Statewide Call for Action: Ventilator-Associated Event (VAE) Prevention Toolkit

Guidance for VAE Prevention in Adult Patients

Florida Department of Health

Health Care-Associated Infection Prevention Program and

Florida Hospital Association

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ACTION for VAE Prevention

Assess data | **C**hoose the best practices | **T**ackle the gaps | **I**mplement prevention strategies | **O**ngoing measures and feedback | **N**avigate change based on outcomes

As part of the Florida Department of Health, the Health Care-Associated Prevention Program has four priority focus areas. The VAE Prevention toolkit falls under the infection prevention standards and practices focus area.

PURPOSE

To create a comprehensive guide to assist acute-care hospitals in their initiative to improve patient outcomes in mechanically ventilated patients ≥18 years of age.

AUDIENCE

Individuals charged with oversight of the infection prevention and control program. These individuals may currently have differing levels of expertise, from novice to expert. Individuals at all levels can benefit from the use of this toolkit to conduct an assessment of their care practices in the mechanically ventilated patient.

SUBJECT MATTER EXPERTS (SMEs)

Infection prevention and control SMEs within the Florida Department of Health, Florida Hospital Association, as well as a consultant from the Association for Professionals in Infection Control and Epidemiology (APIC) collaborated in the development of this toolkit. The SMEs utilized the most current health care-associated infection prevention guidelines and practice recommendations to create this toolkit.

ACCESS

The VAE prevention toolkit can be accessed on the Florida Department of Health's Health Care-Associated Infection (HAI) Prevention Program's landing page here: Health Care-Associated Infections | Florida Department of Health (floridahealth.gov)

USE

This toolkit should be used as part of a performance improvement program in the care of mechanically ventilated patients. The HAI Prevention Program will host an education session on how to use this toolkit. A recording of the session can be accessed here: Health Care-Associated Infections | Florida Department of Health (floridahealth.gov)

CONTENTS

The toolkit includes information on population outcomes that were the catalyst for creation of this toolkit and the subsequent call to action for the HAI Prevention Program.

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INTRODUCTION

Over the last several years, the landscape of health care has experienced many changes and challenges. For example, in the state of Florida, various acute-care hospitals have experienced an increase in certain categories of the Centers for Disease Control and Prevention's (CDC) National Healthcare Safety Network (NHSN)-reportable healthcare-associated infections, most notably in ventilator-associated events. About 300,000 patients receive mechanical ventilation each year in the United States.[1] Mechanical ventilation is a life-saving measure for patients and health care settings providing this type of care needed to ensure safe and effective care practices are in place. Safe and effective care while on a ventilator provides the patient with the greatest opportunity to avoid respiratory complications such as ventilator-associated events (VAE), including ventilator-associated pneumonia, acute respiratory distress syndrome, sepsis, and pulmonary edema and embolism.[1]

The 2020 National and State HAI Report revealed a 38% increase in the standardized infection ratio (SIR) for ventilator-associated events from 2019.[2] VAEs are a voluntary reporting metric for acute-care hospitals (ACH) submitting health care-associated infection outcome data to CDC's NHSN reporting system. From 2020 to 2021, Florida experienced a 26% increase in the SIR for VAEs.[2] A learning needs assessment conducted in 2022 indicated that there was a need among Florida ACHs for guidance and educational materials for VAE prevention.

Our strategy is to improve VAE SIR rates by strengthening VAE preventative practices in Florida's NHSN-participating facilities through training, education, and encouraging the use of evidence-based interventions (i.e., ventilator bundles).

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ASSESS DATA

VAE surveillance and data collection are essential to any quality improvement initiative. It is recommended hospitals should collect and monitor data on multiple VAE measures. This will allow for a more comprehensive assessment of VAE outcomes to identify specific areas for opportunity.

A variety of sources can be used to collect VAE data. These include audit data (ventilator care practices), ventilator use data, and infection surveillance data (VAE outcomes). While it is not mandatory to report, hospitals should report their VAE data to the Centers for Disease Control and Prevention (CDC)'s National Healthcare Safety Network (NHSN) to allow facilities to track and analyze their VAE data. This supports prevention goal setting and improves quality improvement initiatives. For more information about reporting VAE in NHSN, the links to the "NHSN Patient Safety Component VAE Module" and "NHSN Patient Safety Component VAE Training" are in the *Data Analysis Resources* section of this toolkit.

