Guidelines for Preventing Health-Care-Associated Pneumonia, 2003 Recommendations of the CDC and the Healthcare Infection Control Practices Advisory Committee

Summary

This report updates, expands, and replaces the previously published Centers for Disease Control and Prevention (CDC) Guideline for Prevention of Nosocomial Pneumonia. The new guidelines are designed to reduce the incidence of pneumonia and other severe, acute, lower-respiratory-tract infections in acute-care hospitals and in other health-care settings (eg, ambulatory and long-term care institutions) and other facilities where health care is provided.

Among the changes in the recommendations to prevent bacterial pneumonia, especially ventilator-associated pneumonia, are the preferential use of orotracheal rather than nasotracheal tubes in patients who receive mechanically assisted ventilation, the use of noninvasive ventilation to reduce the need for and duration of endotracheal intubation, changing the breathing circuits of ventilators when they malfunction or are visibly contaminated, and (when feasible) the use of an endotracheal tube with a dorsal lumen to allow drainage of respiratory secretions; no recommendations were made about the use of sucralfate, histamine-2 receptor antagonists, or antacids for stress-bleeding prophylaxis. [Editor's note: The sections described in the remainder of the Summary are not included in the following reprint of the guidelines.] For prevention of health-care-associated Legionnaires disease, the changes include maintaining potable hot water at temperatures not suitable for amplification of *Legionella* species, considering routine culturing of water samples from the potable

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This article is an abridgement of the CDC *Recommendations and Reports, Morbidity and Mortality Weekly Report*, March 26, 2004, *MMWR Recomm Rep 2004;53(RR-3):1–36.* This version of the report reflects corrections of errata in the original publication. Reprinted here are the Summary; Introduction; Key terms used in the guidelines; the section on Health-Care-Associated Bacterial Pneumonia from Part II—Recommendations and from Part III—Performance Indicators; and associated references. The complete CDC document with Parts I, II, and III is available online at *http://www.cdc.gov/ncidod/hip/pneumonia/default.htm.*

A full listing of the members of the Healthcare Infection Control Practices Committee is available online.

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water system of a facility's organ-transplant unit when it is done as part of the facility's comprehensive program to prevent and control health-care-associated Legionnaires disease, and initiating an investigation for the source of *Legionella* species when one definite or one possible case of laboratory-confirmed health-care-associated Legionnaires disease is identified in an in-patient hemopoietic stem-cell transplant (HSCT) recipient or in 2 or more HSCT recipients who had visited an out-patient HSCT unit during all or part of the 2–10-day period before illness onset. In the section on aspergillosis, the revised recommendations include the use of a room with high-efficiency particulate air filters rather than laminar airflow as the protective environment for allogeneic HSCT recipients, and the use of high-efficiency respiratory-protection devices (eg, N95 respirators) by severely immunocompromised patients when they leave their rooms when dust-generating activities are ongoing in the facility. In the respiratory syncytial virus (RSV) section, the new recommendation is to determine, on a case-by-case basis, whether to administer monoclonal antibody (palivizumab) to certain infants and children aged $<$ 24 months who were born prematurely and are at high risk for RSV infection. In the section on influenza, the new recommendations include the addition of oseltamivir (to amantadine and rimantadine) for prophylaxis of all patients without influenza illness and oseltamivir and zanamivir (to amantadine and rimantadine) as treatment for patients who are acutely ill with influenza in a unit where an influenza outbreak is recognized.

In addition to the revised recommendations, the guidelines contain new sections on pertussis and lower respiratory tract infections caused by adenovirus and human parainfluenza viruses and refers readers to the source of updated information about prevention and control of severe acute respiratory syndrome.

Introduction

Because of the high morbidity and mortality associated with health-care-associated pneumonia, several guidelines for its prevention and control have been published. The first CDC Guideline for Prevention of Nosocomial Pneumonia was published in 1981 and addressed the main infection-control problems related to hospital-acquired pneumonia at the time: the use of large-volume nebulizers that were attached to mechanical ventilators and improper reprocessing (ie, cleaning and disinfection or sterilization) of respiratory-care equipment. The document also covered the prevention and control of hospital-acquired influenza and RSV infection.

