of pulmonary toileting, prolonged immobility, and failure to recognize signs of hypoxemia and to thoroughly assess the patient prior to initiating lorazepam. This article addresses the issue of immobility and its impact on the recovery of the multitrauma patient.

HISTORICAL PERSPECTIVE

Bed rest was once thought to be an important aspect of recovery. Hippocrates penned "In every movement of the body, whenever one begins to endure pain, it will be relieved by rest."[1]

During the 19th century, *bed rest* was promoted for various conditions from acute medical illnesses to postoperative convalescence. The first thing in any illness was to put the patient to *bed*. *Bed rest* was often related to

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symptoms of weakness rather than by physician order. Hospital capacity has always been delineated by its number of *beds*.[1,2] Illness used to be measured by length of time in *bed*, and physicians were and still are assessed by their *bedside* manner. Hospital capacity has always been delineated by its number of *beds*.[1,2]

As far back as the early 1900s physicians began to question bed rest. Articles and commentaries were published, but there was no change in the overall practice.[1,3] In 1947, an article was published on the dangers of bed rest and included this poem:

> Teach us to live that we may dread,
> Unnecessary time in bed,
> Get people up and we may save,
> Our patients from an early grave.[3]

More recent evidence supports this statement and demonstrates the adverse effects of immobility on many of the body systems.[4,5]

IMMOBILITY IN TRAUMA PATIENTS

Trauma patients are at high risk for complications related to immobility including musculoskeletal, cardiovascular, pulmonary, and psychophysiological. Management of the trauma patient can be complex. These patients do not always require critical care admission but do require specialized care due to the potential for deterioration related to mechanism of injury and multitrauma with both diagnosed and undiagnosed injuries. Multiple system injuries require continuity and coordination of care by multiple disciplines. The trauma patient recovery is dependent on the knowledge and skills of the bedside nurse and the ability to communicate, collaborate, and coordinate.[6]

The loss of muscle mass and strength is a consequence of immobility. Little is known specifically related to immobility in trauma patients. However, studies of other populations are applicable to the traumatically injured. Bed rest study in healthy individuals has shown a 1% to 1.5% loss of quadriceps muscle strength loss for each day of immobility. The majority of strength lost is those muscle groups that maintain posture and aid in transferring along with ambulation. Patients who are immobilized with massive tissue injuries and infection are at a greater risk because inflammation acts synergistically with immobility to promote a greater muscle loss. Atrophy of the muscle by disuse is also linked with structural and metabolic changes. Proteolysis and decreased protein synthesis lead to even more loss of muscle mass and reduced contractile strength. A proinflammatory state has the potential to increase the production of reactive oxygen species, which is also associated with contractile dysfunction and atrophy. Increased production of reactive oxygen species and imbalance of cytokines from the inflammatory process further disturb the muscle synthesis and proteolysis balance. Bone tissue remodeling is a continual process and is effected by physical activity with the ratio of formation to degradation being related to the quantity of stress placed on the extremity.[2,7,8]

Consequences of immobility include both central and peripheral aspects of the cardiovascular system. Trauma patients are at the highest risk for developing deep vein thrombosis of all hospitalized patients.[9] The decreased venous blood flow from pooling of the blood in the legs and feet, vascular injury, and increased coagulopathy from the inflammatory process are the 3 main causes of thromboembolism. Venous stasis and venous compression of veins have the potential to damage the vascular endothelium. Immobility also contributes to fluid shifts from the lower to upper part of the body. This fluid shift to the thoracic cavity stimulates carotid, aortic, and cardiac baroreceptors to increase diuresis, which results in a decrease in plasma volume. Because of the baroreceptor dysfunction associated with bed rest, orthostatic intolerance can begin to appear within 3 to 4 days of bed rest, and even sooner in the elderly. As the patient rises from the supine position the blood volume in the thorax drops causing venous return to the right ventricle to decrease resulting in a reduced cardiac output. In response to the drop in cardiac output, heart rate increases and peripheral arteries vasoconstrict. There is reduced exercise capacity related to this orthostatic intolerance.[8,9-11]

