The Critically Ill ED Boarder

Key Article

- *Mohr NM, Wessman BT, Bassin B, et al. Boarding of critically ill patients in the emergency department. Crit Care Med. 2020; 48:1180-7.*

Background

- ED volumes have increased approximately 30% over the past decade. Over the same period, numerous hospitals have unfortunately closed. Decreased inpatient capacity is considered one of the primary drivers for ED boarding.
- ED boarding has become widespread and is associated with adverse patient outcomes.
- The impact of boarding on critically ill patients is less well studied.
- ED operations and physician focus is on emergent evaluation, resuscitation, and management, not on the longitudinal care of patients.
- Given the increased burden of critically ill ED boarders, SCCM and ACEP jointly convened the ED-Critical Care Medicine Boarding Task Force. Members included EM, CCM, an acute care NP, and clinical pharmacist.
- The Key Article for this podcast is the white paper from this Task Force.

Focus Areas

- Describe the best available evidence on the frequency of ED boarding of critically ill adults in the US since 2000.
- Summarize the association between ED-CCM boarding and patient-oriented outcomes
- Explore local mitigation strategies to combat the deleterious effects of boarding
- (Excluded international literature, focused on adults, limited to those patients identified for ICU admission)

Systematic Review

- Conducted a systematic review to define the frequency of ED-CCM boarding.
- Broad search criteria including national, regional, health system, and individual hospital data
- Literature search resulted in 174 papers, of which 18 were included for analysis.

Results

- Extent of CCM Provided in the ED
    - ED visits for critically ill patients increased 80% between 2006-2014.

    - Number of intubated ED patients increased 16% during this period. Approximately 250,000 patients are ventilated in US EDs, with a median LOS of > 3 hrs
    - Over same period, minimal growth in ED and ICU capacity
    - In academic centers, estimates of critical care billing are between 15%-20%
- How is Boarding Defined?
    - No universal definition of ED boarding exists.
    - Nine different classifications for boarding were identified.
        - Some defined as the time after the decision to admit was made
        - Some used thresholds of 2, 4, and 6 hours
        - Some looked at total number of ED hours
        - Joint Commission recommends boarding no longer than 4 hours
        - ACEP states that boarding begins after the admission or observation order is placed
- How Common is ED Boarding of the Critically Ill?
    - Majority of literature is retrospective single-center studies.
    - Given heterogeneity, a pooled estimate of the standard frequency of boarding could not be obtained.
    - Mean LOS ranges from 1.3 to 8.8 hours
    - Incidence ranges from 2% to 87%
- What Clinically Relevant Outcomes are Associated with Critically Ill ED Boarding?
    - Majority of literature is retrospective and prospective observational studies
    - Increased duration of mechanical ventilation
    - Longer ICU LOS, longer hospital LOS
    - Increased in-hospital mortality
    - Low-quality process-related care
        - Post-intubation care elements often not performed
        - Delays in ABX administration, fluid administration, home medication initiation
        - For stroke patients – increased probability of poor neurologic recovery
    - Increased medication-related adverse events

Mitigation Strategies

- Task Force organized strategies into ED solutions, hospital solutions, and ED-based resuscitation units
- ED Solutions
    - **Sedation Practices**
        - Early deep sedation is associated with longer ventilator duration and higher need for tracheostomy. Excessive sedation of intubated adult patients in the ED was associated with increased patient morbidity and in-hospital mortality. The Richmond Agitation-Sedation Scale (RASS) and Sedation-Agitation Scale (SAS) are the most valid and reliable sedation assessment tools for measuring quality and depth of sedation in adult ICU patients.

1. Pain should be routinely assessed for all intubated patients using a validated scoring tool (e.g. Numeric Rating Scale, Critical Care Pain Observation Tool or Behavioral Pain Scale)
2. Agitation should be routinely assessed for all intubated patients using Richmond Agitation Sedation Scale (RASS) or Riker Sedation Agitation Scale (SAS)
3. Per consensus guidelines, light levels of sedation should be targeted. Sedation intensity within the first 48 hours is associated with worse outcomes.
4. Pain management should be optimized with opioid analgesia. Non-benzodiazepine sedation is suggested.
5. Institutions should individually define frequency of these assessments, goals and medication titrations.