In 1994 the Healthcare Infection Control Practices Advisory Committee (HICPAC) revised and expanded the CDC Guideline for Prevention of Nosocomial Pneumonia to include Legionnaires disease and pulmonary aspergillosis.[1] HICPAC advises the Secretary of Health and Human Services, the directors of CDC, and the National Center for Infectious Diseases about the prevention and control of health-care-associated infections and related adverse events. The 1994 guideline addressed concerns related to preventing ventilator-associated pneumonia (VAP) (eg, the role of stress-ulcer prophylaxis in the causation of pneumonia and the contentious roles of selective gastrointestinal decontamination and periodic changes of ventilator tubing in the prevention of the infection). The report also presented major changes in the recommendations to prevent and control hospital-acquired pneumonia caused by *Legionnella* species and aspergilli.

In recent years demand has increased for guidance on preventing and controlling pneumonia and other lower respiratory tract infections in health care settings other than the acute-care hospital, probably resulting in part from the progressive shift in the burden and focus of health care in the United States away from in-patient care in the acute-care hospital and toward out-patient and long-term care in other healthcare settings. In response to this, demand HICPAC revised the guideline to cover these other settings. However, infection-control data about the acute-care hospital setting are more abundant and well-analyzed; in comparison, data are limited from long-term care, ambulatory, and psychiatric facilities and other health-care settings.

This report consists of Parts II and III of a 3-part document[2] and contains the consensus HICPAC recommendations for the prevention of the following infections: bacterial pneumonia, Legionnaires disease, pertussis, invasive pulmonary aspergillosis (IPA), lower respiratory tract infections caused by RSV, parainfluenza and adenoviruses, and influenza. [Editor's note: This reprint consists of the sections on bacterial pneumonia *only*.) Part III provides suggested performance indicators to assist infection-control personnel in monitoring the implementation of the guideline recommendations in their facilities.

Part I of the guidelines [see *http://www.cdc.gov/ncidod/hip/pneumonia/default.htm*] provides the background for the recommendations and includes a discussion of the epidemiology, diagnosis, pathogenesis, modes of transmission, and prevention and control of the infections.[2] Part I can be an important resource for educating health care personnel. Because education of health care personnel is the cornerstone of an effective infection-control program, health care agencies should give high priority to continuing infection-control education programs for their staff members.

HICPAC recommendations address such issues as education of health care personnel about the prevention and control of health care-associated pneumonia and other lower respiratory tract infections, surveillance and reporting of

diagnosed cases of infections, prevention of person-to-person transmission of each disease, and reduction of host risk for infection.

Lower respiratory tract infection caused by *Mycobacterium tuberculosis* is not addressed in this document; however, it is covered in a separate publication.[3]

The document was prepared by CDC; reviewed by experts in infection control, intensive-care medicine, pulmonology, respiratory therapy, anesthesiology, internal medicine, and pediatrics; and approved by HICPAC. The recommendations are endorsed by the American College of Chest Physicians, American Healthcare Association, Association for Professionals of Infection Control and Epidemiology, Infectious Diseases Society of America, Society for Healthcare Epidemiology of America, and Society of Critical Care Medicine.

Key Terms Used in the Guidelines

Protective environment is a specialized patient-care area, usually in a hospital, with a positive air flow relative to the corridor (ie, air flows from the room to the outside adjacent space). The combination of high-efficiency particulate air (HEPA) filtration, high numbers ($>$ 12) of air changes per hour (ACH), and minimal leakage of air into the room creates an environment that can safely accommodate patients who have received allogeneic HSCT.

Immunocompromised patients are those patients whose immune mechanisms are deficient because of immunologic disorders (eg, human immunodeficiency virus [HIV] infection, congenital immune deficiency syndrome, and chronic diseases [diabetes mellitus, cancer, emphysema, or cardiac failure), or immunosuppressive therapy (eg, radiation, cytotoxic chemotherapy, anti-rejection medication, and steroids). Immunocompromised patients who are identified as patients at high risk have the greatest risk for infection and include persons with severe neutropenia (ie, an absolute neutrophil count of $<$ 500 cells/mL) for prolonged periods of time, recipients of allogeneic HSCT, and those who receive the most intensive chemotherapy (eg, patients with childhood acute myelogenous leukemia).

Part II—Recommendations of the Healthcare Infection Control Practices Advisory Committee

[abridged]

Categorization of Recommendations

In this document each recommendation is categorized on the basis of existing scientific evidence, theoretical rationale, applicability, and potential economic impact. In addition, a new category accommodates recommendations that are made on the basis of existing national or state health regulations. The following categorization scheme is applied in these guidelines:

Category IA. Strongly recommended for implementation and strongly supported by well-designed experimental, clinical, or epidemiologic studies.

