HEALTH HOLDING

HAFER ALBATIN HEALTH CLUSTER
MATERNITY AND CHILDREN HOSPITAL

Department:	Infection Prevention and Control Department		
Document:	Multidisciplinary Policy and Procedure (MPP)		
Title:	Ventilator Bundle for Adult, Pediatric and Neonate		
Applies To:	Patient Care Areas Department		
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1. PURPOSE:

1.1 To reduce the risk of developing VAE / VAP

2. DEFINITONS:

2.1 **Ventilator:** Any device used to support, assist or control respiration (inclusive of the weaning period) through the application of positive pressure to the airway when delivered via an artificial airway, specifically an oral/nasal endotracheal or tracheostomy tube.

2.2 Ventilator bundle: Ventilator bundle is a group of evidence-based interventions for patients with ventilator that, when implemented together, result in better outcomes (reduce VAP/ reduce-PedVAE) than when implemented individually.

2.3 VAP is a pneumonia (PNEU) identified by using a combination of radiologic, clinical and laboratory criteria that occurs in a patient who was ventilated.

2.4 The ventilator has to be in place for >2 days and in place at the date of event or the day before.
Healthcare-associated pneumonia can be characterized by its onset: early or late, early onset pneumonia occurs during the first four days of hospitalization.

3. POLICY:

3.1 Applying the ventilator bundle in the care of ventilated patients can significantly reduce the incidence of VAP and VAE.

3.2 IPC Department provides compliance audit feedback to the critical care unit's HCWs regarding their performance for management of ventilated patients regularly and corrective actions are applied accordingly.

3.3 The hospital applies bundle of care for management of ventilated patients includes elevation of the head of the bed 30 and 45 degrees, daily sedative interruption with assessment of readiness to extubate, peptic ulcer prophylaxis, deep vein thrombosis and daily oral care with chlorhexidine solution.

3.4 The VAP rate per 1000 ventilator-days
These calculations will be performed separately for the different types of ICUs, specialty care areas, and other locations in the institution, as well as by each birthweight category in NICUs.

$$\text{VAP rates} = \frac{\text{The number of VAPs for a location}}{\text{The number of ventilator days for that location}} \times 1000$$

3.5 **Analysis of data:**

$$\text{Ventilator bundle compliance} = \frac{\text{Patients with ventilator compliant to all applicable bundle components}}{\text{Total number of patients with ventilator reviewed for the bundle compliance}} \times 100$$

3.6 Due to replacement of VAP by VAE VAP surveillance can be done in any inpatient pediatric locations such as, pediatric ICUs and SCA, step-down units, wards. VAP surveillance can still be done in adult and neonatal locations as off plan surveillance for mechanically-ventilated patients

4. PROCEDURE:

4.1 Evidence-Based Recommendations for the Prevention of VentilatorAssociated Events (VAEs) in Adults:

4.1.1 Minimize Ventilator Exposure: Avoid intubation and reintubation, if possible, as the most important evidence-based practice for lowering VAE risk. Minimizing a patient's exposure to mechanical ventilation can be achieved in two ways:

4.1.1.1 Use high-flow nasal oxygen or non-invasive positive pressure ventilation (NIPPV) as appropriate whenever safe and feasible.

4.1.1.2 Minimizing its duration by applying ventilator weaning protocols or evidence-based care bundles (for example, the awakening, breathing coordination, and early mobility-ABCDE bundle) can be effective in shortening mechanical ventilation duration. Ventilator weaning protocols that include daily interruption of sedation and coordination with a spontaneous breathing trial have been effective in removing patients from mechanical ventilation quickly and appropriately.

4.1.1.3 Combining high-flow nasal oxygen with NIPPV immediately after extubation decreases the risk of reintubation in patients at high risk for extubation failure.

4.1.2 Minimize Sedation:

4.1.2.1 Minimize sedation of ventilated patients whenever possible.

4.1.2.2 Avoid benzodiazepines in favor of other agents, including analgesics for pain, reassurance for anxiety, and antipsychotics, dexmedetomidine, and/or propofol for agitation.

