



Ventilator-Associated Events (VAE) Road Map

MHA’s road maps provide hospitals and health systems with evidence-based recommendations and standards for the development of topic-specific prevention and quality improvement programs, and are intended to align process improvements with outcome data. Road maps reflect published literature and guidance from relevant professional organizations and regulatory agencies, as well as identified proven practices. MHA quality and patient safety committees provide expert guidance and oversight to the various road maps.

Each road map is tiered into fundamental and advanced strategies:

- **Fundamental strategies** should be prioritized for implementation, and generally have a strong evidence base in published literature in addition to being supported by multiple professional bodies and regulatory agencies.
- **Advanced strategies** should be considered in addition to fundamental strategies when there is evidence the fundamental strategies are being implemented and adhered to consistently and there is evidence that rates are not decreasing and/or the pathogenesis (morbidity/mortality among patients) has changed.

Operational definitions are included to assist facility teams with road map auditing and identifying whether current work meets the intention behind each road map element.

Resources linked within the road map include journal articles, expert recommendations, electronic order sets and other pertinent tools which organizations need to assist in implementation of best practices.

Road map sections	Road map questions (if not present at your hospital or answering no, please see next column for suggested resources)	If specific road map element is missing, consider the following resources:
Patient & family education	<p>FUNDAMENTAL (check each box if “yes”)</p> <p><input type="checkbox"/> The facility has a process in place to provide education to the patient/family about the ventilator [1].</p> <ul style="list-style-type: none"> - Education topics include: staff hand hygiene, ventilator settings used to provide ventilation support and prevent further lung injury, elevation of the head of the bed, daily sedation vacation in the weaning process, spontaneous breathing trial process, early progressive mobility, regularly scheduled oral care with chlorhexidine or other antiseptic agent, and reporting any concerns in relation to ventilator care. 	<p>Communication with the patient and their support system is important, especially during critical illness. There are many patient engagement resources available to support health care providers in developing ventilator-related education, including:</p> <ul style="list-style-type: none"> • Vanderbilt Family Engagement and Empowerment Strategies • University of Pittsburgh School of Medicine When a Loved One is on a Ventilator • SHEA/IDSA/AHA/APIC/CDC/TJC FAQs “Ventilator - Associated Pneumonia”

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Ventilator settings & management	<p>FUNDAMENTAL (check each box if “yes”)</p> <p><input type="checkbox"/> The facility’s order sets for ventilated patients include interventions for head of bed elevation, initiation and weaning of mechanical ventilation, early progressive mobilization and ambulation, and provision of oral care [1].</p> <p><input type="checkbox"/> The facility has a communication plan for ventilator management to ensure appropriate settings and safe adjustments [1,2].</p> <ul style="list-style-type: none"> - Team members include physicians, nurses and respiratory therapists. <p><input type="checkbox"/> Tidal volume of less than 8 ml/kg is maintained to prevent acute respiratory distress syndrome (ARDS) [2,3].</p>	<p>Consider the following example standards of care and order sets when developing facility policies for ventilated patients:</p> <ul style="list-style-type: none"> • CentraCare Health St. Cloud Hospital mechanical ventilation standards of care • CentraCare Health St. Cloud Hospital mechanical ventilation clinical order set <p>Consider the Institute for Healthcare Improvement’s ICU Daily Goals worksheet as a tool to support shared understanding of daily care goals.</p> <p>The Agency for Healthcare Research and Quality developed a Low Tidal Volume Ventilation Guide for Reducing Ventilator-Associated Events in Mechanically Ventilated Patients, which includes resources such as the low tidal volume ventilation tool to collect data on and monitor whether PEEP and tidal volume are within the recommended ranges.</p>
Elevation of the head of the bed	<p>FUNDAMENTAL (check each box if “yes”)</p> <p><input type="checkbox"/> The facility has a process to ensure head of bed is elevated to between 30-45 degrees for ventilated patients [1,4-7].</p> <ul style="list-style-type: none"> - The facility has a process to ensure head of bed elevation during transport [1]. - Visual cues are used to allow for easy identification of proper head of bed elevation [1,2]. For example, utilize a line on the wall that can only be seen if the bed is below a 30-degree angle. 	<p>Head of bed elevation is a simple measure that has resulted in VAE reduction. Consider the following resources to ensure head of bed elevation:</p> <ul style="list-style-type: none"> • Health Research and Educational Trust (HRET) Appendix IV Example of a Best Practice Checklist
Sedation vacation and spontaneous breathing trial	<p>FUNDAMENTAL (check each box if “yes”)</p> <p><input type="checkbox"/> The facility has a process in place to ensure use of the least amount of sedation necessary to achieve respiratory stability, patient safety, and minimal patient anxiety [8].</p>	<p>Consider the following example protocols for conducting sedation vacation and spontaneous breathing trials:</p> <ul style="list-style-type: none"> • CentraCare Health protocol for sedation vacation/spontaneous breathing trials • Vanderbilt University “Wake up and Breathe” Protocol • HealthEast Care System - Bethesda Hospital Ventilator Liberation Care Model