Category IB. Strongly recommended for implementation and supported by certain clinical or epidemiologic studies and by strong theoretical rationale.

Category IC. Required for implementation, as mandated by federal or state regulation or standard.

Category II. Suggested for implementation and supported by suggestive clinical or epidemiologic studies or by strong theoretical rationale.

No recommendation; unresolved issue. Practices for which insufficient evidence or no consensus exists about efficacy.

Prevention of Health-Care-Associated Bacterial Pneumonia

I. Staff Education and Involvement in Infection Prevention

Educate health care workers about the epidemiology of, and infection-control procedures for, preventing health-care-associated bacterial pneumonia to ensure worker competency according to the worker's level of responsibility in the health care setting, and involve the workers in the implementation of interventions to prevent health-care-associated pneumonia by using performance-improvement tools and techniques (IA).[4–11]

II. Infection and Microbiologic Surveillance

A. Conduct surveillance for bacterial pneumonia in intensive care unit (ICU) patients who are at high risk for health-care-related bacterial pneumonia (eg, patients with mechanically assisted ventilation or selected postoperative patients) to determine trends and help identify outbreaks and other potential infection-control problems.[12,13] The use of the new National Nosocomial Infection Surveillance system's surveillance definition of pneumonia is recommended.[14] Include data on the causative microorganisms and their antimicrobial susceptibility patterns.[15] Express data as rates (eg, number of infected patients or infections per 100 ICU days or per 1,000 ventilator days) to facilitate intrahospital comparisons and trend determination.[12,16,17] Link monitored rates and prevention efforts and return data to appropriate health care personnel (IB).[18]

B. In the absence of specific clinical, epidemiologic, or infection-control objectives, do not routinely perform surveillance cultures of patients or of

equipment or devices used for respiratory therapy, pulmonary-function testing, or delivery of inhalation anesthesia (II).[19–22]

III. Prevention of Transmission of Microorganisms

A. Sterilization or Disinfection and Maintenance of Equipment and Devices

1. General measures
   a. Thoroughly clean all equipment and devices to be sterilized or disinfected (IA).[23,24]
   b. Whenever possible, use steam sterilization (by autoclaving) or high-level disinfection by wet heat pasteurization at > 70°C for 30 min for reprocessing semicritical equipment or devices (ie, items that come into direct or indirect contact with mucous membranes of the lower respiratory tract) that are not sensitive to heat and moisture (Table 1). Use low-temperature sterilization methods (as approved by the Office of Device Evaluation, Center for Devices and Radiologic Health, Food and Drug Administration) for equipment or devices that are heat- or moisture-sensitive.[24–28] After disinfection, proceed with appropriate rinsing, drying, and packaging, taking care not to contaminate the disinfected items in the process (IA).[23,24]
   c. Preferentially use sterile water for rinsing reusable semicritical respiratory equipment and devices when rinsing is needed after they have been chemically disinfected. If this is not feasible, rinse the device with filtered water (ie, water that has been through a 0.2-μ filter) or tap water, and then rinse with isopropyl alcohol and dry with forced air or in a drying cabinet (IB).[24]
   d. Adhere to provisions in Food and Drug Administration's enforcement document for single-use devices that are reprocessed by third parties (IC).[24,29]
2. Mechanical ventilators
   Do not routinely sterilize or disinfect the internal machinery of mechanical ventilators (II).
3. Breathing circuits, humidifiers, and heat-and-moisture exchangers (HMEs)
   a. Breathing circuits with humidifiers
      1) Do not change routinely, on the basis of duration of use, the breathing circuit (ie, ventilator tubing and exhalation valve and the attached humidifier) that is in use on an individual patient. Change the circuit when it is visibly soiled or mechanically malfunctioning (IA).[30–35]
      2) Breathing-circuit-tubing condensate.
         a) Periodically drain and discard any condensate that collects in the tubing of a mechanical ventilator, taking precautions not to allow condensate to drain toward the patient (IB).[36]
         b) Wear gloves to perform the previous procedure and/or when handling the fluid (IB).[37,38]
         c) Decontaminate hands with soap and water (if hands are visibly soiled) or with an alcohol-based hand rub after performing the procedure or handling the fluid (IA).[38,39]
      3) No recommendation can be made for placing a filter or trap at the distal end of the expiratory-phase tubing of the breathing circuit to collect condensate (Unresolved issue).
      4) Humidifier fluids
         a) Use sterile (not distilled, nonsterile) water to fill bubbling humidifiers (II).[36,40–43]
         b) No recommendation can be made for the preferential use of a closed, continuous-feed humidification system (Unresolved issue).
   b. Ventilator breathing circuits with HMEs
      1) No recommendation can be made for the preferential use of either HMEs or heated