The increase in intrathoracic and pulmonary blood volume and supine position decreases lung volume and compliance and the airway resistance increases. Normal lung-clearing functions of the mucociliary escalator are impaired with a decreased ability to cough and expectorate. This allows for collection of bronchial secretions and compression atelectasis resulting in decrease diffusion capacity, hypoxemia increasing risk for pneumonia.[3,10-12]

Within 3 days of bed rest evidence denotes an increase in insulin resistance related to impaired glucose delivery and uptake. Insulin regulates energy storage and release and regulates protein metabolism. Decreased muscle protein synthesis is related to insufficient levels of insulin.[13,14]

Systemic vascular endothelium dysfunction contributes to microvascular dysfunction and increases the peripheral vascular resistance contributing to systolic hypertension. A modest amount of physical activity such as engaging in the basic activities of daily living has been shown to improve vascular endothelium function.[15]

Trauma patients are at high risk for psychological problems. Emotional trauma can be exhibited in various psychophysiological symptoms including the loss of strength and decreased energy levels, decrease in motivation and concentration, more easily fatigued but with sleep impairment, increased sensitivity to physical and psychological stressors, depression, and posttraumatic stress disorders.[6,16-18]

BARRIERS TO MOBILIZATION

Understanding the detrimental effects of immobility should instill a sense of urgency to implement early mobility protocols in the acute care setting. Unfortunately, many real and perceived barriers often hinder this vital step to recovery and improved outcomes.

Depending on the size and level of a trauma center and the complexity of the patient injuries, there may be multiple service lines such as trauma, orthopedics, neurosurgery, and cardiology directly involved in the care of 1 patient. Patients with multiple injuries and comorbidities often have many disciplines involved; thus, clear communication between specialty services is essential.

Multiple orthopedic injuries such as an upper extremity injury, nonweight bearing pelvic fracture, and fractured ribs can make transfer of a patient from bed to chair appear impossible. Halo devices for cervical spine stabilization are both heavy and cumbersome making patient mobilization more difficult. Bedside caregivers may be uneducated on safe manipulation of external fixators used for stability of severe extremity fractures causing anxiety and reluctance to move the extremity.

A recent qualitative study described nurse's perceptions regarding who is responsible for ambulating patients. The nurses fell into 2 categories, those who claimed responsibility and those who attributed responsibility to other disciplines. Mobilization of the patient was directly impacted by the perception the nurse held. If the nurse attributed responsibility to other disciplines, mobilization was not a priority, but if the nurse claimed responsibility, mobilization ranked high on the priorities of care and patients were mobilized sooner and more frequently.[17]

Poor pain management and/or over sedation is an ongoing concern. Health care team members are understandably hesitant to cause discomfort to their patients. Multiple injuries can make repositioning extremely painful, and, though pain control is extremely important, the patient will experience some level of discomfort especially early in the mobilization process.

Other barriers include perceived or real lack of staffing for safe mobilization. A lack of assistive devices such as lifts and walkers, portable commodes, and high-backed chairs or recliners makes mobilization more challenging. Multiple tethers such as intravenous fluid lines, urinary catheters, and chest tubes may be perceived as an increased risk for falls and further injury. Poor communication between shifts, health care team members, and service lines can cause confusion concerning the patient's safety for mobilization. Lack of health care team understanding of the pathophysiologic effects of immobility may decrease the sense of urgency.