- **Mechanical Ventilation Practices**
  - Evidence suggests that ventilated patients often receive suboptimal management settings in emergency departments and that those ventilation parameters often impact their initial inpatient management. Implementing a mechanical ventilator protocol in the ED targeting a lung protective approach is feasible and is associated with significant improvements in the delivery of safe mechanical ventilation and clinical outcome. It influences ventilator settings in the ICU and reduces pulmonary complications.
  - Exposure to severe hyperoxia during critical illness has been associated with increased ICU and hospital mortality and associated with fewer ventilator-free days. ED exposure to hyperoxia is common and associated with increased mortality and suggests that hyperoxia in the immediate post-intubation period could be particularly injurious. Targeting normoxia (PaO2 60–120 mm Hg) from initiation of mechanical ventilation may improve outcome.
  - End Tidal CO2 Monitoring via continuous-waveform capnography is recommended, in addition to clinical assessment to confirm and monitor correct placement of an endotracheal tube and to provide feedback on patient cardiopulmonary function.
    1. Get an accurate height to use for predicted body weight (PBW) for optimizing tidal volume (6–8 mL/kg using patient's PBW)
    2. Start supplemental O2 at lower targets to generate minimal FiO2 to meet an O2 saturation greater than 90%, and/or PaO2 between 55–80 mmHg; avoid hyperoxia.
    3. To achieve this goal early monitoring of an arterial blood gas (within 30mins) of intubation/mechanical ventilation.
    4. Match PEEP to the FiO2 according to the ARDSNet protocol
    5. Keep the plateau pressure < 30 mm Hg
    6. Keep the head of the bed at 30 degrees.

7. End-tidal CO2 (PETCO2) is suggested to guide ventilator management.
8. Capnography is suggested to identify abnormalities of exhaled air flow.
9. Volumetric capnography is suggested to assess CO2 elimination and the ratio of dead-space volume to tidal volume (VD/VT) to optimize mechanical ventilation.

- **Infection Prevention Practices**
  - VAP: Care of mechanically ventilated patients is wrought with potential complications, including ventilator-associated events/ infections/pneumonia (VAEs/VAP). Ventilator associated events/infections (VAEs) account for significant patient co-morbidities and health care costs. Prevention of these events has been pivotal to hospital based quality initiatives over the past years and care bundle implementation has been one strategy used to reduce VAE. Certain bundle practices are important in the early stages of care and should be instituted in the emergency department
    1. Maintain continuous head of bed elevation to 30–45 degrees, unless medically contraindicated.
    2. Suction subglottic secretions above the endotracheal tube.
    3. Use closed endotracheal suctioning versus open endotracheal suctioning when possible.
    4. Implement oral hygiene within 1 hour of intubation and continued every 4 hours.
    5. Implement application of chlorhexidine solution to the oral cavity after intubation and every 12h thereafter, orotracheal intubation with a tube that enables continuous subglottic suctioning.
    6. Assess endotracheal cuff pressure after intubation and every 4h thereafter to maintain pressure between 20 and 30 cm H_2O.
  - CLABSI: Central-line-associated bloodstream infection (CLABSI) is associated with increased morbidity, mortality, length of stay, and cost. Implementation of a central line bundle has been shown to reduce CLABSI rates.(16, S27-S30)
    1. Implement a standardized hand hygiene; maximal barrier precautions upon insertion of central lines; chlorhexidine skin antisepsis; optimal catheter site selection, with avoidance of femoral vein for central venous access in adult patients.
    2. Standardize use of aseptic technique for accessing and changing needleless connectors and the use of a disinfectant cap on intravenous line hubs is recommended; when disinfectant caps are not available, ensure the hub is disinfected with an alcohol or chlorhexidine-based disinfectant using friction for 30 seconds prior to accessing.

- CAUTI: Catheter-associated urinary tract infections (CAUTI) are common and lead to increased hospital costs, as well as increased morbidity and mortality.
    1. If a patient requires placement of an indwelling catheter, ensure that all Centers for Disease Control and Prevention (CDC) guidelines are adhered to in order to prevent catheter-associated urinary tract infections (CAUTI).
    2. Catheters should remain in place only as long as needed.