Table 1. Examples of Semicritical Items* Used on the Respiratory Tract

Anesthesia device or equipment including:
Face mask or tracheal tube
- Inspiratory and expiratory tubing
- Y-piece
- Reservoir bag
- Humidifier
Breathing circuits of mechanical ventilators
Bronchoscopes and their accessories, except for biopsy forceps and specimen brush†
Endotracheal and endobronchial tubes
Laryngoscope blades
Mouthpieces and tubing of pulmonary-function testing equipment
Nebulizers and their reservoirs
Oral and nasal airways
Probes of carbon dioxide analyzers, air-pressure monitors
Resuscitation bags
Stylets
Suction catheters
Temperature sensors

*Items that directly or indirectly contact mucous membranes of the respiratory tract should be sterilized or subjected to high-level disinfection before re-use.
†Considered critical items and should be sterilized before re-use.

humidifiers to prevent pneumonia in patients receiving mechanically assisted ventilation (Unresolved issue) (IB).[44–49]

2) Changing HME
   a) Change an HME that is in use on a patient when it malfunctions mechanically or becomes visibly soiled (II).
   b) Do not routinely change more frequently than every 48 hours an HME that is in use on a patient (II).[50–52]
3) Do not change routinely (in the absence of gross contamination or malfunction) the breathing circuit attached to an HME while it is in use on a patient (II).[53]

4. Oxygen humidifiers
   a. Follow manufacturers' instructions for use of oxygen humidifiers (II,IC).[29,54–56]
   b. Change the humidifier-tubing (including any nasal prongs or mask) that is in use on one patient when it malfunctions or becomes visibly contaminated (II).
5. Small-volume medication nebulizers: in-line and hand-held nebulizers
   a. Between treatments on the same patient, disinfect, rinse with sterile water, or air-dry small-volume in-line or hand-held medication nebulizers (IB).[57–59]
   b. Use only sterile fluid for nebulization, and dispense the fluid into the nebulizer aseptically (IA).[40–42,58,60–62]
   c. Whenever possible, use aerosolized medications in single-dose vials. If multidose medication vials are used, follow manufacturers' instructions for handling, storing, and dispensing the medications (IB).[60,62–67]
6. Mist tents
   a. Between uses on different patients, replace mist tents and their nebulizers, reservoirs, and tubing with those that have been subjected to sterilization or high-level disinfection (II).[68]
   b. No recommendation can be made about the frequency of routinely changing mist-tent nebulizers, reservoirs, and tubing while in use on one patient (Unresolved issue).
   c. Subject mist-tent nebulizers, reservoirs, and tubing that are used on the same patient to daily low-level disinfection (eg, with 2% acetic acid) or pasteurization followed by air-drying (II).[69]
7. Other devices used in association with respiratory therapy
   a. Respirometer and ventilator thermometer: between their uses on different patients, sterilize or subject to high-level disinfection portable respirometers and ventilator thermometers (IB).[70–74]
   b. Resuscitation bags
      1) Between their uses on different patients, sterilize or subject to high-level disinfection reusable hand-powered resuscitation bags (IB).[75–79]
      2) No recommendation can be made about the frequency of changing hydrophobic filters placed on the connection port of resuscitation bags (Unresolved issue).
8. Anesthesia machines and breathing systems or patient circuits
   a. Do not routinely sterilize or disinfect the internal machinery of anesthesia equipment (IB).[80]
   b. Between uses on different patients, clean reusable components of the breathing system or patient circuit (eg, tracheal tube or face mask, inspiratory and expiratory breathing tubing, Y-piece, reservoir bag, humidifier, and tubing), and then sterilize or subject them to high-level liquid chemical disinfection or pasteurization in accordance with the device manufacturers' instructions for their reprocessing (IB).[24,26]
   c. No recommendation can be made about the frequency of routinely cleaning and disinfecting unidirectional valves and carbon dioxide absorber chambers (Unresolved issue).[81]
   d. Follow published guidelines or manufacturers' instructions about in-use maintenance, cleaning, and disinfection or sterilization of other components or attachments of the breathing system or patient circuit of anesthesia equipment (IB).[82,83]
   e. No recommendation can be made for placing a bacterial filter in the breathing system or patient circuit of anesthesia equipment (Unresolved issue).[3,84–89]
9. Pulmonary function testing equipment
   a. Do not routinely sterilize or disinfect the internal machinery of pulmonary-function testing machines between uses on different patients (II).[90,91]
   b. Change the mouthpiece of a peak flow meter or the mouthpiece and filter of a spirometer between uses on different patients (II).[91,92]
10. Room-air "humidifiers" and faucet aerators
    a. Do not use large-volume room-air humidifiers that create aerosols (eg, by venturi principle, ultrasound, or spinning disk, and thus