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Sedation vacation and spontaneous breathing trial, cont.	<input type="checkbox"/> Daily assessments of readiness to extubate are conducted with the use of sedation vacation and spontaneous breathing trial [1,4-7,9]. <ul style="list-style-type: none"> - Nurses and respiratory therapists work in collaboration when performing spontaneous breathing trials in coordination with a sedation vacation [1,2]. - Conduct sedation vacation at least daily [4,6], once per staffed shift. - Conduct spontaneous breathing trial at least daily [4,7] immediately following sedation vacation [4]; conduct once per staffed shift. - Utilize a sedation scale to assess sedation level and achieve sedation goals [1,2,7]. 	Consider use of validated sedation scales to assess sedation level: <ul style="list-style-type: none"> • Riker Sedation-Agitation Scale (SAS) • Richmond Agitation-Sedation Scale (RASS)
Oral care	<p>FUNDAMENTAL (check each box if “yes”)</p> <input type="checkbox"/> The facility has a process in place to conduct daily oral care at 4-hour intervals [1,2]. <ul style="list-style-type: none"> - Utilize chlorhexidine twice daily [1,2,7] or other comparable approved, evidence-based antiseptic agent [10-15]. <input type="checkbox"/> The facility has a process in place for use of subglottic suctioning (continuous or intermittent) in patients expected to be mechanically ventilated for >72 hours to prevent aspiration and the risk of ventilator-associated pneumonia [2,4-6]. <ul style="list-style-type: none"> - Use an endotracheal tube with a dorsal lumen above the endotracheal cuff to allow drainage by continuous suctioning of tracheal secretions that accumulate in the subglottic area [1,2,5,6] - If using intermittent suctioning, conduct regularly to achieve a continuous-like system [5]. - Perform subglottic suctioning prior to transport and before changes to head of bed elevation. 	Oral care is an important component of care for ventilated patients. Consider the MHA Ventilated Patient Oral Health Road Map and AHRQ’s Appendix J: Definitions and Techniques for Oral Care with Chlorhexidine (CHG) Protocol when developing oral care processes.
Early exercise and progressive mobilization	<p>FUNDAMENTAL (check each box if “yes”)</p> <input type="checkbox"/> The facility has a process in place to implement early progressive mobilization and ambulation in ventilated patients [1-4,9].	The ABCDEF bundle elements individually and collectively can help reduce delirium, improve pain management, and reduce long-term consequences for intensive care unit patients. <ul style="list-style-type: none"> • Early mobility and exercise is an integral component of the bundle.

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Performance improvement monitoring	<p>FUNDAMENTAL (check each box if “yes”)</p> <p><input type="checkbox"/> The facility’s medical record is designed to capture sufficient detail to allow for review of adherence to ventilator practices.</p> <ul style="list-style-type: none"> - Includes: elevation of the head of the bed, tidal volume in ml/kg, sedation vacation twice a day, spontaneous breathing trial twice a day, regularly scheduled oral care including subglottic suctioning, patient mobility and activity. <p><input type="checkbox"/> The facility has a process in place to monitor adherence to ventilator practices [2,4].</p> <ul style="list-style-type: none"> - For example, conduct and document observational and chart audits. 	<p>The Health Research and Educational Trust (HRET) VAE change package, appendix IV includes a sample ICU best practice audit form.</p> <p>AHRQ has developed a daily care processes data collection tool which can be used to collect data on and monitor how many mechanically ventilated patients are receiving sedation assessments, delirium assessments, spontaneous awakening trials, and spontaneous breathing trials.</p> <p>AHRQ’s Early Mobility Data Collection Tool supports monitoring of the number of vented patients achieving a higher level of mobility and identification of perceived barriers.</p>
	Staff education	<p>FUNDAMENTAL (check each box if “yes”)</p> <p><input type="checkbox"/> Education and competency assessments for staff caring for ventilated patients are incorporated into training on hire and at least annually.</p> <ul style="list-style-type: none"> - Education includes: appropriate adherence to hand hygiene and aseptic technique; rationale supporting good oral hygiene and its potential benefit in reducing ventilator-associated pneumonia; daily review that all components — low tidal volume, head of bed elevation, sedation vacation, spontaneous breathing trial, oral care, early mobility— are in place.
<p>ADVANCED (check each box if “yes”)</p> <p><input type="checkbox"/> Compliance with VAE interventions are posted in a prominent place in the ICU or other designated area to encourage change and motivate staff.</p>		<p>Consider the use of visual tools such as HRET’s VAE Top Ten Checklist poster as a present reminder and motivator for staff to comply with interventions.</p>

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