VENTILATOR CARE PRACTICE AUDITS

Conducting regular audits of ventilator-related practices and processes is important to ensure frontline staff are following best practices for ventilator care. Process data collected from audits, along with VAE and ventilator utilization data, provide specific feedback on VAE prevention performance to frontline staff and guide where educational interventions may be needed.

The *Data Analysis Resources* section of this toolkit contains a Quick Observation Tool (QUOT) developed by the CDC for auditing of ventilator care practices. The QUOT can be used to establish a baseline after observation collection over several days, maintain vigilance, and detect when adherence to best practices falls below expectations. Observation tools should be tailored to fit the protocol of the facility, but the same tool must be used for each audit to best indicate changes in performance. After each modification of the observation tool, collect at least a week's worth of observations to establish a new baseline.

Examples of ventilator care practices to audit:

- Head of bed elevated to greater than 30 degrees
- Oral care performed per policy
- Spontaneous awakening trial performed
- Spontaneous breathing trial performed

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VAE OUTCOME DATA

There are three categories of VAE outcome data that are collected by NHSN, including ventilator-associated conditions (VAC), infection-related ventilator-associated conditions (IVAC), and possible ventilator-associated pneumonia (PVAP). There is a hierarchy of definitions within VAE outcomes. For example, if a patient meets the criteria for VAC and IVAC, the event is reported as an IVAC. If the patient meets criteria for VAC, IVAC, and PVAP, the event is reported as PVAP. The VAE definitions provided by NHSN are used for surveillance purposes and not intended for clinical management or diagnosis of patients. For more information on VAE surveillance please see the "2024 Patient Safety Component Manual–VAE Chapter," "NHSN Patient Safety Component VAE Training," and the "NSHN VAE Calculator" in the *Data Analysis Resources* section of the toolkit.

Ventilator-Associated Conditions (VAC) Indicates there is a respiratory deterioration event occurring that has resulted in increased ventilatory support.

Infection-Related Ventilator-Associated Complication (IVAC) Indicates that there is evidence that the event may be infectious vs. non-infectious

Possible Ventilator-Associated Pneumonia (PVAP) Indicates that there is additional evidence the infection may be respiratory related

VAE data are often expressed as a standardized infection ratio (SIR). The SIR compares the actual number of infections observed to the predicted number of infections based on the CDC prediction model. The SIR can be calculated for each location, unit, or the whole facility using specified numerator and denominator data. If the SIR is less than 1.0, fewer VAEs were observed than predicted. If the calculated SIR is greater than 1.0, there is an indication that more VAEs were observed than predicted. An SIR greater than 1.0 could be an indication for prioritization of a unit or location for an audit or other infection control intervention. SIR reports for VAE are available in NHSN for facilities that report VAE. For more information about SIR and SIR reports in NHSN, see the "NHSN SIR Guide" in the *Data Analysis Resources* section of this toolkit.

$$\text{SIR} = \frac{\textbf{Observed Number of VAEs}}{\textbf{Predicted Number of VAEs}}$$

VENTILATOR UTILIZATION DATA

Ventilator utilization data can help determine if there is excess or unnecessary ventilator use and gauge the effectiveness of interventions targeted at unnecessary ventilator use. Ventilator utilization data is expressed as a device utilization ratio (DUR) or device standardized utilization ratio (SUR).

The DUR can be useful for tracking device use over short periods of time. Unlike the SUR and SIR, the DUR is not risk adjusted. The SUR compares the observed device days reported to what would be predicted based on the CDC prediction model.

$$\text{Ventilator DUR} = \frac{\text{Number of Ventilator Days}}{\text{Number of Patient Days}}$$

Like the interpretation of the SIR, if the SUR calculated is greater than 1, more device days occurred than predicted and could indicate excess or unnecessary ventilator use. If the calculated SUR is less than 1, fewer device days occurred than predicted. SUR reports for VAE are available in NHSN for facilities that report VAE. For more information about SUR and SUR reports in NHSN see the "NHSN SUR Guide" in the *Data Analysis Resources* section of this toolkit.

$$\text{Ventilator SUR} = \frac{\text{Observed Device Days}}{\text{Predicted Device Days}}$$

TAKE ACTION!