4.1.2.3 Use a protocol to minimize sedation as potential strategies include protocols for targeted light sedation and daily sedative interruptions (i.e., spontaneous awakening trials) for patients without contraindications

4.1.3 Maintain and Improve Physical Conditioning:

4.1.3.1 Provide early exercise and mobilization as it may shorten the duration of mechanical ventilation, reduce ICU length of stay, lower VAE rates, and increase the rate of return to independent function.

4.1.4 Elevation head of the bed to 30–45°:

4.1.4.1 Elevating the head of the bed in adult patients was associated with a significant reduction in VAP rates.

4.1.4.2 This helps to reduce the potential for aspiration and to improve ventilation

4.1.5 Provide oral care with tooth brushing but without chlorhexidine:

4.1.5.1 Daily tooth brushing is associated with significantly lower VAE and VAP rates, shorter duration of mechanical ventilation, and shorter ICU length of stay.

4.1.6 Maintain Ventilator Circuits:

4.1.6.1 Change the ventilator circuit only if it is visibly soiled or malfunctioning.

4.1.6.2 Follow manufacturers' instructions for use.

4.1.7 Deep Venous Thrombosis (DVT) Prophylaxis:

4.1.7.1 Applying deep venous thrombosis prophylaxis is an appropriate intervention for all sedentary patients.

4.1.7.2 The risk of venous thromboembolism is reduced if antithrombotic and thrombolytic therapy is considered for the prophylaxis of patients undergoing surgery, trauma patients, acutely ill medical patients, and patients admitted to the intensive care unit.

4.1.7.3 While the link between DVT prophylaxis and VAP rates is unclear, the literature found that VAP rates fell most significantly in hospitals that fully implemented all aspects of the ventilator bundle, including DVT prophylaxis.

4.1.7.4 Important considerations on using anticoagulants for prophylaxis may increase the risk of bleeding.

4.1.8 Using endotracheal tubes with subglottic secretion drainage ports:

4.1.8.1 To minimize the pooling of secretions above the endotracheal cuff in patients likely to require >72 hours of intubation. These have been approved to reduce the risk of VAP.

4.1.9 Early tracheostomy:

4.1.9.1 Early tracheostomy (within 10 days of intubation) may be associated with a 40% decrease in VAP rates, less time on mechanical ventilation, and fewer ICU days.

4.1.9.2 The treating team should integrate these potential benefits with each patient's values and preferences when determining whether and when to proceed with tracheostomy.

4.1.10 Consider post-pyloric feeding tube placement in patients with gastric feeding intolerance at high risk for aspiration:

4.1.10.1 Placement of a post pyloric tube requires skilled personnel and should be reserved for patients with gastric feeding intolerance, as well as those at high risk for aspiration.

4.1.11 Avoid routine use of continuous Neuromuscular blocking agent, and if used, should be for the shortest possible period (48 hours or less if there is clinical improvement is expected

4.2 Evidence-Based Recommendations for the Prevention of Pediatric Ventilator-Associated Events (PedVAEs) in Pediatric Patients :

4.2.1 Avoid intubation if possible:

4.2.1.1 Use non-invasive positive pressure ventilation (NIPPV) or high-flow oxygen by nasal cannula whenever safe and feasible.

4.2.1.2 Risks of NIPPV in pediatric patients are the same for adults, with the added issue that pediatric patients often need sedation to tolerate NIPPV.

4.2.1.3 CPAP may be superior to high-flow oxygen by nasal cannula to avoid intubation in infants with bronchiolitis.

4.2.2 Minimize Duration of Mechanical Ventilation:

4.2.2.1 Assess readiness to extubate daily in patients without contraindications. Daily spontaneous breathing trials can decrease the mean duration of ventilation and length of stay in the PICU.

4.2.2.2 Minimize unplanned extubations and reintubations

4.2.2.3 Avoid fluid overload, as fluid overload is associated with an increased risk for prolonged mechanical ventilation (>48 hours).

