POSTURAL CHANGES IN HEMODYNAMICALLY UNSTABLE PATIENTS IN CRITICAL CARE UNIT

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Abstract

In the critical care population, heart rate and rhythm, blood pressure, respiratory rate, and oxygen saturation are monitored continuously, providing immediate feedback regarding any changes in patient status. Hemodynamic instability is a term commonly used by clinicians to describe labile changes in cardiopulmonary status. The clinician's perception of hemodynamic instability may cause a delay or omission in turning, repositioning, and other interventions to advance patient mobility and may contribute to pressure ulcer formation. The intensive care unit's practice culture and individual clinician perceptions regarding hemodynamic instability may lead to staff not turning patients out of fear that they are "too unstable to turn."Critical care personnel determine the quality of patient care and patient outcomes. Interdisciplinary care is based on a comprehensive approach that includes standards and guidelines consistent with high quality evidenced based care.

Key words: Hemodynamic instability,Progressive mobility, Repositioning.

Introduction

Caring for the critically ill patient allows the bedside nurse to see the extent to which excellent nursing care can be a major factor in reducing morbidity and mortality.[1-3] Clinical assessment provides a number of advantages over the use of invasive methods to assess severity of illness and adequacy of the initial resuscitation of the hemodynamically unstable patient.Assessing hemodynamically unstable patients provide timely, low risk and potentially useful diagnostic and prognostic information.[4-5] The Nurse rapidly monitors for the development of complications, consults with appropriate personnel for additional interventions and generally ensures that care is provided according to accepted practice guidelines and protocols.[6,7]Routine care of mechanically ventilated patients typically involves a regimen of body position changes to aid in the prevention of skin breakdown, to enhance secretion clearance, and to improve ventilation/ perfusion relationships.[8]

Defining Hemodynamic Instability

Hemodynamic instability is typically characterized by blood pressure lability, bradycardia, tachycardia, systemic hypotension, hypoxemia, and/or hypoperfusion, and may be affected by blood loss, decreased systemic vascular resistance from sepsis, decreased cardiac output, as well as supportive measures such as extracorporeal circulation.[10-11]

Clinical Assessment of Hemodynamically Unstable Patients

Clinical assessment methods are readily available and can be performed without the use of additional specialized equipment. Several types of clinical assessment including change in temperature and mean arterial pressure have been validated to predict mortality in patients with critical illness in different patient populations. In addition, there is evidence that response to therapy in hemodynamically unstable patients may predicted by changes in clinical exam.

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Further, clinical assessment is low risk and can be repeated as often as necessary.[12-14]

Need for postural changes

1. Critically ill patients who are older, with comorbid conditions such as diabetes and preexisting cardiac disease and or the presence of vasoactive agents, will be at greater risk for not tolerating in-bed mobilization. It is critical that the nurse assess the risk factors and plan when activity will occur to allow sufficient physiological rest to meet the oxygen demand that positioning will place on the body.
2. When positioning the high-risk patientswho need preoxygenation before position change to increase the oxygen supply side, the right lateral position should be used initially to prevent the hemodynamic challenges.
3. Prevent prolonged gravitational equilibrium by initiating a turning schedule within hours of admission to the ICU. Prolonged periods in a stationary position result in greater hemodynamic instability when the patient is turned.
4. If the patient does not tolerate manual turning using the just-stated recommendations, as evidenced by a sustained decrease in blood pressure and oxygen saturation and/or an increase in heart rate, the patient should be returned to the supine position and the nurse should consider the use of continuous lateral rotational therapy in an effort to train the patient's body to tolerate side-to-side movement.
5. Continuous lateral rotation therapy should be managed. Significant problems are created for ICU patients when they are not mobilized effectively. Mobilization enables the prevention of complications and faster healing and recovery.[9-10]

Positions andHemodynamics

Effect of Supine Position

1. In the supine position, ventilation and perfusionare greater in dependent areas of the lungs than in the anterior areas. In healthy lungs,adequate matching of ventilation and perfusion(V/Q match) can be achieved in the supine position.
2. In diseased lungs, prolonged placement in the supine position can alter the V/Qmatch. For example, excess fluid associated with pulmonary edema accumulates in the dependent areas of the lungs and interferes with diffusion of gases across the alveolar capillary membranes Perfusion, however,remains constant in the dependent areas.
3. Therefore, there is a V/Q mismatch that results in an intrapulmonary shunt.The supine position results in anatomical changes that alter ventilation and perfusion,especially in patients with enlarged hearts. In the supine position, the major part of the left lower lobe and a significant part of the right lower lobe are located beneath the heart.
4. Enlarged heart produce an increased pleural pressure in the dependent areas and contribute to alveolar collapse. Studies using isotope ventilation-perfusion scans in patients with cardiomegaly and no evidence of pulmonary pathology have shown a 40% to 50% reduction in left lower lobe ventilation in a prolonged supine position with no concomitant reduction in regional perfusion.
5. Patients with acute respiratory distress syndrome (ARDS) who are mechanically ventilated while in the supine position develop atelectasis in the dependent areas of the lungs.
6. Ventilation is impaired by airway, lung edema, and cardiac and abdominal compression of the lungs while perfusion is secretions maintained, and this results in intrapulmonary shunt and severe hypoxemia[31].