1. Identify VAE outcome, ventilator use, and process measures to track for improvement

2. Plan for data collection — who will collect the data and how often?

3. Plan for data reporting — how often will you enter VAE data into NHSN?

ACTION for VAE Prevention

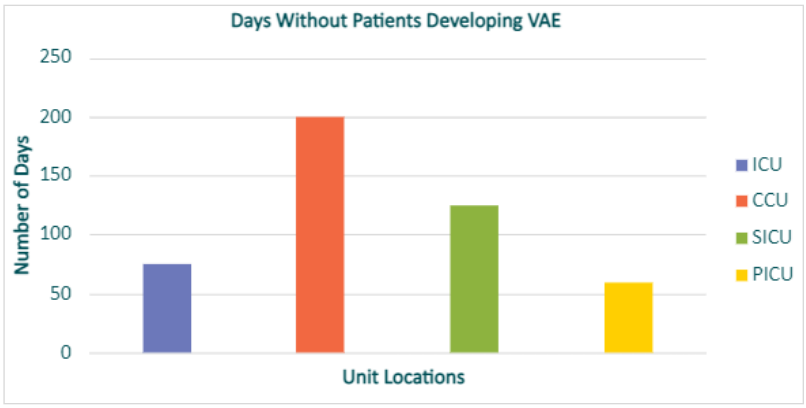
Assess data | **C**hoose the best practices | **T**ackle the gaps | **I**mplement prevention strategies | **O**ngoing measures and feedback | **N**avigate change based on outcomes

DATA PRESENTATION

Presentation of VAE data is critical to engage teams and leadership on the need for improvement. Graphs and charts are useful tools to visualize VAE trends and intervention efforts over time. Data that are shared should be relevant, understandable, and actionable to the targeted audience. Data should be shared with leadership and staff quarterly at a minimum. Figures 1 and 2 are example of types of data visualization tools. In figures 1 and 2, ICU refers to intensive care unit, CCU refers to cardiac care unit, SICU refers to surgical intensive care unit, and PICU refers to pediatric intensive care unit.

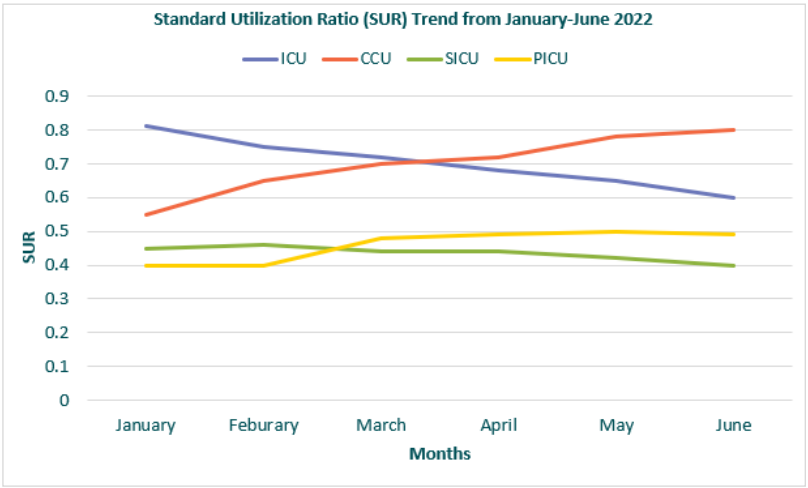
Bar charts are best for displaying data that are discrete and in different categories and are useful for comparison between groups. The example bar chart to the right shows that the selected units have gone at least 50 days without any patients developing a VAE.

Figure 1. Sample Bar Chart



Line charts visually connect a sequence of data points and are good for showing trends over time. By looking at a line graph, the audience can easily determine if data trends are improving, worsening, or remaining stable. The example line chart on the right shows that CCU has an increasing use trend, while other units demonstrate a stable or decreasing use trend.

Figure 2. Sample Line Graph



TAKE ACTION!

1. Review the gaps identified in the VAE ACTION assessment and determine which tools would guide and benefit your team for VAE improvement.

