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A Mobility Protocol for Critically Ill Adults

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Although the complications of immobility are well-described in the literature, critically ill patients are often subjected to prolonged periods of bed rest. Nurses, by virtue of their expertise in preventing iatrogenic complications, are in an ideal position to prevent the adverse outcomes associated with immobility. This article describes how nurses can use a mobility protocol to increase the activity of critically ill patients in a timely manner that may prevent the infirmity and suffering that is caused by unnecessarily long periods of bed rest.

Keywords: Mobility, Immobility, Complications, Protocol-based care

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When critically ill patients are in our care, it is important to protect them from further deterioration or delays in recovery. This is especially true for complications that are not related to the underlying pathophysiology that brought the patient to the acute care facility. Immobility is a well-recognized risk factor for a variety of adverse outcomes such as deep vein thrombosis, decubiti, and pulmonary insufficiency. Critically ill patients are at a particularly high risk for these complications because they are often placed on strict bed rest and are sometimes completely immobilized by sedative and paralytic medications. Because of competing priorities in busy critical care units and varying levels of nurses' knowledge and motivation, mobilizing patients out of bed is frequently neglected. Consequently, many patients are subjected to prolonged bed rest and suffer iatrogenic events. A mobility protocol was adapted from several available guidelines.[1,2] The intent of the protocol is to provide nurses with explicit recommendations that will help them to increase the activity of critically ill patients in a timely and safe manner.

CONSEQUENCES OF IMMOBILITY

Bed rest is a highly unphysiologic form of therapy that can result in a number of serious complications (see Table 1).[3-8] Pulmonary dysfunction from decreased respiratory excursion and stasis of secretions is frequently seen and can result in atelectasis and pneumonia. Orthostatic hypotension due to hypovolemia and a dampened carotid baroreceptor response can be caused by prolonged recumbency. A reduction in skeletal muscle contraction of the lower extremities can result in reduced venous return to the heart, venous stasis, and deep vein thrombosis. Deconditioning, or loss of skeletal muscle mass and strength, caused by immobilization is often independent of the underlying disease process for many patients. The absence of weight-bearing stress on the skeleton can result in the bone demineralization and the formation of urinary tract stones. Joint contractures result when muscle fibers atrophy and shorten and are further compounded when tendons and ligaments lose their normal pliability. Decubitus ulcers develop when prolonged pressure, particularly over bony prominences, results in a disruption of blood supply to tissues. Other

TABLE 1 Immobility-Associated Complications

System	Complications
Respiratory	Atelectasis
	Pneumonia
	Pulmonary embolus
Cardiovascular	Hypovolemia
	Dampened carotid baroreceptor response
	Orthostatic hypotension
	Deep venous thrombosis
Gastrointestinal	Constipation
	Ileus
Renal	Renal calculi
	Urinary stasis
Endocrine	Hyperglycemia
	Insulin resistance
Musculoskeletal	Muscular atrophy and deconditioning
	Bone demineralization
	Joint contractures
Skin	Decubitus ulcers
Psychosocial	Depression
	Decreased functional capacity

complications associated with immobility include hyperglycemia, insulin resistance, decreased gastrointestinal motility, constipation, urinary stasis, and depression.

A reduction in skeletal muscle contraction of the lower extremities can result in reduced venous return to the heart, venous stasis, and deep vein thrombosis.

Bed rest has not been found to result in any therapeutic benefit and may actually delay recovery for a wide variety of medical conditions and procedures.[9] The elderly are particularly vulnerable to the deleterious effects of immobility. A prospective cohort study conducted in a large teaching hospital found that patients aged 70 years and older who had lower levels of mobility while hospitalized experienced significantly higher rates of functional decline, new institutionalization, and death.[10] These researchers also noted that there was no documented medical reason for bed rest for almost 60% of the study participants. Winkelman et al[11] conducted a descriptive study in 2005 and found that mechanically ventilated patients in an intensive care unit were rarely gotten up to a chair despite physiologic stability. Therefore, it is imperative that nurses find a highly reliable mechanism to progress the mobility of critically ill patients.

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MOBILITY PROTOCOL

Purpose of the Mobility Protocol

All hospitalized patients should have a detailed and specific activity program initiated on admission. Furthermore, this plan should be evaluated and updated by nurses on every shift. A mobility protocol for critically ill patients was developed in an effort to deter the indiscriminate use of bed rest in the critical care unit (see Table 2). The intent of this protocol is to provide a structured approach for the nursing staff to evaluate and progress patient activity in a stepwise fashion. The protocol will help nurses view mobility as a core component of nursing care and empower them to proactively initiate therapeutic patient activity.

