Central Line Bloodstream Infections

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Central Line Bloodstream Infections

• Central Lines
  – Hickman
  – Groshong
  – Dialysis Catheter
  – Implanted ports
  – Triple lumen
  – PICC Line

• Midlines are not counted as a central line
Cost of CL-BSI Annually

- 250K – 400K CVC-associated BSIs occur in the U.S. annually
- Estimated cost per infection $25 - $56K
- Estimated annual cost to healthcare system: up to $2.3 billion
## Rate of BSI by Catheter Type

<table>
<thead>
<tr>
<th>Type of Catheter</th>
<th>Per 100 Catheters (mean)</th>
<th>Per 1,000 Catheter Days (mean)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIV</td>
<td>0.2</td>
<td>0.6</td>
</tr>
<tr>
<td><strong>Short-term CVC</strong></td>
<td>3.3</td>
<td>2.3</td>
</tr>
<tr>
<td><strong>PICC</strong> (too low per Dr. Maki)</td>
<td>1.2*</td>
<td>0.4* (2.1)</td>
</tr>
<tr>
<td>Tunneled CVC</td>
<td>20.9</td>
<td>1.2</td>
</tr>
<tr>
<td>Implanted Port</td>
<td>5.1</td>
<td>0.2</td>
</tr>
<tr>
<td>Dialysis: noncuffed</td>
<td>16.2</td>
<td>2.8</td>
</tr>
<tr>
<td>Dialysis: cuffed</td>
<td>6.3</td>
<td>1.1</td>
</tr>
</tbody>
</table>
Hospital Acquired Infections by Infection Type

<table>
<thead>
<tr>
<th>Infection Type</th>
<th>Average Charge per Discharge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urinary Tract Infection</td>
<td>$13,159</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>$14,951</td>
</tr>
<tr>
<td>Bloodstream Infection</td>
<td>$25,996</td>
</tr>
</tbody>
</table>

\(^2\)Agency for Healthcare Research and Quality (AHRQ) 2002. Data based on DRGs 320, 89, and 415 for urinary tract infection, pneumonia, and septicemia, respectively. Infection types may be community- or hospital-acquired.*Includes skin, intra-abdominal, and central nervous system infections.
Skin Preparation

Apply chlorhexidine skin antiseptic using friction for 30 seconds in a back & forth motion

Attachment on passage through the skin

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Daily Site Assessment

- Assess exit site for drainage
- Check if dressing is wet, loose or soiled
- Change if needed
- Notify MD if site is tender & swollen or has pus-like drainage
Cleansing Site for Dressing Change

Apply Chloraprep using friction for 30 seconds; let dry completely

Clean exit site with alcohol if needed; e.g., remove old blood
Regrowing Surface Bacteria

WITHIN HOURS EDEMA/DRAINAGE OCCUPY THE SKIN TRACT

MIGRATION OF REGROWING SURFACE BACTERIA BY DIFFUSION IN THE EDEMATOUS SKIN TRACT
Migration of Regrowing Surface Bacteria

Antimicrobial Dressing with Chlorhexidine Gluconate

MIGRATION OF REGROWING SURFACE BACTERIA

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2nd Source of CLBSI

• Hubs are 2nd source of CRI
• Suspect hub as source of CRI if infection develops > 10 days after insertion
• Failure to clean IV tubing/hub connection
• Every access must be disinfected
• Clean with alcohol like “juicing an orange”
• Needless connector design is implicated in ↑ rates of CLBSI---Dr Wm Jarvis, epidemiological work
Strategies to Prevent Central Line–Associated Bloodstream Infections in Acute Care Hospitals

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PURPOSE

Previously published guidelines are available that provide comprehensive recommendations for detecting and preventing healthcare-associated infections. The intent of this document is to provide guidance for caring for patients placed in emergency circumstances, repeatedly accessed each day, and often needed for extended periods.1,2

b. Non-ICU population: Although the primary focus of attention over the past 2 decades has been the ICU setting, recent data suggest that the greatest numbers of patients...
Central Line Bundle Checklist