2. Determine how VAE data can be best used to engage stakeholders

ACTION for VAE Prevention

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KEY RECOMMENDATIONS

- Conduct routine audits on ventilator care practices using the same audit tool each time and allow the first week of audits to establish a baseline for future audits. *If the audit tool is changed, conduct a week's worth of audits using the new tool to establish a new baseline.*
- Enroll your facility in CDC's National Healthcare Safety Network and use the Patient Safety Component to conduct VAE outcome surveillance.
- Share data with main stakeholders at least quarterly using appropriate data presentation tools.

Please refer to Appendix G of the 2022 NHSN Internal Validation Guidance and Toolkit for additional guidance. The checklist is intended to ensure completeness and accuracy of CLABSI, CAUTI, and VAE data entered into NHSN and can be used at various facilities including acute-care hospitals, long-term acute-care hospitals, critical access hospitals, and inpatient rehabilitation facilities.

2022 NHSN INTERNAL VALIDATION GUIDANCE AND TOOLKIT

APPENDIX G: DATA QUALITY CHECKLIST FOR VAE DATA

Summary Denominator Data		
Indicator	**Description/Action**	**Validated**
i) Missing summary data	Verify that summary data has been entered for the location and month/year. (Go to NHSN Application –> Alerts –> Missing Summary Data)	
ii) Missing denominator variables (Incomplete summary data)	Verify that all mandatory/required fields are completed, and that "Report No Events" is checked, where appropriate. (Go to NHSN Application –> Alerts –> Incomplete Summary Data)	
iii) Verify denominator data accuracy:	Generate Rate Tables to display summary data by location and month in a table format. Go to NHSN Application –> Analysis –> Reports –> Device-Associated (DA) Module –> Central Line-Associated BSI –> Rate Table **OR** NHSN Application –> Analysis – Reports –> Device-Associated (DA) Module –> Urinary Catheter-Associated UTI –> Rate Table **OR** NHSN Application –> Analysis – Reports –> Device-Associated (DA) Module –> Ventilator-Associated Events –> Rate Table **Alternative Method:** Generate a Summary Line List Go to NHSN Application –> Analysis –> Reports –> Advanced –> Summary-level Data –> Line Listing – All Summary Data	
1. Total Patient Days should not be greater than the location beds multiplied by number of days in the reporting month.	Example: If location beds is 30 and the reporting month is June, Total Patient Days should not be greater than 900 (30 x 30).	
2. Total Patient Days should be **greater than (or equal to)** Central Line Days or Urinary Catheter Days or Ventilator Days for the same location and month.	Central Line Days/Urinary Catheter/Ventilator Days should not be greater than Total Patient Days.	
3. Zero (0) Total Patient Days reported for a location for multiple months.	Does this location need to be inactivated?	

Source: 2022 Internal Validation Toolkit (cdc.gov)

2022 NHSN INTERNAL VALIDATION GUIDANCE AND TOOLKIT

APPENDIX G: DATA QUALITY CHECKLIST FOR VAE DATA

Event Data Entry		
Indicator	**Description/Action**	**Validated**
i) All CLABSI, CAUTI and VAE events reported	Verify that all CLABSI, CAUTI and VAE events have been reported. Go to NHSN Application –> Analysis –> Reports –> Device-Associated (DA) Module –> Central Line-Associated BSI –> Line Listing – All CLAB Events **OR** NHSN Application –> Analysis – Reports –> Device-Associated (DA) Module –> Urinary Catheter-Associated UTI –> Line Listing – All CAU Events **OR** NHSN Application –> Analysis – Reports –> Device-Associated (DA) Module –> Ventilator-Associated Events –> Line Listing – All VAE	
ii) Missing numerator variables (Incomplete events)	Verify that all mandatory/required data fields (marked with an *, **, or > on the event form) are completed. (Go to NHSN Application –> Alerts –> Incomplete Events, Event Type: BSI/UTI/VAE)	
iii) Missing events	Verify that 'Report No Events' are checked for in-plan CLABSI/CAUTI/VAE events as appropriate in the summary data form for respective location/month.	
iv Confirm that date of event occurred on or after the third calendar day of admission to the inpatient location for CLABSI/CAUTI.	If the date of event did not occur on or after the third calendar day of admission, then it is not considered an HAI and will not be counted in the SIR.	
v) Confirm that the date of event occurred on or after the third calendar day of admission to the inpatient location for VAE.	If the date of event did not occur on or after the third calendar day of admission to an inpatient unit, then it is not considered a VAE for the facility and will not be counted in the SIR.	
vi) Confirm that presence of a central line (permanent/temporary in specialty care locations) or indwelling urinary catheter is indicated on the event form.	If device presence is not confirmed on the event form, it will not be counted in the SIR.	