Patients and their family will have varying degrees of understanding and expectations of bed rest and mobilization. These may include previous experiences, culture, age, and education level along with other psychosocial issues. Many elderly may be fearful of unfamiliar surroundings and fear of further injuries from falls. Some patients do not expect to have to walk or be up from the bed and feel they should rest until they are well. A recent study evaluated patients in an MSU of a large teaching hospital. Direct observation of the patients showed that they were in bed 53% of the time, out of bed 43% of the time, standing 1% of the time, and walking 5% of the time. In a written survey, 38% of the patients expected to remain in bed while hospitalized. Ambulation was more frequent when mobilization was a priority with the health care team members.[19] A qualitative study explored the elderly patient's expectation of hospital activity. The elderly were less resistant to mobilize if they received direct communication from their physicians regarding being out of bed and exercising. This study suggests that medical staff communication and involvement has a significant impact on mobilization.[20]

BUILDING A MULTIDISCIPLINARY MOBILITY TEAM

Although the care of the trauma patient can be daunting, building a team and translating the evidence into clinical practice can be just as challenging. The need for early intervention cannot be addressed by just 1 individual. A coordinated intervention merging special skills sets of multiple disciplines are required to produce best outcomes. In an attempt to build a team and launch an innovation at the University of Texas Medical Branch, Galveston, Davis and Marshall[21] noted that it was important to first define teamwork. They used the definition by Kozlowski and Ilgen—"A team can be defined as (a) two or more individuals who (b) socially interact (face-to-face or, increasingly virtually); (C) possess one or more common goals; (d) are brought together to perform organizationally relevant tasks; (e) exhibit interdependencies with respect to workflow, goals, and outcomes; (f) have different roles and responsibilities; and (g) are together embedded in an encompassing organizational system, with boundaries and linkages to the broader system context and task environment."[22]

Key traits for team members were identified as having a focus on quality, committed to the organization, and having the ability to collaborate, knowing and understanding strategic goals and an ability to lead. They found that a diverse team was preferred because the depth of diversity including culture, age, sex, experiences, affiliations, and interests added texture and a broader view beyond the key traits. Team selection was the significant foundational building block, and desired participants were those referred to as risk takers, creative souls, lifelong learners, experts, and problem solvers.

In building a team for the multi-injured trauma patient, it is important to include all key stakeholders. This may include the trauma program manager and/or coordinator, a trauma physician, mid-level provider, unit manager, nurse, physical and occupational therapist, pharmacist, case manager, bedside technician, a trauma patient, and family member (either current or former). Transforming care at the bedside requires multiple health care team members to implement change and improve patient outcomes. The ongoing need to improve communication among all members of the team and ensure support is required for success.[23]

Patients and their families can make valuable contributions when implementing change. While in the hospital they witness and experience the health care process first hand including inconsistencies in care and adverse events. Collaborating with the patient and family ensures that proposed changes and implementations address their needs and allows for the health care team to clarify and understand their real or perceived understanding and expectations, as well as providing culturally competent care. Empowering patients to question existing practices mandates a health care team to review current processes and evaluate if there may be a better way to meet the needs. Integrating the patient into the teambuilding process can add another challenge, and individual hospital policy needs to be considered. Patient engagement is critical to the quality, safety, and delivery along with the experience of care.[24]

INTEGRATING EVIDENCE INTO PRACTICE

The use of evidenced-based therapies is often difficult to integrate into practice. The strategy for translating evidence into practice is 1 model developed by Pronovost et al[24] at the John Hopkins Hospital using an interdisciplinary collaborative method for broad dissemination of knowledge into practice.

The first step of this model is to summarize the evidence. The team would collaboratively gather and explore evidence regarding immobility and mobilization processes in addition to reviewing the current bedside practice of mobilization within their own organization. During this time interventions associated with improved outcomes are identified. Those interventions with the greatest benefit and lowest barriers to implement using the current resources and staffing available should be considered.

The second step is to identify local barriers to implementation. "Walk the process" to identify defects in the steps of implementation. Defects and all concerns by team members should be discussed to identify potential gains and losses associated with the implementation. A "preconditioned" criterion for a culture of respect during all meetings is imperative. Collaboration is the basis of any successful implementation of best practice. Without mutual respect and a sense of common purpose the team will be unable to work effectively for change. Each team member needs to feel safe to share and that their input will be respected.[25] Some barriers to consider are lack of resources, culture, communication between service lines, over sedation and pain management practices, and equipment.