actually are nebulizers) unless they can be sterilized or subjected to high-level disinfection at least daily and filled only with sterile water (II).[40,93,94]

b. Faucet aerators

1) No recommendation can be made about the removal of faucet aerators from areas for immunocompetent patients (see also section on Legionnaires Disease [not reprinted here], Part II, Section I-C-1-d) (Unresolved issue).

2) If *Legionella* species are detected in the water of a transplant unit and until *Legionella* species are no longer detected by culture, remove faucet aerators in the unit (see also section on Legionnaires Disease [not reprinted here], Part II, Section I-C-1-d) (II).[95]

B. Prevention of Person-to-Person Transmission of Bacteria

1. Standard Precautions

a. Hand hygiene: Decontaminate hands by washing them with either antimicrobial soap and water, or with nonantimicrobial soap and water (if hands are visibly dirty or contaminated with proteinaceous material or are soiled with blood or body fluids), or by using an alcohol-based antiseptic agent (eg, hand rub) if hands are not visibly soiled after contact with mucous membranes, respiratory secretions, or objects contaminated with respiratory secretions, whether or not gloves are worn. Decontaminate hands as described previously, before and after contact with a patient who has an endotracheal or tracheostomy tube in place, and before and after contact with any respiratory device that is used on the patient, whether or not gloves are worn (IA).[37,39]

b. Gloving

1) Wear gloves for handling respiratory secretions or objects contaminated with respiratory secretions of any patient (IB).[37]

2) Change gloves and decontaminate hands as described previously, between contacts with different patients; after handling respiratory secretions or objects contaminated with secretions from one patient and before contact with another patient, object, or environmental surface; and between contacts with a contaminated body site and the respiratory tract of, or respiratory device on, the same patient (IA).[37,39,96–98]

c. Gowning

When soiling with respiratory secretions from a patient is anticipated, wear a gown and change it after soiling occurs and before providing care to another patient (IB).[37,97]

2. Care of patients with tracheostomy

a. Perform tracheostomy under aseptic conditions (II).

b. When changing a tracheostomy tube, wear a gown, use aseptic technique, and replace the tube with one that has undergone sterilization or high-level disinfection (IB).[23,24,37]

c. No recommendation can be made for the daily application of topical antimicrobial agent(s) at the tracheostoma (Unresolved issue).[99]

3. Suctioning of respiratory tract secretions (See also Section IV-B-1-d).

a. No recommendation can be made for the preferential use of either the multiuse closed-system suction catheter or the single-use open-system suction catheter for prevention of pneumonia (Unresolved issue).[44,100–102]

b. No recommendation can be made about wearing sterile rather than clean gloves when performing endotracheal suctioning (Unresolved issue).

c. No recommendation can be made about the frequency of routinely changing the in-line suction catheter of a closed-suction system in use on one patient (Unresolved issue).[103]

d. If the open-system suction is employed, use a sterile, single-use catheter (II).

e. Use only sterile fluid to remove secretions from the suction catheter if the catheter is to be used for re-entry into the patient's lower respiratory tract (II).