Effect of Prone Position

1. Increases intra abdominal pressure, decreases VR to the heart, and increases systemic and pulmonary vascular resistance however, may improve as Perfusion of the entire lungs improves Increase in intra abdominal pressure decreases chest wall compliance,which under PPV, improves ventilation of the dependent zones of the lung, and Previously atelectatic dorsal zones of lungs may open[29].
2. Research demonstrates that prone positioning in critically ill patients with acute lung injury and/or ARDS improves pulmonary gas exchange and reduces the rate of VAP. The physiological mechanisms responsible for improvement in pulmonary gas exchange have not been fully elucidated.

3. Possible mechanisms may include better drainage of pulmonary secretions, reopening of atelectactic units inthe dorsal regions of the lungs, and minimizing ventilator-induced lung injury.
4. Despitein pulmonary gas exchange, recent studies reported no survival benefit for the use of the prone position in ARDS. Alsaghir and Martin recently conducted asystematic review and meta-analysis to assess the effect of the prone position, as compared to the supine position, on improvement in oxygenation,number of days on the ventilator, VAP, and mortality.
5. Prone positioning showed significant and persistent improvement in PaO2/FIO2 in all phases of ARDS Although no significant difference in short-term or long-term mortality was reported, a couple of studies showed that prone position significantly reduced mortality in patients with higher illness severity.
6. Adverse consequences include dislodgement ofthe artificial airway and enteral feeding tubes,loss of venous access, development of facial edema and pressure ulcers, and difficulties with cardiopulmonary resuscitation.
7. For critical care units that use prone positioning,evidence-based guidelines for bedside nurses should be in place. These guidelines should include indications and contraindications,preprone assessment and safety practices,strategies for placing the patient in the prone position, assessment guidelines for monitoring patient response to the prone position,and limb positioning while in the prone position[27,28,29].

Contraindications

The following are relative contraindications to prone positioning. Although it might be reasonable to commence proning patients with some of these conditions, they should be considered carefully at consultant and senior nurse level before proceeding.

- Increased intracranial pressure
- Severe Haemodynamic instability
- Uncontrolled bleeding
- Recent airway surgery including tracheostomy
- Cardiac arrhythmias likely to require pacing or defibrillation
- Significant likelihood of requiring CPR
- Chest drainage with persistent air leak
- Spinal instability
- Unstable fractures
- Recent abdominal or thoracic surgery
- Raised intra-abdominal pressure
- Active intra-abdominal pathology[23]

Stationary Lateral Positions

1. The decision to place critically ill patients inthe left or right lateral decubitus position is based on relevant lung pathology and hemodynamic stability. Studies have shown that when patients with unilateral lung disease(pneumonia, atelectasis) are placed with the consolidated lung in the dependent position,there is a mismatch of ventilation to perfusion that results in hypoxemia.
2. Placement of the diseased lung in the dependent lateral position results in greater perfusion to a diseased poorly ventilated lung and impairs gas exchange.
3. Therefore, patients with unilateral lung pathology should be placed in a lateral positionwith the "good" lung down.
4. Even though this is the golden rule for patients with unilateral disease, there are contraindications to this position in certain lung pathologies. For example,in patients with pulmonary abscesses or pulmonary hemorrhage, it is important to keep the affected lung in the dependent position so that drainage will not migrate toward the healthy lung.
5. At 10 to 30 minutes after a lateral position change, cardiac output and heart rate may not be the same as in the supine position, but

these changes in most mechanically ventilated patients are not clinically significant.

6. Early evidence demonstrated that cardiovascular changes can be highly individualized and may be most prominent in patients with low cardiac output and in patients who are hypothermic and/or receiving vasoactive medications.
7. More recent evidence suggests that lateral positioning of critically illpatients who are hypoxemic or have low car cardiac output does not further endanger tissue oxygenation.[25]

Effect of Semirecumbent Position with Head of Bed Elevation

1. Head of bed (HOB) elevation is an importantcomponent of the semirecumbent position t hat must be considered for patients who are receiving enteral nutrition to prevent aspiration of gastric contents and ventilator-associated pneumonia (VAP).
2. Several studies using radiolabeled enteral feeding solutions in mechanically ventilated patients have reported that aspiration of gastric contents occurs to agreater degree when patients are in the supineposition than when they are in the semi-recumbent position with the HOB elevated to 30 to45 degree.[24]

Contraindications to HOB Elevation

- Pulmonary
- Atelectasis
- Pneumonia Hypoxemia
- Cardiovascular
- Venous thromboembolism
- Syncope because of diminished baroreceptoractivity
- Skin integrity
- Pressure ulcers
- Low cardiac index
- Hypotension
- Neurological Ischemic stroke
- Traumatic brain injury
- Procedure in progress in which HOB elevationis in appropriate
- Prone position
- Medical order for no HOB elevation

Beach Chair Position

1. The beach chair position was conceptualized as a method of early mobilization to help reduce the incidence of VAP in ICU patients who, because of pathological reason(s) or physiological instability, are unable to get out of bed.

