Field Guide: **Ventilator-Associated Events**

**Definition and Harm Impact**

An essential, life-saving therapy for patients with critical illness and respiratory failure is mechanical ventilation. More than 300,000 patients receive mechanical ventilation in the United States each year.\(^1\)\(^2\)\(^3\) Ventilator-associated events (VAEs) are complications that can occur in patients receiving mechanical ventilation. These complications include, and are not limited to: ventilator associated pneumonia (VAP), sepsis, acute respiratory distress syndrome (ARDS), and pulmonary embolism. Mortality rates in patients with acute lung injury secondary to mechanical ventilation has been estimated to range from 24 percent in persons 15–19 years of age to 60 percent for patients 85 years and older.\(^4\) VAE is also associated with higher healthcare costs and extended lengths of stay.\(^5\)

In January 2013, the National Healthcare Safety Network (NHSN) adopted a new definition for VAEs, which includes three definition tiers within the VAE algorithm: (1) ventilator-associated condition (VAC), (2) infection-related ventilator-associated complication (IVAC), and (3) possible ventilator associated pneumonia (PVAP).\(^6\)

**Engaging Patients and Families**

Patients and family members are critical partners in the safe care of critical-care patients and ventilator-related injury reduction.

Education points:

- Educate families on the risk of VAE, prevention measures put in place, and what they can do to help. This may include:
  - Maintaining proper head of bed (HOB) elevation and encouraging them to speak up if HOB is not in compliance.
  - Performing oral care, including suctioning oral secretions.
  - Assisting in performing passive range-of-motion exercises.
- Empower families to speak up and hold everyone accountable for hand hygiene.
- Use family members insight into the patient’s cognitive and baseline function when assessing changes in the patient’s mental status.
- Encourage the family to use their voice to speak to and reorient the patient by speaking softly and using simple, familiar words including sharing about family and friends.
- Maintain open visiting hours where family members should be encouraged to bring in sensory aides (eyeglasses, hearing aids) and decorate the room with reminders of home.

Additional patient/family engagement strategies:

- Add a Patient Family Advisory Council (PFAC) member to critical care safety committee and/or review all patient education.
- Focus on keeping patient and family informed and actively involved in decision-making and self-management.
- Engage the patient and family during patient care bedside rounding and solicit feedback from the
patient’s family.

- Use large white communication boards in each room to keep the family up to date.
- Implement an intensive care unit (ICU) diary program.
- Provide ICU recovery support groups for survivors, care givers, and family members.

Hospital Improvement Strategies

Improvement efforts are aimed at decreasing the duration of mechanical ventilation, mortality, length of stay, and costs associated with VAE. The ABCDEF bundle described below was developed by the Society of Critical Care Medicine to improve the health of ventilated patients by breaking the cycle of deep sedation and prolonged ventilation, reducing the incidence and duration of ICU delirium, improving mobility, improving patient comfort, reducing the risk of infection, and decreasing the risk of morbidity. The bundle approach provides a means to incorporate evidence-based interventions into patient care.

- **A—Assess, prevent, and manage pain**
  - Evaluate pain and find the appropriate tools for assessment, treatment, and prevention.
  - Assume pain is present, look for behavioral clues, ask family members about pain behaviors.

- **B—Both Spontaneous Awakening Trial (SAT) and Spontaneous Breathing Trial (SBT).**
  - Consider wake-up and breath protocol to promote synergy of SAT and SBT.
  - Implement interdisciplinary team-driven protocols.

- **C—Choice of sedation**
  - Understand the importance of defining the depth of sedation, choosing the right medication.
    Importance of rapid offset/rapid onset, predictable dose response, promotion of natural sleep.
  - Implement standardized scale such as Richmond Agitation-Sedation Scale (RASS) for assessing sedation.

- **D—Delirium: assess, prevent, and manage**
  - Understand delirium risk factors and find tools for assessment, treatment, and prevention.
  - Standardize evaluation of delirium with Confusion Assessment Method for ICU (CAM-ICU).
  - Lower lighting, draw shades, and use sun/moon graphics for time of day orientation.

- **E—Early mobility and exercise**
  - Early progressive mobility protocol with patient’s current mobility as the starting point and goal of returning to his/her baseline.
  - Get the right people involved (e.g., physical therapy and respiratory therapy) as a partner when walking ventilated patient.

- **F—Family engagement and empowerment**
  - Focus on keeping patient and families informed and actively involved in decision-making and self-management.

Additional strategies to prevent VAE:

- **Use Low Tidal Volume Ventilation**
  - The recommended tidal volume for all ventilated patients is 6ml/kg.
  - This has been shown to decrease pulmonary complications due to barotrauma and the development of ARDS.
• Raise the head of the patient’s bed between 30–45 degrees, and use visual cues.
  – This has been shown to help prevent aspiration of gastric contents and secretions.
• Provide daily mouth care with chlorhexidine while the patient is ventilated.\(^\text{10}\)
• Measure often: Share results with team members and incorporate learnings along the way.

**Measurement**

The Hospital Improvement Innovation Network (HIIN) goal for improvement in VAE is a reduction in rates by 20 percent from baseline (2015). The NHSN Surveillance Algorithm is used to measure VAE events. The definition for the three tiers of the VAE algorithm include (1) ventilator-associated conditions (VACs), which is the number of events that meet the criteria of VAC (numerator) over the total number of ventilator days for each location under surveillance during the data collection period (denominator); (2) Infection-related ventilator-associated condition (IVACs), which is the number of events that meet the criteria of IVAC (numerator) over the total number of ventilator days for each location under surveillance during the data collection period (denominator); and (3) possible ventilator-associated pneumonia (PVAP), which is the number of events that meet the criteria of PVAP (numerator) over the total number of ventilator days for each location under surveillance during the data collection period (denominator).

**Resources and Guides for Hospitals**

• Society of Critical Care Medicine—ICU Liberation: ABCDEF Bundle: Available at: https://www.sccm.org/ICULiberation/ABCDEF-Bundles.
• Vanderbilt University—Critical Illness, Brain dysfunction, and Survivorship (CIBS) Center Research on Delirium: Available at: https://www.icudelirium.org/.
• Health Services Advisory Group Hospital Improvement Innovation Network (HSAG HIIN)—VAE Reporting Presentation: Available at: https://www.hsag.com/contentassets/68f8bedf02464c61a93f953a451f6c38/veapptfocusgroup508.pdf.
• HSAG HIIN—VAE Observation Tool: Available at: https://www.hsag.com/contentassets/68f8bedf02464c61a93f953a451f6c38/veaobservationtool1508.xlsx.