Source: 2022 Internal Validation Toolkit (cdc.gov)

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Data Analysis Resources

2022 Internal Validation Toolkit

2024 Patient Safety Component Manual–VAE Chapter

NHSN VAE Calculator

NHSN Patient Safety Component VAE Module

NHSN Patient Safety Component VAE Training

NHSN SIR Guide.pdf

NHSN SUR Guide.pdf

Ventilator Quick Observation Tool (QUOT)

CHOOSE THE BEST PRACTICE ELEMENTS IN THE BUNDLES

After data assessment, facilities should utilize that data to choose the best practices and tools to help support VAE prevention teams in their quality improvement efforts. These tools include evidence-based guidelines, patient and family education materials, data analysis and visualization software, and examples of protocols and practices shared by other organizations.

GUIDELINES

In 2022, the Society for Healthcare Epidemiology of America, the Infectious Diseases Society of America, and the Association for Professionals in Infection Control and Epidemiology led the development and publication of the Compendium of Strategies to Prevent Healthcare-Associated Infections in Acute Care Hospitals which included the Strategies to prevent ventilator-associated pneumonia, ventilator-associated events, and nonventilator hospital-acquired pneumonia in Acute Care Hospitals: 2022 Update.[5]

The summary of recommendations to prevent VAE from the compendium categorizes the best practice elements by the quality of evidence to support them—high, moderate, low, and good evidence. The definitions for the categorizations are below. It is highly recommended that facilities adopt best practices in the HIGH or MODERATE categories at minimum.

Table 1. Categories of Evidence for VAE Best Practices in the Compendium of Strategies to Prevent Health Care-Associated Infections in Acute-Care Hospitals.

HIGH	Highly confident that the true effect lies close to that of the estimated size and direction of the effect. Evidence is rated as "HIGH" quality when there are a wide range of studies with no major limitations, there is little variation between studies, and the summary estimate has a narrow confidence interval.
MODERATE	The true effect is likely to be close to the estimated size and direction of the effect, but there is a possibility that it is substantially different. Evidence is rated as "MODERATE" quality when there are only a few studies and some have limitations but not major flaws, there is some variation between studies, or the confidence interval of the summary estimate is wide.
LOW	The true effect may be substantially different from the estimated size and direction of the effect. Evidence is rated as "LOW" quality when supporting studies have major flaws, there is important variation between studies, the confidence interval of the summary estimate is very wide, or there are no rigorous studies.
GOOD EVIDENCE	Good evidence that the intervention decreases the average duration of mechanical ventilation, length of stay, mortality, and/or costs. Benefits likely outweigh risks.

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ESSENTIAL PRACTICES FOR PREVENTING VAE IN ADULT PATIENTS

Category of Evidence	Best Practice
HIGH	♦ Use high-flow nasal oxygen or noninvasive positive pressure ventilation (NIPPV) as appropriate whenever safe and feasible ♦ Provide early enteral vs. parenteral nutrition ♦ Change the ventilator circuit only if visibly soiled or malfunctioning (or per manufacturers' instructions) ♦
MODERATE	♦ Minimize sedation: - Avoid benzodiazepines in favor of other agents - Use a protocol to minimize sedation - Implement a ventilator liberation protocol ♦ Maintain and improve physical conditioning ♦ Provide oral care with toothbrushing but without chlorhexidine
LOW	♦ Elevate the head of the bed to 30–45°

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CHECKLIST EXAMPLE FOR PREVENTING VAE IN ADULT PATIENTS

Please see checklist below as an example. This checklist is an editable document that can be customized to your organization's policies and procedures.