4.2.3 Regular Oral Care:

4.2.3.1 Oral care causes significant decreases in VAE rates.

4.2.3.2 Wipe the gums with a gauze pad after each feeding to remove plaque and residual formula that could harm erupting teeth.

4.2.3.3 For children aged <3 Years, the ADA recommends brushing children's teeth as soon as they begin to come into the mouth using fluoride toothpaste in an amount of no more than a smear the size of a grain of rice.

4.2.3.4 A pea-sized amount of fluoride toothpaste is recommended for children aged 3–6 years.

4.2.3.5 After oral hygiene, rinse and suction the mouth. Keep the oral mucosa and lips clean, moist, and intact using sponge-tipped applicators dipped in a non-alcohol, non-peroxide mouth rinse.

4.2.4 Elevation of The Head of The Bed Unless Medically Contraindicated:

4.2.4.1 VAP bundles that included head of bed elevation reported lower VAP rates.

4.2.4.2 Many hospital cribs do not have inbuilt angle-measuring devices. Alternative measuring devices are required in these circumstances.

4.2.5 Maintain Ventilator Circuits:

4.2.5.1 Change ventilator circuits only when visibly soiled or malfunctioning or per manufacturers' instructions.

4.2.5.2 Remove condensate from the ventilator circuit frequently to avoid draining the condensate toward the patient.

4.2.6 Proper Endotracheal Tube Selection and Management:

4.2.6.1 Use cuffed endotracheal tubes to decrease the risk of microaspiration.

4.2.6.2 Maintain cuff pressure and volume at the minimal occlusive settings to prevent clinically significant air leaks around the endotracheal tube, typically 20–25 cm H2O.

4.2.6.3 Suction oral secretions before each position change.

4.3 Evidence-Based Recommendations for the Prevention of VentilatorAssociated Events (VAEs) in Neonates:

4.3.1 Avoid Intubation If Possible

4.3.1.1 Nasal continuous positive airway pressure (CPAP) ventilation (with or without nasal intermittent mechanical ventilation) and high-flow oxygen via nasal cannula are viable alternatives to intubation in most preterm infants.

4.3.2 Minimize Duration of Mechanical Ventilation:

4.3.2.1 Manage patients without sedation whenever possible

4.3.2.2 Use caffeine therapy for apnea of prematurity within 72 hours after birth to facilitate extubation.

4.3.2.3 Assess readiness to extubate daily.

4.3.2.4 Minimize unplanned extubations and reintubations by using nasal CPAP or nasal NIPPV in the post-extubation period to help prevent the need for reintubation.

4.3.3 Appropriate ventilator circuit care:

4.3.3.1 Change the ventilator circuit only if visibly soiled, malfunctioning, or per manufacturers' instructions for use.

4.3.3.2 Draining ventilator condensate away:

4.3.3.2.1 Keep the ventilator tubing clear of condensation.

4.3.3.2.2 Ensure proper sterilization of reusable respiratory care equipment, using sterile water in a humidification system, periodic drainage of condensate from the breathing circuit, and hand hygiene before and after contact with respiratory equipment.

4.3.4 Oral care with sterile water:

4.3.4.1 Provide oral care with sterile water or with maternal colostrum, such as oral care of breast milk in preterm neonates.

4.3.5 Head of the bed elevation:

4.3.5.1 Additional Recommendations to consider implementing if rates remain elevated despite essential practices

4.3.5.1.1 Lateral recumbent positioning.

4.3.5.1.2 Reverse Trendelenburg positioning.

4.3.5.1.3 Closed/in-line suctioning.

4.4 Additional Recommendations:

4.4.1 Minimize sedation as daily sedative interruptions decreased the duration of mechanical ventilation and PICU length of stay

4.4.2 Use endotracheal tubes with subglottic secretion drainage ports, as this intervention is only feasible for children aged ≥10 years

4.4.3 Early tracheostomy (<10 days) was associated with lower VAP rates, shorter ICU length of stay, lower mortality rates, and fewer ventilator days.

4.5 Education and Training:

4.5.1 The education and training activities should include all ICU, PICU, and NICU staff with different levels according to the job description.