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Ventilator Associated Pneumonia

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Ventilator-Associated Pneumonia (VAP)

- HAI in patients on a mechanical ventilator
  - Whom have no other reason for the infection
  - Infection started after ventilation
    - New or progressive pulmonary infiltrate with fever
    - Leukocytosis
    - Purulent tracheobronchial secretions
  - Considered a VAP
    - If the patient was intubated and ventilated at the time or within 48 hours before the onset of infection
- CDC definition, “There is no minimum period of time that the ventilator must be in place in order for the PNEU to be considered ventilator-associated.”
• Leading cause of death from HAIs
  – Exceed the rate of death to:
    • Central Line Infections (CLIs)
    • severe sepsis
    • respiratory tract infections in non-intubated patients
  – Mortality 46% compared to 32% for ventilated patients without pneumonia*

• Prolongs time spent on ventilator
• Increase length of stay in ICU
• Increase length of stay after discharge from ICU*
• Cost an additional $40,000**


Compendium of Strategies to Prevent HAIs (APIC-SHEA)

http://www.shea-online.org/about/compendium.cfm

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Strategies to Prevent Ventilator-Associated Pneumonia in Acute Care Hospitals

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PURPOSE

Previously published guidelines are available that provide comprehensive recommendations for detecting and preventing healthcare-associated infections. The intent of this document is to highlight practical recommendations in a concise format designed to assist acute care hospitals in implementing and prioritizing their ventilator-associated pneumonia (VAP) prevention efforts. Refer to the Society for Healthcare Epidemiology of America's Infections Diseases Society of America “Compendium of Strategies to Prevent Healthcare-Associated Infections" Executive Summary and Introduction and accompanying editorial for additional discussion.

1. Mortality attributable to VAP may exceed 10%.xxx
2. Patients with VAP require prolonged periods of mechanical ventilation, extended hospitalizations,xxx excess use of antimicrobial medications, and increased mortal and surgical patient populations.*** The results of recent quality improvement initiatives, however, suggest that many cases of VAP might be prevented by careful attention to the process of care.

SUPPORTING ARTICLES SHEA/IDSA PRACTICE RECOMMENDATION

October 2011, Vol. 18, Supplement 3

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• 45% reduction in VAPs by use of the VAP Bundle
• Requires interventions and teamwork
  – randomized controlled trial of 86 intubated patients on mechanical ventilation assigned to semi-recumbent (45 degrees) or supine position, there were 18% fewer confirmed cases of VAP (p=0.018). *
  – In another study 128 adults on mechanical ventilation randomized to daily interruption of sedation until the patient was awake or interruption at the clinician’s discretion, the duration of ventilation was decreased from 7.3 days to 4.9 days (p=0.004). **
• These results brought about the VAP Bundle

VAP Bundle

1. Elevation of the head of the bed (HOB) to between 30 and 45 degrees
2. Daily “sedative interruption” and daily assessment of readiness to extubate
3. Peptic ulcer disease (PUD) prophylaxis
4. Deep venous thrombosis (DVT) prophylaxis (unless contraindicated)
• Elevation of the head of the bed (HOB) to between 30 and 45 degree
  – patients in the supine position will have lower spontaneous tidal volumes on pressure support ventilation than those seated in an upright position. Although patients may be on mandatory modes of ventilation, the improvement in position may aid ventilatory efforts and minimize atelectasis.
Changes That Can Result In Improvement

HEAD –OF-THE BED ELEVATED

• Implement a mechanism to ensure head-of-the-bed elevation, such as including this intervention on nursing flow sheets and as a topic at multidisciplinary rounds.

• Create an environment where respiratory therapists work collaboratively with nursing to maintain head-of-the-bed elevation.

• Involve families in the process by educating them about the importance of head-of-the-bed elevation and encourage them to notify clinical personnel when the bed does not appear to be in the proper position.

• Use visual cues so it is easy to identify when the bed is in the proper position, such as a line on the wall that can only be seen if the bed is below a 30-degree angle.