- **Hemodynamic Management**
    - Effective management of the critically ill patient often requires assessment of cardiovascular performance and determining correct therapeutic interventions.(S31)
        1. Consider other assessment variables such as right ventricular function, intrathoracic pressure, vena cava filling, and venous compliance when considering fluid responsiveness and titrating fluids and vasopressors.
        2. Bedside monitoring using point of care ultrasonography and various invasive and noninvasive monitoring can provide a multi-modal approach to basic hemodynamic monitoring and aid in selecting an optimal resuscitation strategy.
- **Transfusion Practices**
    - For all patient populations in which it has been studied, transfusing RBCs at a threshold of 7 mg/dl is associated with similar or improved survival, fewer complications, and reduced costs compared with higher transfusion triggers." It is possible that different thresholds may be appropriate in patients with acute coronary syndromes, although most observational studies suggest harms of aggressive transfusion even among such patients. A significant percentage of ED blood product transfusions are discordant with guideline recommendations, though it is unclear if ED transfusion practice relates to worse clinical outcomes. Adoption of standardized transfusion triggers/practices that align with inpatient recommendations seems prudent.(S32, S33)
        1. Do not transfuse RBCs in hemodynamically stable, nonbleeding ICU patients with an Hb concentration greater than 7 mg/dl.
        2. Evidence-based transfusion guideline that recommends packed red blood cell transfusion for four distinct situations:
            - Acute bleeding (blood loss of >30%) with severity evidenced by tachycardia and low blood pressure
            - Hemoglobin of <8 g/dL in high-risk patients (e.g. cardiovascular and chronic pulmonary disease; patients receiving chemotherapy)
            - Hemoglobin of <7 g/dL in patients with symptomatic chronic anemia; special circumstances (e.g. sickle cell crisis and other causes of poor oxygen delivery).

- **Resource Management**
  - Palliative Care: Perceived value and quality rarely are associated with overly aggressive life-sustaining therapy and prolonged dependence on their support. Engaging patients at high risk of death and their surrogate decision makers in discussions about alternatives to life-sustaining therapies may promote value and improve the quality of dying, and reduce distress and bereavement.
    1. Don't delay engaging available palliative and hospice care services in the emergency department for patients likely to benefit.
    2. Don't continue life support for patients at high risk for death or severely impaired functional recovery without offering patients and their families the alternative of care focused entirely on comfort.

- <u>Hospital Solutions</u>
  - Most of these solutions focus on controlling patient flow by matching demand with capacity – recognizing interdependence of OR, ICU, ward, and the ED on competing for the same beds
  - Active bed management with system control at the physician level
  - Shift the location of boarding (during surge conditions place medical ICU patients in surgical ICUs)
  - Reassign ICU providers and RNs to care for patients outside the ICU
  - Encourage intensivists to round in the ED and place orders on boarding patients
  - Expand to alternative sites of care
- <u>ED-Based ICUs</u>
  - Provides short-term critical care that might replace more traditional ED boarding
  - Provide early respiratory, cardiovascular, neurologic, and hemodynamic support through the transition from resuscitation in the ED to early longitudinal phase of critical illness
  - Current units differ in operations, flow, and staffing and are primarily designed to meet the needs of the institution
  - Recent observational data:
    - 15% reduction in risk-adjusted 30-day mortality
    - Significant reductions in hospital and 24-hr mortality
    - 13% reduction in ICU admissions from the ED
    - 37% reduction in short-stay admissions

Task Force Conclusions

- **No universal definition of ED boarding of the critically ill exists**
- **CC services are provided for extended periods by ED physicians**
- **Boarding often present in large academic centers**
- **Associated with worse patient outcomes**
- **Opportunities exist to improve, create, disseminate, and evaluate mitigation strategies**

Task Force Recommendations

- **Define boarding as time spent in the ED**
  - **After the decision to admit to the ICU is made OR**
  - **After 6 hours in the ED (from arrival)**