



Getting Started Kit: Prevent Ventilator-Associated Pneumonia

Bibliography

100,000 Lives Campaign

We invite you to join a Campaign to make health care safer and more effective — to ensure that hospitals achieve the best possible outcomes for all patients. The Institute for Healthcare Improvement (IHI) and other organizations that share our mission are convinced that a remarkably few proven interventions, implemented on a wide enough scale, can avoid 100,000 deaths between January 2005 and July 2006, and every year thereafter. Complete details on the web at <http://www.ihl.org/IHI/Programs/Campaign/>.

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American Thoracic Society. Guidelines for the management of adults with hospital acquired, ventilator-associated, and healthcare-associated pneumonia. *Am J Respir Crit Care Med*, 2005. **171**(4): p. 388-416.

Updated guidelines from the American Thoracic Society and the Infectious Diseases Society of America. Although these guidelines focus on treatment of established ventilator-associated pneumonia, there is also an up-to-date discussion of modifiable risk factors and a series of recommendations for practices that will reduce the risk; these include use of protocols to improve sedation use and to accelerate weaning and nursing patients in the semirecumbent position.

Babcock HM. An Educational Intervention to Reduce Ventilator-Associated Pneumonia in an Integrated health system. A Comparison of Effects. *Chest* 2004; **125**: 2224-2231.

An observational study in 4 hospitals before and after implementation of a 10-page educational self-study modular educational program on best practice for prevention of ventilator-associated pneumonia. Rates of ventilator-associated pneumonia fell overall, but no reduction in rate was seen in the hospital with the lowest rate of module completion amongst respiratory therapists.

Center for disease Control and Prevention. Guidelines for preventing health-care-associated pneumonia, 2003 recommendations of the CDC and the Healthcare Infection Control Practices Advisory Committee. *Respir Care*, 2004. **49**(8): p. 926-39.

This is an abridged version of the full CDC guidelines (see Tablan et al, below), and includes correction of errata in that report.

Collard HR, Saint S. Chapter 17: Prevention of Ventilator-Associated Pneumonia. IN: Agency for Healthcare Research and Quality. *Making health care safer: a critical analysis of patient safety practices*. <http://www.ahrq.gov/clinic/evrptfiles.htm#ptsafety>. Accessed 19 January 2005.

A detailed literature review, performed by the University of California at San Francisco (UCSF)-Stanford University Evidence-Based Practice Center, of published research on prevention of ventilator-associated pneumonia, sponsored by AHRQ and published in July 2001.

Craven DE, Steger KA. Nosocomial pneumonia in mechanically ventilated adult patients: epidemiology and prevention in 1996. *Semin Respir Infect*. 1996;**11**(1):32-53.

Review of the epidemiology and causative factors for ventilator-associated pneumonia, concluding that aspiration of gastric contents is a major risk factor.

Dellinger RP, Carlet JM, Masur H, et al. Surviving Sepsis Campaign guidelines for management of severe sepsis and septic shock. *Crit Care Med*. 2004;**32**(3):858-873.

Clinical practice guideline from the Society of Critical Care Medicine on the care of critically ill patients with sepsis. Includes guidance on stress ulcer prophylaxis and prophylactic anticoagulation. Available at http://www.sccm.org/professional_resources/guidelines/table_of_contents/Documents/FINAL.pdf

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Dodek P, Keenan S, Cook D, et al. Evidence-based clinical practice guideline for the prevention of ventilator-associated pneumonia. *Ann Intern Med.* 2004;141(4):305-313.
A clinical practice guideline written by the Joint Planning Group of the Canadian Critical Care Trials Group and the Canadian Critical Care Society. The guidelines were generated after a systematic search of MEDLINE, EMBASE, and the Cochrane Database of Systematic Reviews for all relevant randomized controlled trials that involved mechanically ventilated adults published up until 1 April 2003.

Drakulovic MB, Torres A, Bauer TT, Nicolas JM, Nogue S, Ferrer M. Supine body position as a risk factor for nosocomial pneumonia in mechanically ventilated patients: a randomised trial. *Lancet.* 1999;354(9193):1851-1858.
Randomized controlled trial in 86 mechanically ventilated patients assigned to semi-recumbent or supine body position demonstrating the excess risk of ventilator-associated pneumonia associated with supine position.

Geerts WH, Pineo GF, Heit JA, et al. Prevention of venous thromboembolism: the Seventh ACCP Conference on Antithrombotic and Thrombolytic Therapy. *Chest.* 2004;126(3 Suppl):338S-400S.
A clinical practice guideline issued as part of the Seventh American College of Chest Physicians Conference on Antithrombotic and Thrombolytic Therapy: Evidence-based Guidelines. The recommendations cover patients undergoing surgery, trauma patients, acutely ill medical patients, and patients admitted to the intensive care unit.