• Include this intervention on order sets for initiation and weaning of mechanical ventilation, delivery of tube feedings, and provision of oral care.

• Post compliance with the intervention in a prominent place in your ICU to encourage change and motivate staff.
SEDATION VACATION

- Implement a protocol to lighten sedation daily at an appropriate time to assess for neurological readiness to extubate. Include precautions to prevent self-extubation such as increased monitoring and vigilance during the trial.
- Include a sedative interruption strategy in your overall plan to wean the patient from the ventilator; if you have a weaning protocol, add sedative interruption to that strategy.
- Assess compliance each day on multidisciplinary rounds.
- Consider implementation of a sedation scale such as the Riker scale to avoid over-sedation.
- Post compliance with the intervention in a prominent place in your ICU to encourage change and motivate staff.
Changes That Can Result In Improvement

PEPTIC ULCER PREVENTION

– Include peptic ulcer disease prophylaxis as part of your ICU order admission set and ventilator order set. Make application of prophylaxis the default value on the form.

– Include peptic ulcer disease prophylaxis as an item for discussion on daily multidisciplinary rounds. Count this item as “met” if the discussion occurs and is documented, even if there is a decision not to provide this intervention.

– Empower pharmacy to review patients in the ICU to ensure that some form of peptic ulcer disease prophylaxis is provided for all appropriate ICU patients.

– Post compliance with the intervention in a prominent place in your ICU to encourage change and motivate staff.
Changes That Can Result In Improvement

• Deep Venous Thrombosis (DVT) Prophylaxis
  – Include deep venous thrombosis prophylaxis as part of your ICU order admission set and ventilator order set. Make application of prophylaxis the default value on the form.
  – Include deep venous thrombosis prophylaxis as an item for discussion on daily multidisciplinary rounds. Count this item as “met” if the discussion occurs and is documented, even if there is a decision not to provide this intervention.
  – Empower pharmacy to review orders for patients in the ICU to ensure that some form of deep venous thrombosis prophylaxis is in place at all times on ICU patients.
  – Post compliance with the intervention in a prominent place in your ICU to encourage change and motivate staff.
Reference/Resources

- [www.hai.org](http://www.hai.org)
  - Best Practice documents
Surgical Site Infections
• Burden of SSIs as complications in acute care facilities.
  – a. SSIs occur in 2%-5% of patients undergoing inpatient surgery in the United States.
• Approximately 500,000 SSIs occur each year.
Outcomes Associated with SSIs

• Each SSI is associated with approximately 7-10 additional postoperative hospital days.
  Patients with an SSI have a 2-11 times higher risk of death, compared with operative patients without an SSI.
• Seventy-seven percent of deaths among patients with SSI are directly attributable to SSI.
• Attributable costs of SSI vary, depending on the type of operative procedure and the type of infecting pathogen; published estimates range from $3,000 to $29,000.
• SSIs are believed to account for up to $10 billion annually in healthcare expenditures.
Methods for Surveillance of SSI

- **Direct Method**
  - Daily observation
  - Impractical

- **Indirect**
  - Review of lab reports and pt. medical records
  - Surgeon/patient surveys
  - Readmission screening
  - Coding or operative reports
    - Reliable

- **Post discharge surveillance**
  - No standardized or reliable method has been established

- SSIs managed in outpatient setting – superficial
- Readmissions – deep incisional and organ/space infections
Surgical Improvement Project 2003

- Performance Measures
  - Proper hair removal
    - Clipper or depilatory method
  - Controlling blood glucose levels in CABG patients
    - 6am blood glucose levels lower than 200 mg/dL on postop day 1 and 2 – day of surgery is postop day 0
  - Normothermia for patients have colorectal surgery
  - IV antibiotics within 1 hour before incision (2 hours are allowed for vancomycin and fluoroquinolones)
  - Discontinue use of antibiotics within 24 hours after surgery (48 hours is allowable for CABG procedures)
Risk Factors

- **Intrinsic**
  - Age, glucose control, obesity, smoking cessation, immunosuppressive medication