IV. Modifying Host Risk for Infection

A. Increasing Host Defense Against Infection: Administration of Immune Modulators

1. Pneumococcal vaccination. Vaccinate patients at high risk for severe pneumococcal infections.

a. Administer the 23-valent pneumococcal polysaccharide vaccine to persons aged ≥ 65 years; persons aged 5–64 years who have chronic cardiovascular disease (eg, congestive heart failure or cardiomyopathy), chronic pulmonary disease (eg, chronic obstructive pulmonary disease [COPD] or emphysema, but not asthma), diabetes mellitus, alcoholism, chronic liver disease (eg, cirrhosis), or

cerebrospinal fluid leaks; persons aged 5–64 years who have functional or anatomic asplenia; persons aged 5–64 years who are living in special environments or social settings; immunocompromised persons aged ≥ 5 years with human immunodeficiency virus (HIV) infection, leukemia, lymphoma, Hodgkin disease, multiple myeloma, generalized malignancy, chronic renal failure, nephrotic syndrome, or other conditions associated with immunosuppression (eg, receipt of HSCT, solid-organ transplant, or immunosuppressive chemotherapy, including long-term systemic corticosteroids); and persons in long-term-care facilities (IA).[104–109]

b. Administer the 7-valent pneumococcal polysaccharide protein-conjugate vaccine to all children aged < 2 years and to children aged 24–59 months who are at increased risk for pneumococcal disease (eg, children with sickle-cell disease or other hemoglobinopathies, or children who are functionally or anatomically asplenic; children with HIV infection; children who have chronic disease, including chronic cardiac or pulmonary disease [except asthma], diabetes mellitus, or cerebrospinal fluid leak; and children with immunocompromising conditions, including malignancies, chronic renal failure or nephrotic syndrome, or receipt of immunosuppressive chemotherapy, including long-term corticosteroids, and receipt of solid-organ transplant). Consider administering the vaccine to children aged 24–59 months, with priority to children aged 24–35 months, children who are American Indians/Alaska Natives or black, and children who attend group child-care centers (IB).[104]

c. In nursing homes and other long-term-care facilities, establish a standing-order program for the administration of 23-valent vaccine to persons at high risk for acquiring severe pneumococcal infections, including pneumococcal pneumonia (IA).[105,110,111]

2. No recommendation can be made for the routine administration of preparations of granulocyte-colony stimulating factor or intravenous gamma globulin for prophylaxis against health-care-associated pneumonia (Unresolved issue).[112–117]

3. No recommendation can be made for the routine enteral administration of glutamine for prevention of health-care-associated pneumonia (Unresolved issue).[118,119]

B. Precautions for Prevention of Aspiration

As soon as the clinical indications for their use are resolved, remove devices such as endotracheal, tracheostomy, and/or enteral (ie, oro- or nasogastric or jejunal) tubes from patients (IB).[120–125]

1. Prevention of aspiration associated with endotracheal intubation

a. Use of noninvasive ventilation to reduce the need for and duration of endotracheal intubation.

1) When feasible and not medically contraindicated, use noninvasive positive-pressure ventilation delivered continuously by face or nose mask, instead of performing endotracheal intubation in patients who are in respiratory failure and are not needing immediate intubation (eg, those who are in hypercapnic respiratory failure secondary to exacerbation of COPD or cardiogenic pulmonary edema) (II).[126–129]

2) When feasible and not medically contraindicated, use noninvasive ventilation as part of the weaning process (from mechanically assisted ventilation) to shorten the period of endotracheal intubation (II).[130]

b. As much as possible, avoid repeat endotracheal intubation in patients who have received mechanically assisted ventilation (II).[131]

c. Unless contraindicated by the patient's condition, perform orotracheal rather than nasotracheal intubation on patients (IB).[44,132,133]

d. If feasible, use an endotracheal tube with a dorsal lumen above the endotracheal cuff to allow drainage (by continuous or frequent intermittent suctioning) of tracheal secretions that accumulate in the patient's subglottic area (II).[44,134–137]

e. Before deflating the cuff of an endotracheal tube in preparation for tube removal, or before moving the tube, ensure that secretions are cleared from above the tube cuff (II).