4.5.2 The introduction of evidence-based practices in the clinical setting should be supported by active and multifaceted education programs.

4.5.3 Education sessions help to summarize evidence, explain new processes, set expectations, and encourage staff to adopt recommended practices.

4.5.4 Education sessions can include workshops, hands-on training, conferences, slide presentations, and/or interactive discussions;

4.5.5 Ongoing staff education helps maintain high levels of compliance with recommended practices.

4.5.6 Implementation of experiential learning strategies (simulation models, knowledge and attitude competencies, and feedback) to improve bundle adherence.

4.5.7 Providing feedback helps staff appreciate how their efforts to improve are affecting performance

rates and patients' outcomes. This helps maintain staff motivation and can boost adherence to new processes.

4.5.8 Feedback is also important for future efforts because feedback helps pinpoint new areas for improvement and marks successful transitions to new standards of care.

4.5.9 Educating patients and family members helps them better engage with and support the medical team's plan of care.

5. MATERIALS AND EQUIPMENT:

5.1 **Forms and Records:**

5.1.1 ADULT VENTILATOR BUNDLE FORM. (See attachment).

5.1.2 PEDIATRIC / NEONATAL VENTILATOR BUNDL FORM. (See attachment).

5.2 **Materials and Equipment**

5.2.1 N/A

6. RESPONSIBILITIES:

6.1 Infection Prevention and Control Department

6.2 All Medical and Nurse Staff if ICUs and Respiratory Staff

7. APPENDICES:

7.1 N/A

8. REFERENCES:

8.1 Healthcare Associated Infections (HAIs) Surveillance Manual. MOH Surveillance Manual. Second Edition: November 2023

8.2 IPCKSA WEBSITE: Guidelines for Prevention of Ventilator- Associated Pneumonia (VAP) and Ventilator-Associated Events (VAEs) (Adult, Pediatric and Neonatal Intensive Care Units). February - 2025. Version 1

9. APPROVALS:

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5.1 Forms and Record

5.1.1ADULT VENTILATOR BUNDLE FORM

Patient Name:
MRN#
Gender:
Patient Label

Adult Ventilator Bundle Form

PATIENT'S INFORMATION					
Unit:		Bed#		Admission date:		Admission diagnosis:
Ventilator Insertion date:				Place of insertion:		

BUNDLE ELEMENTS																		
Date	Head of Bed Elevation (30°-45°)			Daily Assessment of Readiness to Wean			Daily Sedation Interruption			Deep venous thrombosis (DVT) Prophylaxis*			Early Mobility & Exercise*			Provide oral care*		
	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A

Note:
- *N/A- not applicable.*
- *Deep venous thrombosis (DVT) Prophylaxis (Unless contraindicated).*
- *Early Mobility & Exercise (Physical therapy or Passive Range of Motion exercises).*
- *Provide oral care with tooth brushing but without chlorhexidine.*

5.1.2 PEDIATRIC / NEONATAL VENTILATOR BUNDL FORM

Patient Name:
Age:
MRN:
Gender:
Patient label

Pediatric & Neonatal Ventilator Bundle Form

PATIENT'S INFORMATION					
Unit:		Bed#		Admission date:		Admission diagnosis:
Ventilator Insertion date:				Place of insertion:		
For neonates: *(birth weight in Grams)* ☐ ≤750 ☐ 751-1000 ☐ 1001-1500 ☐ 1501-2500 ☐ >2500						

BUNDLE ELEMENTS																		
Date	Hand Hygiene			Daily Assessment of Readiness to Wean			Daily Sedation Interruption			* Head of Bed Elevation			Closed Ventilator Circuit Management			Oral Hygiene and Suctioning		
	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A

Note:
- *N/A- not applicable.*
- *Adjust interventions based on the patient's weight, age, and underlying conditions. Head of Bed Elevation: NEONATES- 15 to 30 degrees; INFANTS/OLDER CHILDREN – 30 to 45 degrees*
- **Mouth rinses every 2 to 4 hours: PEDIATRIC – Normal saline or sterile water; NEONATES – Maternal colostrum (if Available) or sterile water.*