- **Extrinsic**
  - Hair removal, preop infections, surgical scrub, skin preparation, antibiotic time, choice, duration, surgeon skill/technique, operative time

- **Operating room characteristic**
  - Ventilation
  - Traffic
  - Environmental surfaces
  - Sterilization of surgical equipment
Education

• Surgeons and Perioperative personnel
• Patients and families
  – What you need to know about infections after surgery fact sheets
    • http://www.ihi.org/NR/rdonlyres/0EE409F4-2F6A-4B55-AB01-16B6D6935EC5/0/SurgicalSiteInfectionsPtsandFam.pdf
  – Surgical Care Improvement Project consumer info
Unresolved Issues

- Preoperative bathing with chlorhexidine (CHG)
- Routine screening for MRSA
  - Routine decolonization
- Maintaining oxygenation post colorectal procedure
- Maintaining normothermia post colorectal procedure
- Perioperative intranasal and pharyngeal CHG treatment post cardiothoracic procedures
Performance Measures

• Process measures
  – Correct type of antibiotic
  – Administration time of antibiotic
  – Discontinuation of antibiotic
Calculations

• Calculating infections
  Number of patients who appropriately received antibiotic prophylaxis
  Total number of selected procedures performed \( \times 100 = \% \)

• Compliance with hair-removal guidelines
  Number of patients with appropriate hair removal \( \times 100 = \% \)
  Total number of selected operations performed

• Compliance with perioperative glucose control
  Number of patients with appropriately maintain serum glucose at 6am on both postoperative day 1 and day 2 after cardiac surgery \( \times 100 = \% \)
  Total number of cardiac procedures performed

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Outcome Measures

- Use NHSN definitions and risk adjustment methods

\[
\text{Number of patients with surgical site infections after selected operations} \times 100 =
\]
\[
\text{Total number of selected operations performed}
\]

- Surgeon Infection Rates

\[
\text{Number of SSI per surgeon} \times 100 = 
\]
\[
\text{Number of like procedures done by the surgeon}
\]
External Reporting

• Hospital-Infection Control Practices Advisory Committee

• Healthcare-Associated Infection Working Group of the Joint Public Policy Committee

• National Quality Forum
State and Federal Requirements

• Federal
  – Hospitals that receive Medicare reimbursement must report quality measures required by CMS

• State
  – Data required by state
Supplement Article: SHEA/IDSA Practice Recommendation

Strategies to Prevent Surgical Site Infections in Acute Care Hospitals

Deverick J. Anderson, MD, MPH; Keith S. Kaye, MD; David Classen, MD, MS; Kathleen M. Arias, MS, CIC; Kelly Podgorny, RN, MS, CPHQ; Helen Burstin, MD; David P. Callen, MD, MS; Susan E. Coffin, MD, MPH; Erik R. Dubberke, MD; Victoria Fraser, MD; Dale N. Gerding, MD; Frances A. Griffin, RRT, MPA; Peter Gross, MD; Michael Klompas, MD; Evelyn Lo, MD; Jonas Marschall, MD; Leonard A. Mermel, DO, ScM; Lindsay Nicolle, MD; David A. Pegues, MD; Trish M. Perl, MD; Sanjay Saint, MD; Cassandra D. Salgado, MD, MS; Robert A. Weinstein, MD; Robert Wise, MD; Deborah S. Yokoe, MD, MPH

Purpose

Previously published guidelines are available that provide comprehensive recommendations for detecting and preventing healthcare-associated infections. The intent of this document is to highlight practical recommendations in a concise format designed to assist acute care hospitals to implement and prioritize their surgical site infection (SSI) prevention efforts. Refer to the Society for Healthcare Epidemiology of America/Infectious Diseases Society of America "Compendium of Strategies to Prevent Healthcare-Associated Infections: Executive Summary and Introduction and overview..."

i. Seventy-seven percent of deaths among patients with SSI are directly attributable to SSI.7

1. Definitions

http://www.shea-online.org/about/compendium.cfm

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QUESTIONS