Category		Best Practice	Quality of Evidence
ESSENTIAL APPROACHES	☐	♦ Use high-flow nasal oxygen or noninvasive positive pressure ventilation (NIPPV) as appropriate whenever safe and feasible	♦ HIGH
	☐	♦ Provide early enteral vs. parenteral nutrition	♦ HIGH
	☐	♦ Change the ventilator circuit only if visibly soiled or malfunctioning (or per manufacturers' instructions	♦ HIGH
	☐	♦ Minimize sedation: Avoid benzodiazepines in favor of other agents	♦ MODERATE
	☐	♦ Minimize sedation: Use a protocol to minimize sedation	♦ MODERATE
	☐	♦ Minimize sedation: Implement a ventilator liberation protocol	♦ MODERATE
	☐	♦ Maintain and improve physical conditioning	♦ MODERATE
	☐	♦ Provide oral care with toothbrushing but without chlorhexidine	♦ MODERATE
	☐	♦ Elevate the head of the bed to 30–45°	♦ LOW
ADDITIONAL APPROACHES	☐	♦ Use selective oral or digestive decontamination in countries and ICUs with low prevalence of antibiotic-resistant organisms	♦ HIGH
	☐	♦ Use endotracheal tubes with subglottic secretion drainage ports for patients expected to require >48-72 hours of mechanical ventilation	♦ MODERATE
	☐	♦ Consider early tracheostomy	♦ MODERATE
	☐	♦ Consider post pyloric rather than gastric feeding for patients with gastric intolerance or at high risk for aspiration	♦ MODERATE

Klompas, M., Branson, R., Cawcutt, K., Crist, M., Eichenwald, E., Greene, L., . . . Berenholtz, S. (2022). Strategies to prevent ventilator-associated pneumonia, ventilator-associated events, and nonventilator hospital-acquired pneumonia in acute-care hospitals: 2022 Update. *Infection Control & Hospital Epidemiology, 43*(6), 687-713. doi:10.1017/ice.2022.88

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TACKLE THE GAPS

Data influence change, but successful implementation of change also requires continuous improvement. VAE prevention teams should develop tests-of-change cycles such as the Plan-Do-Study-Act (PDSA) cycle.[4] This model is a framework that allows quality improvement teams to test a change on a smaller scale, observe the results, and act on what was learned.

The PDSA model reinforces action-oriented learning as teams implement tests on a small scale, learn from the practical knowledge, and make changes as necessary. There are four steps in the PDSA cycle:

Step 1: PLAN – VAE prevention teams should develop a plan to test the change. Specify the question that the test is designed to answer. For example, what are we trying to accomplish? Teams should also make a prediction of what the outcome of the test will be. Planning should also include the "who, what, when, and how" elements of the testing cycle. Teams should aim for what and how the data will be measured during the testing cycle.

Step 2: DO – Teams will first need to conduct the test on a small scale; for example, implementing with a small group of staff members and patients on one unit. VAE prevention teams should also document and monitor the outcomes and any unexpected observations.

Step 3: STUDY – After implementation, analysis of the results should be conducted. A critical component of this step is to carefully review the results and determine what key determining factors made the test a success or a failure. How will we know when a change is an improvement?

Step 4: ACT – Use the lessons learned from the test and plan for the next action. That next action could be to adopt the idea and implement on a larger scale, adapt the idea by making changes and conducting further tests of change, or abandon the idea and move on to something else. What change can we make that will result in improvement?

TAKE ACTION!

1. Choose the small test of change that your team will implement.

2. Choose the location that the change will be tested on.

3. Design the implementation plan.

4. Be prepared to assess the results.

5. Perform the test.

6. Be prepared to adjust and redesign if needed.

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IMPLEMENT VAE PREVENTION STRATEGIES AND INVOLVE LOCAL CHAMPIONS

Designing a sustainable VAE prevention program is necessary for the ongoing improvement of patient safety. Initially, new quality improvement programs may be seen as a freestanding initiative, creating eagerness and motivating staff to become involved. However, eagerness and motivation may subside as these new actions may become part of the daily routine. Sustainability can be a challenge if personnel are not routinely educated on changes and best practices or strive for improvement. A solid understanding of the current state of the program, having clear and achievable goals, and having a properly designed implementation plan are essential to designing a sustainable VAE prevention program.