The protocol can be easily incorporated into multidisciplinary rounds so that healthcare professionals can plan for patient mobility needs and ensure that the steps of the protocol are applied as soon as the patient regains some physiologic stability. Although the protocol provides explicit steps, it is important to individualize the plan according to the unique needs of each patient. In our unit, we use a daily goal sheet during our multidisciplinary rounds to develop and communicate the patient's plan of care. A daily goal sheet is a form that has been shown to improve communication and decrease critical care unit length of stay by having healthcare team members clarify the tasks and goals that need to be accomplished before the patient can be moved out of the critical care unit.[12] During our multidisciplinary rounds, we use the daily goal sheet to review each patient's status and plan for mobility progression. We usually discover several patients who are stable enough to be placed on the protocol. Because the spread of innovation is enhanced by social interaction, clinical leaders in our unit support and teach the clinical staff during the rounds as they learn to use the protocol.[13]

TABLE 2 Mobility Protocol

- Complete bed rest orders for prolonged periods should be a rare exception and should be questioned if a legitimate reason is not apparent.
- Use progressive mobility protocol for the following patients:
  - Deconditioned by >3 d of immobility
  - Requires orthostatic training to upright positioning
  - Ready to begin ventilator weaning
- Turn patients every 2 h while on bed rest. Document reason if contraindicated or patient does not tolerate turning.
- Perform ROM BID on all patients who cannot actively participate in their care.
- Maintain HOB of mechanically ventilated patients >30 degrees unless contraindicated.
- Evaluate readiness for and progression of activity on each shift.
  - Document why mobilization did not occur
- Progressive mobilization should occur 2-3 times a day unless patient meets exclusion criteria*
- Evaluate tolerance to activity and progress to the next step as tolerated
- Consider physical therapy consult when patient is able to follow simple commands
- Progress as follows:
  1. Elevate HOB to 45 degrees. Consider reverse Trendelenburg at 45 degrees if patient's abdomen is large.
  2. Elevated HOB to 45 degrees plus legs in dependent position (partial chair position). Consider lower HOB angle if patient's abdomen is large.
  3. Elevated HOB to 65 degrees plus legs in full dependent position (full chair position). Consider lower HOB angle if patient's abdomen is large.
  4. Dangle with assistance once patient is conscious and following commands. Patient's feet should be touching the floor if possible. Support torso but encourage independence.
  5. Stand patient at bedside with support once patient is able to lift his leg against gravity. Patient should bear weight.
  6. Transfer to chair by pivoting or taking 1-2 small steps. Patient should sit up for 1-2 h
  7. Walk with assistance. Use walker if needed.
  8. Walk independently

*Exclusion criteria for progressive mobilization:

- Cardiovascular instability
  - Hypotension—SBP <90 mm Hg
  - Tachycardia—HR >130 beats/min
  - Unstable cardiac rhythm
  - Two or more vasopressors/inotropes or frequent (>hourly) upward titration
  - Intra-aortic balloon counterpulsation
  - Active bleeding
- Neurological instability
  - Acute traumatic brain injury, intracranial hemorrhage, or subarachnoid hemorrhage
  - ICP monitoring
  - Intraventricular drain
  - Unstable SCI or vertebral fracture
  - Any new neurological deterioration
- Respiratory instability
  - F_{IO_2} >0.60
  - PEEP > +10 cm H
  - Respiratory rate >35 breaths/min
  - Requirement for neuromuscular blockade medications
  - Pressure control ventilation mode
  - High frequency oscillatory ventilation
- Femoral sheath or arterial line
- Balanced skeletal traction

ROM indicates range of motion; BID, twice daily; HOB, head of bed; SBP, systolic blood pressure; HR, heart rate; ICP, intracranial pressure; SCI, spinal cord injury; F_{IO_2}, fraction of inspired oxygen; PEEP, positive end expiratory pressure.

We also use the daily goal sheet during the change of shift report to communicate each patient's mobility plan.

Inclusion/Exclusion Criteria

The progressive mobility protocol should be used for patients who are deconditioned by more than 3 days of immobility, require orthostatic training to the upright position, or are ready to begin mechanical ventilation weaning.[1-4,8,14] Mechanical ventilation is not a contraindication to getting patients out of bed. In fact, early mobilization is considered to be an essential step to liberating patients from long-term mechanical ventilation.[15] Other inclusion criteria include physiologic stability and the absence of invasive femoral arterial lines. Patients with cardiovascular, neurological, or respiratory instability should not be mobilized until their underlying physiologic derangements are improved to the point where they can tolerate activity without deterioration. Patients with acute traumatic brain injuries and increased intracranial pressure should remain on bed rest with the head of the bed elevated to 30 degrees until the acute phase of the injury has passed.[16-18] Lastly, a requirement for balanced skeletal traction will prohibit patients from getting out of bed.