Ibrahim EH, Tracy L, Hill C, Fraser VJ, Kollef MH. The occurrence of ventilator-associated pneumonia in a community hospital: risk factors and clinical outcomes. *Chest.* 2001;120(2):555-561.
Prospective, single-center cohort study over 22 months of the risk factors for and mortality from ventilator-associated pneumonia in a medical and surgical ICU in a 500-bed community hospital.

Jacobi J, Fraser GL, Coursin DB, et al. Clinical practice guidelines for the sustained use of sedatives and analgesics in the critically ill adult. *Crit Care Med.* 2002;30(1):119-141.
A clinical practice guideline prepared by the American College of Critical Care Medicine of the Society for Critical Care Medicine, and available at http://www.sccm.org/professional_resources/guidelines/table_of_contents/Documents/Sedatives.pdf. It gives detailed recommendations for ensuring adequate sedation and analgesia for patients on the ICU.

Kress JP, Pohlman AS, O'Connor MF, Hall JB. Daily interruption of sedative infusions in critically ill patients undergoing mechanical ventilation. *N Engl J Med.* 2000;342(20):1471-1477.
Randomized controlled trial in 128 adult patients on mechanical ventilation, randomized to daily interruption of sedation irrespective of clinical state or

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interruption at the clinician's discretion. Daily interruption resulted in a marked and highly significant reduction in time on mechanical ventilation.

MacIntyre NR, Cook DJ, Ely EW, Jr., et al. Evidence-based guidelines for weaning and discontinuing ventilatory support: a collective task force facilitated by the American College of Chest Physicians; the American Association for Respiratory Care; and the American College of Critical Care Medicine. *Chest*. 2001;120(6 Suppl):375S-395S.

A clinical practice guideline, available at http://www.sccm.org/professional_resources/guidelines/table_of_contents/Documents/Chest-Weaning.pdf, giving detailed recommendations on weaning patients from mechanical ventilation. The paper reviews the evidence that unnecessary delays in weaning increase the complication rate for mechanical ventilation, including pneumonia, as well as the cost. The guidelines draw on an AHRQ-sponsored summary of the literature published in 1999 by the McMaster University Evidence-Based Practice Center.

Rello J, Ollendorf DA, Oster G, et al. Epidemiology and outcomes of ventilator-associated pneumonia in a large US database. *Chest*. 2002;122(6):2115-2121.

Retrospective matched cohort study from a large US inpatient database examining risk factors for, and the mortality, duration of ventilation, and cost associated with ventilator-associated pneumonia.

Tablan OC, Anderson LJ, Besser R, Bridges C, Hajjeh R. Guidelines for preventing health-care-associated pneumonia, 2003: recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee. *MMWR Recomm Rep*. 2004;53(RR-3):1-36.

This is a 179-page document, available at http://www.cdc.gov/ncidod/hip/guide/CDCpneumo_guidelines.pdf, which gives definitive guidance on prevention of all types of health-care associated pneumonia, including ventilator-associated pneumonia.

Task Force on Guidelines. Guidelines for standards of care for patients with acute respiratory failure on mechanical ventilatory support. Task Force on Guidelines; Society of Critical Care Medicine. *Crit Care Med*. Feb 1991;19(2):275-278.

This is one of a series of guidelines published by the Task Force on Guidelines of the Society of Critical Care Medicine and is available at http://www.sccm.org/professional_resources/guidelines/table_of_contents/Documents/Acute_Respiratory_Failure.pdf. It specifies a number of minimum standards for the care of critically ill patients on mechanical ventilation, including personnel, monitoring equipment, support services, and equipment. There is a brief discussion of clinical management, but no discussion of the supporting evidence.

Torres A, Serra-Batlles J, Ros E, et al. Pulmonary aspiration of gastric contents in patients receiving mechanical ventilation: the effect of body position. *Ann Intern Med*. Apr 1 1992;116(7):540-543.

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Randomized cross-over study of 19 patients on mechanical ventilation. Tc99m sulphur colloid labeling of stomach contents was performed, followed by sequential radioactivity counts in endobronchial secretions over a 5h period. Patients were randomized to the prone position or semi-recumbency and studied 12h later; the study was repeated 48h later with the patient in the alternate position. Radioactive counts were higher, indicating aspiration of gastric contents, in the prone position, and increased over time.