Ways to achieve sustainability include ongoing leadership engagement, influencing quality improvement champions as a resource to frontline staff, maintaining a strong multidisciplinary perspective for improvement, and continuously using data to drive change. VAE prevention teams should also think critically about their past experiences, future goals, and next steps on how to achieve those goals. In doing so, this framework will help teams develop an action plan for sustainment.

VAE PHYSICIAN AND NURSE CHAMPIONS

VAE prevention champions such as physicians and nurses are at the center of engaging both frontline workforce and leaders in the implementation of evidence-based interventions to reduce the risk of VAEs. Champions are the individuals who are experts and have the respect of their peers with the commitment to decrease VAEs in their organization. Champions work to sustain VAE prevention programs by continuing to educate novice health care personnel, identifying ongoing opportunities to test new evidence-based interventions, and collaborating with various units to help expand the success and innovations of their VAE prevention work.

TAKE ACTION!

1. Engage leadership commitment for ongoing efforts around VAE prevention.

2. Identify a physician and a nurse champion for VAE prevention.

3. Prepare for ongoing data measurement and sharing with staff to maintain engagement.

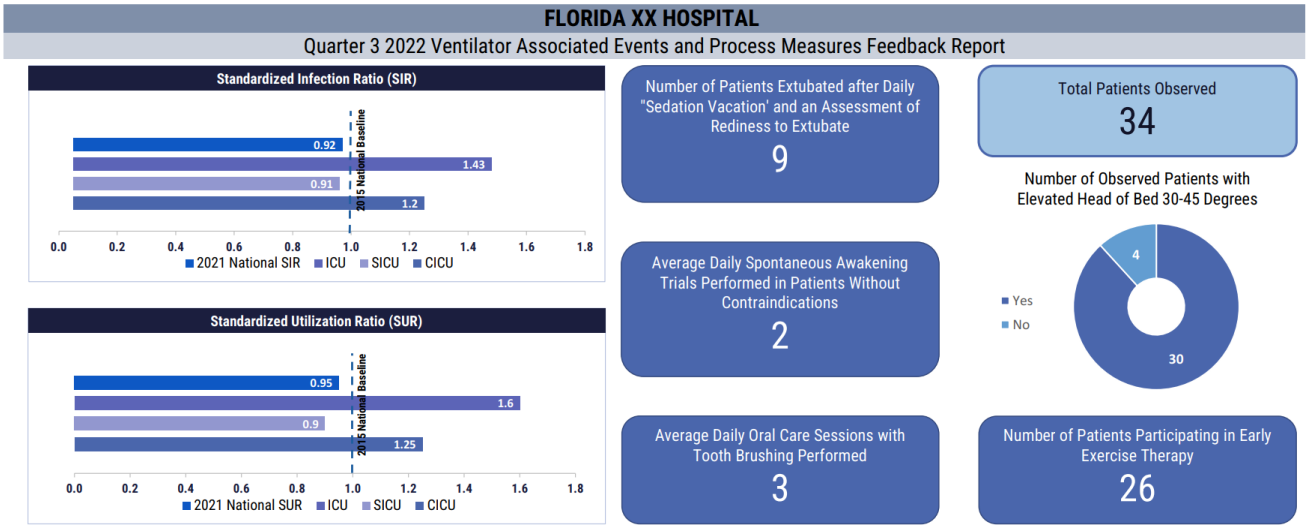
4. Plan for ongoing education and critique strategies to keep the workforce up to date on VAE prevention progress and best practices.

ONGOING MEASUREMENTS AND FEEDBACK

Providing ongoing evaluations and critiques to health care workers on basic principles of infection prevention are essential to creating better awareness and understanding of overall HAI prevention. When addressing specific device-related infections, including VAE, teams should review evidence-based guidelines as these recommendations can further promote the implementation of training programs:

- Measurement of VAE prevention performance should be completed with persistent formal and informal audits of clinical practice.
- Evaluate process and outcomes measures to enhance awareness, create expectations, establish priorities, and reward advances in behaviors.
- Monitoring for compliance to all basic infection prevention components in real time. Areas of poor compliance can be rapidly identified and corrected.
- Engaging with patients and their families is critical for education. It is important to maintain open communication about the plan of care and to educate them on what to expect while the patient is receiving care.
- Education sessions for both staff and physicians to summarize evidence, describe new guidelines, and motivate health care workforce to embrace recommended practices.
- Strengthen redundancy in care delivery process that increases the probability that the best actions are followed.
- Feedback can be displayed via dashboards or during meetings on a systematic basis. This helps the workforce to value their efforts to improve patient outcomes. Figure 5 is an example of a dashboard.