2. The BCP is defined as having the patient's head of bed elevated to 70° and the foot of bed at a −75° angle, as if the patient is sitting in a chair. By using the bed frame to place the patient in the BCP, patients who might not be able to get out of bed are able safely to attain a sitting position. BCP candidates include patients who require sedation or who are hemodynamically unstable.[22,23]

Common Nursing Interventions for positioning Unstable Patient

- Turning technique is also very important for success. Moving the patient from the supine position to a full lateral turn during a bed bath, for example, is not an appropriate gauge of the patient's ability to turn. Rather, we advocate that slow, incremental turns are essential to allow the patient to adjust to the change in gravity versus the body alignment.
- The patient should be turned slowly, with adequate staff, to 15˚ for 15 seconds, then 30˚ for 15 seconds, 45˚for 15 seconds, and then completion of the turn to allow for needed care (eg, linen changes, hygiene, and skin care). The patient should then be brought back down on wedges and pillows to the 30˚position, using the same incremental 15-second technique.
- Changes in hemodynamic status should be monitored for 10 minutes.[16]

- Braden pressure ulcer risk assessment.
- Continued in heart rate, for instance, should not invoke a knee-jerk reaction to stop the turning intervention.
- These patient-specific responses should be individualized to the patient. If patients are noted to have no concerning changes in vital signs at 15˚but show hemodynamic instability without recovery at 30˚, then they will be provided a miniturn for the time being at the 15˚level. With the next turning attempt, patients will again be turned incrementally, but with the goal to achieve a 30˚turn[20-21]
- Patients who tolerate repositioning are considered to be "stable"; in these patients, turning frequency should be individualized dependent upon their condition and the support surface that is in use and should generally range from 1 to 4 hours.[16-17]
- Provide mini turns
- Weight shift patient at least every 30 minutes
- Elevate heels from surface of bed
- Reposition patients head, arms and legs at least every hour, consider passive ROM
- Consider use of continuous lateral rotation therapy to prevent development of gravitational equilibrium. Begin: SLOW and LOW angles of turning to guage patient response
- When turning patient: Go SLOW provide serial small turns from supine to lateral position to achieve linen changes, hygiene checks and reposition with wedges and pillows.[15]

Clinical findings which prevent patient turning

1.Development of life threatening arrhythmia with symptomatic response (Ventricular Fibrillation/ Ventricular tachycardia / Systemic Ventricular Tachycardia). This does not include asymptomatic Atrial Fibrillation.

2.Active Fluid resuscitation (ie. no volume going in = no systemic blood pressure).

3.Active Hemorrhaging

- Following cardiac surgery / Active Tamponade
- Massive G.I bleeding with use of Blakemore tube.
- Active hemorrhage following trauma

4.Changes in baseline haemodynamic parameters (BP, HR, Oxygen Saturation, RR, etc) does not recover within 10 minutes of position change and is not an expected result faced on diagnosis.[15]

- Interdisciplinary Collaboration The task of turning, repositioning, and mobilizing the intensive care patient requires a true multidisciplinary collaboration. For pressure ulcer prevention, the nurse should support the principles of progressive mobility and should join forces with the nursing staff and physical therapists. Increasing patient mobility in the ICU population is likely to contribute to reduction in pressure ulcer incidence.
- Even the most critically ill patients can usually be turned; for example, most cardiac surgery patients and neurosurgery patients with intracranial pressure monitoring can be turned safely beginning in the immediate postoperative period.[18]

The Role of Critical Care Nurses

Skilled nursing management of a critically ill patient operates on many levels. Critical care nurses' skill level is dependent upon their knowledge, experience of, and exposure to, critically ill patients. Improving patient outcomes Wards and units can benefit greatly from using the full potential of their critical care nurses[30].

Nurses can improve patient recovery by using patient-centred care, pro-active management and vigilance, coping with unpredictable events, and providing emotional support Patients are helped by skilled and timely reduction of sedation, weaning from ventilation, physical rehabilitation, and psychological support. Effective nursing care also includes pro-active prediction and prevention of complications, and prompt and skilled intervention in the event of sudden deterioration. Skilled critical care nursing will reduce the risk of complications, the number of critical care bed days and improve patient outcomes. Observation will reduce a patient's risk of precipitous deterioration, monitor their total dependence on support equipment and prevent their agitation or confusion leading to harm. Observation involves assimilation, interpretation and evaluation of information, including the patient's physical and psychological response to interventions, changes in condition, the significance of monitored physiological parameters and the safe functioning

of equipment. Only appropriately trained and experienced nurses can provide this comprehensive level of observation.[19-20]

Conclusion

Every patient, nurse and care facility is different. So providing the right nursing care for critically ill patients is not simply a matter of applying standard nurse-to patient ratios. The skill of the nurse, the complexity of the patient's needs and the physical environment of care will all influence nursing requirements.

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