After identifying barriers the development of a performance measurement tool is necessary for evaluating procedures and outcomes such as the time from admission to first mobility session, bed rest to standing, or bed rest to chair transfer. When evaluating for outcomes other information would be important to consider such as patient refusal and/or inability to mobilize and lack of medical orders. The team will want to measure baseline performance prior to implementation and test the measurement tool for detail and accuracy.

The development of a mobilization guideline will ensure that all patients receive the intervention, which is the fourth and final step in the evidence-based practice implementation. Begin the implementation on 1 unit and evaluate and modify the interventions as necessary to obtain the desired outcomes prior to expanding to other units.

This model also uses a 4 "Es" approach to disseminate knowledge to all stakeholders from the bedside staff to the executive officers.

1. *Engage*: Explain why the interventions are important. Executive officers will have a clearer understanding of the need for additional resources and process changes if there is a clear understanding that mobility will increase safety, decrease secondary complications and improve outcomes, ultimately shortening hospital stays and cost of care. Bedside staff will better understand the importance of mobility if they understand the pathophysiologic effects of immobility. Clearly educating the patient and their family will increase their acceptance and understanding for the need to be up out of the bed.
2. *Educate*: Summarize the evidence for implementation obtained by the team and disseminate to all stakeholders. The evidence supporting the benefits of early mobility can be presented in various ways such as during staff meetings, with posters displayed in break rooms and nursing stations, short and informative e-mails, and newsletters. The information should be disseminated in a clear and concise method and include the processes that will be implemented. Allow staff to walk through the process and share concerns along with gains and potential pitfalls of the implementation. Staff education by

the physical and occupational therapist on body mechanics, mobilization, and transfer techniques, as well as the use of lift and transfer devices available, may alleviate some concerns of the staff. Orthopedic devices such as Halos, spine braces, cervical collars, and external fixators can cause fear and uncertainty in both the patients and bedside caregivers. An understanding of why these devices have been applied and how to mobilize the patient with these devices is imperative for safe and aggressive mobilization.

Patient and family education is imperative in collaboration for implementing mobility interventions. An educational pamphlet and verbal reinforcement by nursing staff on the detrimental effects of immobility on the various body systems using simple language and avoiding medical jargon can assist the patient and their family to better understand the risks. Early pain management education and discussion can result in realistic expectations and goals for the patient. Analgesic medications must be timed and administered for best effects during mobilization and ADLs. An effective daily plan of care requires inclusion of the patient and family for successful implementation.

3. *Execute*: Consider designing a "toolkit" for the unit targeted at barriers, resources, independent checks, reminders, door hangers identifying patient weight bearing status, and assistive devices available. A daily team assessment of every patient for mobilization readiness is imperative for aggressive initiation of interventions.
4. *Evaluate*: Evaluate performance measures including unintended consequences. Interventions may need to be changed depending on the evaluation of the outcomes. All stakeholders should be included during the evaluation of the performance measures for a diverse interpretation and better outcomes.

CONCLUSIONS

There are multiple challenges when mobilizing the multitrauma patient. The lack of resources such as staff and equipment, lack of education about the detrimental effects of bed rest, and staff and patient perceptions are some of the barriers that contribute to these challenges.

The sequela of immobility has a significant detrimental pathophysiologic effect on patients resulting in secondary complications, increased length of hospital stay, and patient care costs. Recent evidence supports early mobilization to prevent secondary injuries and improve patient outcomes. One solution is to develop a multidisciplinary team to increase awareness and to change the culture to enhance patient recovery and satisfaction for all stakeholders. The use of the translating evidence into practice model uses a multidisciplinary collaborative approach that incorporates engaging all key stakeholders within an organization. Using multidisciplinary collaboration and coordination of activities can help ensure that mobility in trauma care becomes a routine practice.

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KEY POINTS

- Immobility or bed rest can have detrimental effects on the trauma patient causing secondary complications.
- Early mobilization can be challenging due to the multiple injuries sustained.
- Integrating a multidisciplinary mobility program in the acute care setting can reduce complications and hospital length of stay and improve patient outcomes.

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