South Yorkshire and Bassetlaw
Critical Care Operational Delivery Network

Prevention of Ventilator Associated Pneumonia Guidance

Final Version

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Contents

Introduction

Ventilator associated pneumonia (VAP)[1] is a common form of hospital acquired pneumonia which occurs within the critical care setting. It affects between 10 and 20% of patients who are mechanically ventilated. It is known to have a significant negative effect on mortality, length of ICU (and hospital) stay, duration of mechanical ventilation and increased healthcare costs. Antimicrobial treatment of VAP adds to the increasing burden of antimicrobial use within the ICU.

Definition of VAP

There is presently no consensus definition of VAP. It is widely acknowledged as a pneumonia that occurs more than 48 hours from the instigation of invasive ventilation and is diagnosed using a combination of non-specific clinical, radiological and microbiological criteria.

Primary Review (Answer must be yes to all questions)

	Yes	**No**
Invasive Ventilation for greater than 48 hours		
Antimicrobial therapy started for NEW* chest deterioration		
Antimicrobial therapy continued for greater than 48 hours		

No antibiotics for chest infection in previous 5 days

Secondary Review (Must have ONE of the following:)

	Yes	**No**
New/Progressive changes on CXR		
Positive Microbiology on respiratory sample		

OR TWO of the following**:**

	Yes	**No**
Reduced PF ratio > 4 or Fi02 increased by > 0.1		
Fever >38.5 or <36 degrees celsius		
Worsening infection markers **WCC >11 or increase >2 / PCT >0.25 or any increase**		

Objectives of Prevention[2]

- **Reduce aspiration of microorganisms**
- **Reduce length of invasive ventilation**

Associated care bundles

- VTE prophylaxis
- Gastric ulcer prophylaxis
- Sputum sampling

Reducing Aspiration of Microorganisms[3]

Elevation of head of bed 30-45%

All mechanically ventilated patients should be nursed at a minimum of 30% head up elevation. There is a demonstrated link between VAP and patients nursed supine.[4]

Possible considerations and contra-indications

- Spinal or Pelvic instability
- Patients nursed in prone position
- Significant heamodynamic instability

If a procedure is undertaken that requires a flat supine position (e.g. tracheostomy or line insertion) the patient should subsequently be assessed for reinstatement of head up position.

Maintenance of endotracheal tube cuff pressure

Endotracheal tube (ETT) cuff pressures should be checked and maintained at 20-30 cm H20 using a cuff manometer.

- Immediately after cuff inflation
- On admission to Critical Care
- 4 hourly as a routine
- If concerns arise regarding cuff pressures (e.g. audible or monitored leak apparent)

Use of ETT with subglottic suction

Pooling of endotracheal secretions are a potential source of pathogens (particularly in cases of cuff leak or deflation).

All patients requiring invasive ventilation should be intubated using an ETT with subglottic suction available e.g. a Taperguard tube. Suction should be performed 4 hourly as a minimum.

If patients are admitted from elsewhere without such a tube, a pragmatic decision should be made upon re-intubation with one. This will depend upon individual circumstances that take account of predicted length of ventilation. Generally speaking, anyone who is likely to require invasive ventilation for more than 48 hours should have an ETT change undertaken in daytime hours.

Avoidance of unnecessary ventilator circuit manipulation

Contamination of condensate in ventilator tubing and subsequent infiltration of this into the airway is associated with VAP.

Circuits should only be replaced if:

- Visibly soiled or mechanically malfunctioning
- If following manufacturers guidance.

Added considerations following local practice

Mouth care guidelines (4 hourly as a minimum) for patients in critical care[5]

Use of proton pump inhibitors and enteral feeding guidelines.

Reducing Length of Invasive Mechanical Ventilation

Daily Sedation Holds

As a patient is ventilated for longer periods of time, their risk of developing VAP increases.[6]Continuous or excessively deep sedation can lead to accumulation of sedatives and prolong mechanical ventilation duration.

Performing a daily sedation hold can shorten the duration of mechanical ventilation and reduce the risk of developing a VAP.

All mechanically ventilated patients receiving continuous infusions of sedative drugs for greater than 24 hours should have daily sedation holds.

Contra-indications

- Requirement for muscle relaxants
- High ventilatory requirements (e.g. prone positioning, Fi02 greater than 0.6, high airway pressures)
- Raised Intra-cranial pressure
- Seizures or severe agitation
- Risk of unresolvable loss of airway
- Therapeutic temperature management (e.g. post cardiac arrest)
- Heamodynamic instability
- Planned intervention (such as surgery-in this case a sedation hold may still be considered appropriate afterwards)

Planned Weaning

Implementation (and adherence to) weaning plans to instigate spontaneous breathing and culminate in liberation from the ventilator. Reducing the length of invasive ventilation via the weaning process assists in reducing the incidence of VAP.[7]

Summary

The guideline provides a definition of VAP that can be used to record and report the incidence on units. Network adaptation will allow benchmarking. Prevention of VAP and reduction of VAP rates is possible using the clinical advice shown.

Related Documents and Guidance

1. P Gunasekera, A Gratrix. Ventilator-associated pneumonia, *BJA Education*, Volume 16, Issue 6, June 2016, Pages 198–202.

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3. Torres A, Serra-Batlles J, Ros E, Piera C, Puig de la Bellacasa J, Cobos A, et al. Pulmonary aspiration of gastric contents in patients receiving mechanical ventilation: the effect of body position. *Ann Intern Med*1992; 116: 540–543.

4. Drakulovic MB, Torres A, Bauer TT, et al. Supine body position as a risk factor for nosocomial pneumonia in mechanically ventilated patients: A randomised trial. *Lancet* 1999; 354: 1851–1858.

5. Price R, Maclennan G, Glen J. Selective digestive or oropharyngeal decontamination and topical oropharyngeal chlorhexidine for prevention of death in general intensive care: Systematic review and network meta-analysis. *BMJ* 2014; 348: g2197.

6. Quenot J-P, Ladoire S, Devoucoux F, et al. Effect of a nurse-implemented sedation protocol on the incidence of ventilator-associated pneumonia. *Crit Care Med* 2007; 35: 2031–2036.

7. Girard TD, Kress JP, Fuchs BD, et al. Efficacy and safety of a paired sedation and ventilator weaning protocol for mechanically ventilated patients in intensive care (Awakening and Breathing Controlled trial): A randomised controlled trial. *Lancet* 2008; 371: 126–134