Figure 4. Sample Dashboard. All data used are fictitious and for demonstration purposes only.



NAVIGATE CHANGE BASED ON OUTCOMES

The necessity to change is based on the above five elements listed in this toolkit:

- Assessment of existing data collected of current organization plan, policies, and procedures
- Review of most current best practice recommendations and guidelines
- Utilization of your facility's quality improvement platform to engage key stakeholders
- Ongoing measurement of current care practices along with staff and family education with feedback
- Continuous review of outcomes data at established intervals to effect change within the organization

Using the audit and outcome data with frontline staff feedback, teams will need to critique the initial process change strategy, current processes and achievements, and what changes can be made to accomplish the ideal process and outcomes.

Including frontline staff when considering the redesign decision process is crucial. Their recommendations will assist to maximize efficiency and effectiveness of the change.

QUESTIONS TO STUDY IN THE PROCESS OF REDESIGN AND REFLECTION:

Assess Data

- Was the outcome target goal met for the unit (SIR goal, SUR goal, etc.)?
- Are frontline staff and stakeholders aware of the target goals for their unit?
- Did adherence to best care practices improve on unit audits?
- Are frontline staff and stakeholders aware of VAE audit criteria?

Choose the Best Practice Elements in the Bundles

- Have you been neglecting any critical steps?
- Are all steps required?
- Are there areas of redundancy or repetition?
- Are there areas or other processes that rely on an individual to "remember" to do something?

ACTION for VAE Prevention

Assess data | **C**hoose the best practices | **T**ackle the gaps | **I**mplement prevention strategies | **O**ngoing measures and feedback | **Navigate change based on outcomes**

QUESTIONS TO STUDY IN THE PROCESS OF REDESIGN AND REFLECTION (CONTINUED):

Tackle the Gaps

- What is the outcome of the test for change?
- Who (stakeholders) should be included in the test for change?
- What factors made the test for change a success or failure?
- If a failure, what changes worked and what adjustments should be made?
- If a success, how can the small test for change be implemented on a larger scale?
- How will the success be measured when implemented on a larger scale?

Implement Prevention Strategies

- What skills are necessary to perform each step?
- If higher skills are required, can current staff be trained or do duties need to be shifted to more qualified staff?
- Is there any technology that would make this system more logical or coherent?

Ongoing Measures and Feedback

- Do you need better results?
- Is there a problem with current process?
- What happens if the process breaks down?
- Do you need a fail-safe mechanism?
- Is there a completely different way to do this process?
- Can some steps be done simultaneously?
- Is there a better way to arrange the steps?

TAKE ACTION!

1. Build and implement your redesign plan.

2. Prepare to measure results.

3. Administer plan.

4. Share outcomes with the team.

5. If successful, plan for distribution of results.

REFERENCES

[1]Centers for Disease Control and Prevention. (2024, January). *National Healthcare Safety Network (NHSN) 2024 Patient Safety Component Manual.* https://www.cdc.gov/nhsn/pdfs/pscmanual/pcsmanual_current.pdf

[2]Centers for Disease Control and Prevention. (2021, October). *2020 National and State Healthcare-Associated Infections Progress Report*. https://www.cdc.gov/hai/data/archive/2020-HAI-progress-report.html

[3]Health Research and Educational Trust of New Jersey. (2019). *Ventilator-Associated Events (VAE) Prevention Toolkit*. https://www.njha.com/media/574967/ALERTVAEtoolkitFINAL508.pdf

[4]Institute for Healthcare Improvement. (2019). PDSA Model. https://www.ihi.org

[5]Klompas, M., Branson, R., Cawcutt, K., Crist, M., Eichenwald, E., Greene, L., . . . Berenholtz, S. (2022). Strategies to prevent ventilator-associated pneumonia, ventilator-associated events, and nonventilator hospital-acquired pneumonia in acute-care hospitals: 2022 Update. *Infection Control & Hospital Epidemiology, 43*(6), 687-713. doi:10.1017/ice.2022.88