Reducing harm in critical care: Reducing harm from mechanical ventilation

The Goal

Prevent ventilator-associated pneumonia (VAP) and other complications in patients on ventilators by reliably implementing a set of interventions known as the “Ventilator Care Bundle.”

Background

Some references from Saving Lives: delivering clean and safe care. High Impact Intervention No.5 – Care bundle for ventilated patients (or tracheostomy where appropriate). Department of Health, 2007.

- Respiratory infections are the fourth-largest contributor to hospital-acquired infection in the UK, and 19% of these are ventilation-related.

- VAP is a significant cause of morbidity and mortality in critically ill and postoperative patients receiving mechanical ventilation. In one study VAP was the most frequent infection, accounting for 45% of all infections in intensive care units (ICUs) in Europe.

- The incidence of VAP can vary from 9% to 68% in mechanically ventilated patients. VAP is associated with increased duration of ventilation, ICU stay, hospital stay, and cost.

- VAP occurs in up to 15% of patients receiving mechanical ventilation. Risk factors include tracheostomy, multiple central line insertions, reintubation, and the use of antacids. The hospital mortality rate of ventilator patients who develop VAP is 46%, compared to 32% for ventilator patients who do not develop VAP.
**Intervention – Ventilator Bundle**

The power of a “bundle” is that it brings together those scientifically grounded concepts that are both necessary and sufficient to improve the clinical outcome of interest. The focus of measurement is the completion of the entire bundle as a single intervention, rather than completion of its individual components.

This “ventilator bundle” includes four components: elevation of the head of the bed to between 30 and 45 degrees, daily “sedative interruption” and daily assessment of readiness to extubate, peptic ulcer disease (PUD) prophylaxis, venous thromboembolism (VTE) prophylaxis (unless contraindicated). The first two components are directed at preventing VAP and the latter two components at preventing other complications associated with mechanical ventilation.

- **Patient positioning**
  Elevation of the head of the bed is an integral part of the ventilator bundle and has been correlated with reduction in the rate of ventilator-associated pneumonia. The recommended elevation is 30-45 degrees.

- **Ventilator weaning**
  Periodic “sedative interruptions” and daily assessment of readiness to extubate may reduce the duration of mechanical ventilation and the risk of VAP.
• **Peptic ulcer disease (PUD) prophylaxis**

Patients with respiratory failure have an increased risk of “stress ulcers” and associated gastrointestinal (GI) bleeding. Medications that reduce gastric acidity have been shown to protect such patients from the development of PUD and GI bleeding.


• **Venous thromboembolism prophylaxis**

Patients with respiratory failure have an increased risk of deep vein thrombosis. Treatment with anticoagulants (e.g., heparin) has been shown to reduce this risk.