2. Prevention of aspiration associated with enteral feeding

a. In the absence of medical contraindication(s), elevate at an angle of 30–45 degrees

the head of the bed of a patient at high risk for aspiration (eg, a person receiving mechanically assisted ventilation and/or who has an enteral tube in place) (II).[138–140]

b. Routinely verify appropriate placement of the feeding tube (IB).[141–143]

c. No recommendation can be made for the preferential use of small-bore tubes for enteral feeding (Unresolved issue).[144]

d. No recommendation can be made for preferentially administering enteral feedings continuously or intermittently (Unresolved issue).[145–148]

e. No recommendation can be made for preferentially placing the feeding tubes, (eg, jejunal tubes) distal to the pylorus (Unresolved issue).[149–155]

3. Prevention or modulation of oropharyngeal colonization

a. Oropharyngeal cleaning and decontamination with an antiseptic agent: develop and implement a comprehensive oral hygiene program (that might include the use of an antiseptic agent) for patients in acute-care settings or residents in long-term-care facilities who are at high risk for health-care-associated pneumonia (II).[156,157]

b. Chlorhexidine oral rinse

1) No recommendation can be made for the routine use of an oral chlorhexidine rinse for the prevention of health-care-associated pneumonia in all postoperative or critically ill patients and/or other patients at high risk for pneumonia (Unresolved issue) (II).[158]

2) Use an oral chlorhexidine gluconate (0.12%) rinse during the perioperative period on adult patients who undergo cardiac surgery (II).[158]

c. Oral decontamination with topical antimicrobial agents

1) No recommendation can be made for the routine use of topical antimicrobial agents for oral decontamination to prevent VAP (Unresolved issue).[159]

4. Prevention of gastric colonization

a. No recommendation can be made for the preferential use of sucralfate, H2-antagonists, and/or antacids for stress-bleeding prophylaxis in patients receiving mechanically assisted ventilation (Unresolved issue).[160–167]

b. No recommendation can be made for the routine selective decontamination of the digestive tract of all critically ill, mechanically ventilated, or ICU patients (Unresolved issue).[168–200]

c. No recommendation can be made for routinely acidifying gastric feeding (Unresolved issue).[201,202]

C. Prevention of Postoperative Pneumonia

1. Instruct preoperative patients, especially those at high risk for contracting pneumonia, about taking deep breaths and ambulating as soon as medically indicated in the postoperative period. Patients at high risk include those who will have abdominal aortic aneurysm repair, thoracic surgery, or emergency surgery; those who will receive general anesthesia; those who are aged $\geq$ 60 years; those with totally dependent functional status; those who have had a weight loss $>$ 10%; those using steroids for chronic conditions; those with recent history of alcohol use, history of COPD, or smoking during the preceding year; those with impaired sensorium, a history of cerebrovascular accident with residual neurologic deficit, or low ($<$ 8 mg/dL) or high ($>$ 22 mg/dL) blood urea nitrogen level; and those who will have received $>$ 4 units of blood before surgery (IB).[203–206]

2. Encourage all postoperative patients to take deep breaths, move about the bed, and ambulate unless medically contraindicated (IB).[205–207]

3. Use incentive spirometry on postoperative patients at high risk for pneumonia (IB).[205–207]

4. No recommendation can be made about the routine use of chest physiotherapy on all postoperative patients at high risk for pneumonia (Unresolved issue).[205–207]

D. Other Prophylactic Procedures for Pneumonia

1. Administration of antimicrobial agents other than in selective decontamination of the digestive tract

a. Systemic antimicrobial prophylaxis.
No recommendation can be made about the routine administration of systemic antimicrobial agent(s) to prevent pneumonia in critically ill patients or in those receiving mechanically-assisted ventilation (Unresolved issue).[200,208]

b. Scheduled changes in the class of antimicrobial agents used for empiric therapy
No recommendation can be made for scheduled changes in the class of antimicrobial agents used routinely for empiric treatment of suspected infections in a particular group of patients (Unresolved issue).[209,210]

2. Turning or rotational therapy
   No recommendation can be made for the routine use of turning or rotational therapy, either by "kinetic" therapy or by continuous lateral rotational therapy (ie, placing patients on beds that turn on their longitudinal axes intermittently or continuously) for prevention of health-care-associated pneumonia in critically ill and immobilized patients (Unresolved issue).[44,211–216]

[The remainder of Part II is not reprinted here. See *http://www.cdc.gov/ncidod/hip/pneumonia/default.htm*]

Part III—Performance Indicator
[abridged]

To assist infection-control personnel in assessing personnel adherence to the recommendations, the following performance measure is suggested:

1. Monitor rates of VAP; can use established benchmarks and definitions of pneumonia (eg, National Nosocomial Infection Surveillance definitions and rates).[14] Provide feedback to the staff about the facility's VAP rates and reminders about the need for personnel to adhere to infection-control practices that reduce the incidence of VAP.

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