Steps of the Mobility Protocol

Complete bed rest orders for prolonged periods should be a rare exception and should be questioned if a legitimate reason is not apparent. When bed rest is truly warranted, the rationale should be documented in the medical record at least once a shift. Immobilized patients should be repositioned every 2 hours and receive range-of-motion exercises twice each day to prevent pressure ulcers, contractures, and loss of muscle tone. An upright posture is the optimal position for gas exchange to occur.[4] Therefore, the nurse should assist the patient in progressing from sitting upright in bed to ambulating as soon as possible. Initially, the head of the bed should be elevated to 45 degrees to allow for vasomotor training and prevention of aspiration.

An upright posture is the optimal position for gas exchange to occur.

Alternatively, patients with large abdomens can be placed in a 45-degree reverse Trendelenburg position to keep the contents of the abdomen from pressing on the diaphragm, thus allowing the patient to take slower and deeper breaths.[19] As the patient adjusts to changes in posture, the bed should be configured into a chair position so that the patient can experience sitting upright with the legs in a dependent position for 1 to 2 hours. If a bed that adjusts to a chair position is not available, the patient may be moved to a recliner chair with a mechanical lift or slide board device. If the patient is unable to perform weight-shifting maneuvers, the length of time in the chair position should be limited to 1 hour to prevent skin breakdown. The next steps are to place the patient in a chair position with the head of the bed elevated to 65 degrees and then to dangle the patient on the side of the bed. While dangling, the patient's feet should be touching the floor, and the patient should be encouraged to support his torso in an upright position. Once the patient has the strength to tolerate these activities, the nurse should assist the patient with standing up, bearing weight, and taking a couple of steps to a recliner chair. The nurse should assist the patient with ambulating when the patient regains enough strength and balance to walk for short distances. A walker may be used to help steady the patient's gait. The final step in the mobility protocol is to encourage independent ambulation. Although these maneuvers are not revolutionary, it is the structure provided by the protocol and the constant evaluation by every nurse on every shift that may help critically ill patients regain their strength and functional abilities as soon as possible.

Kinetic Rotational Therapy

It has become an accepted standard that immobilized patients should be turned every 2 hours. However, there is evidence to suggest that this does not happen for some critically ill patients. Krishnagopalan et al[20] in 2002 reviewed the activities of 74 critically ill patients and found that only 2.7% had a demonstrable change in body position every 2 hours. They also noted that 28% of the study participants remained supine during the observational period of the study. Therefore, the researchers suggest that kinetic rotation, or continuous turning of the patient on the longitudinal axis, may be a viable alternative for patients who are too unstable to get out of bed.

A multicenter study of critically ill medical, surgical, and trauma patients showed that kinetic therapy for at least 18 hours per day resulted in a significant reduction of ventilator-associated pneumonia and lobar atelectasis.[21] Patients were eligible for the study if they had a PaO_2/FIO_2 ratio less than 250 and a Glasgow Coma Score less than 11 and required mechanical ventilation. Therefore, patients who meet these criteria should be considered for kinetic therapy (see Table 3). The oscillating bed should be set to turn to 40 degrees on each side, and therapy should occur for at least 18 hours out of each 24-hour period. Although a 40-degree turn has the added benefit of relieving pressure on the sacrum, nurses should manually turn the patient at least once a shift so that the skin on the back and

TABLE 3 Kinetic Rotational Therapy

Initiate kinetic therapy for mechanically ventilated patients who meet exclusion criteria for progressive mobilization guidelines and have a P/F ratio <250 and a Glasgow Coma Score <11.

- Rotation should occur for at least 18 h every day
- Adjust bed for right turn at 40%, right pause at 10 min, center pause at 5 min, left turn at 40%, left pause at 10 min
- If gradual rotation is needed, the rotational training mode may be used which increases rotation by 10% every hour.
- Reassess need for rotation every shift
- Turn patient and inspect skin at least every shift
- Return to progressive mobility guidelines once instability has resolved

Contraindications to kinetic therapy:

- Unstable spine injury
- Unstable pelvic fracture
- Increased intracranial pressure
- Hemodynamic instability
- Traction

There may also be some height and weight restrictions.

sacrum can be assessed for signs of breakdown.[22] The need for kinetic therapy should be evaluated every shift, and patients should be moved to the mobility protocol once they are medically stable enough to tolerate an upright position.[4] Because the cushions of most oscillating beds do not provide stability, kinetic therapy on an air mattress bed should not be used for patients with an unstable spinal cord or an unstable pelvic fracture.[23] Patients experiencing delirium may not tolerate kinetic therapy.

SUMMARY

Prolonged bed rest has been associated with a number of well-documented adverse outcomes that can have severe consequences, especially for the elderly. Critically ill patients are often relegated to prolonged periods of immobilization without much thought. A mobility protocol for critically ill patients may provide nurses with the structure and impetus to progress patient activities in a systematic manner that prevents bed rest–related complications. Future research is needed to illuminate the best methods and timing to optimize the functional abilities of critically ill patients.

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