Proper Collection of Blood Cultures To Improve Patient Outcomes

A Lecture at the APIC Central Illinois IP Conference,
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Infection Control Preventionist
Lecture Objectives

- Provide evidence on the potential impact of specimen contamination on CLABSIs and CAUTIs

- Describe guideline recommendations and study findings that provide insight on blood and urine culture collection

- Provide a checklist of best practices in blood and urine culture collection
Blood Cultures
A Multidisciplinary Team Review of Best Practices for Blood Cultures to Determine Effective Interventions for Increasing the Yield of True-Positive Bacteremias, Reducing Contamination, and Eliminating False-Positive Central Line Associated Bloodstream Infections (CLABSI)

Reviewed by L. Hadaway, T. Murphy, F. Singh, D. Roberts

American Journal of Infection Control and Epidemiology, Dec 2015
Reasons for Optimizing Blood Culture Collection & Handling

- Identifying true pathogens
- Avoidance of blood culture contamination
- Avoiding false positive CLABSIs
Need for Maximizing True Pathogens

- Septicemia is the 11th leading cause of death in the U.S. accounting for more than 38,000 lives per year
- Sepsis is currently the most expensive hospital condition ($20.29 billion) among inpatients
- ...has accounted for a 32 percent increase in hospitalizations in recent years
- ...and is the leading cause of admission to a hospital for adults aged 45 to 84 years after an Emergency Department (ED) visit
- Guidelines recommend blood cultures to be obtained within three hours of presentation and prior to administration of antibiotics

Surviving Sepsis Campaign. Updated Bundles in Response to New Evidence. Available at: http://www.survivingsepsis.org/SiteCollectionDocuments/SSC_Bundle.pdf
Blood Culture Contamination

- Contaminated BCs are associated with severe financial and clinical consequences
- Landmark study by the College of American Pathologists (CAP) of 497,134 BCs obtained in 640 hospitals reported mean contamination rate of 2.5%
- Most U.S. hospitals use a BCC benchmark of ≤3.0% as derived from CAP Q-Tracks Monitor data
- BCs are considered contaminated if one or more of the following organisms are found in only one bottle in a series of BC sets (e.g., 1 of 1; 1 of 2, etc.):

Performance Improvement

DMAIC

Define:
- What's important?
- Identify the key issue, key problem, key process.

Measure:
- What are we doing?
- Measure key parameters.
- Map service flow/information flow.

Analyze:
- What's wrong?
- Analyze root causes.
- Look at process efficiency.

Improve:
- What needs to be done?
- Eliminate waste. Identify actions.

Control:
- How do we guarantee performance?
- Validate and verify improvements. Process controls.
Define & Measure (Surveillance): NHSN CLABSI Definitions, 2016

<table>
<thead>
<tr>
<th>LCBI</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCBI 1</td>
<td>Patient has a recognized pathogen cultured from one or more blood cultures AND organism cultured from blood is not related to an infection at another site.</td>
</tr>
<tr>
<td>LCBI 2</td>
<td>Patient has at least one of the following signs or symptoms: fever (&gt;38.00°C), chills, or hypotension AND organism cultured from blood is not related to an infection at another site (See Appendix 1 Secondary BSI Guide) AND the same common commensal (i.e., diphtheroids [Corynebacterium spp. not C. diphtheriae], Bacillus spp. [not B. anthracis], Propionibacterium spp., coagulase-negative staphylococci [including S. epidermidis], viridans group streptococci, Aerococcus spp., and Micrococcus spp.) is cultured from two or more blood cultures drawn on separate occasions.</td>
</tr>
<tr>
<td>LCBI 3</td>
<td>Patient ≤ 1 year of age has at least one of the following signs or symptoms: fever (&gt;38.00°C), hypothermia (&lt;36.00°C), apnea, or bradycardia AND organism cultured from blood is not related to an infection at another site (See Appendix 1 Secondary BSI Guide) AND the same common commensal (i.e., diphtheroids [Corynebacterium spp. not C. diphtheriae], Bacillus spp. [not B. anthracis], Propionibacterium spp., coagulase-negative staphylococci [including S. epidermidis], viridans group streptococci, Aerococcus spp., and Micrococcus spp.) is cultured from two or more blood cultures drawn on separate occasions.</td>
</tr>
</tbody>
</table>

System Analysis

CLABSIs

STAFF BEHAVIOR & PRACTICE
- Aseptic vs. Sterile Techniques used during insertion & maintenance
- Attire worn during procedure
- Site of Insertion
- Experience of Person Inserting

EDUCATION
- Consideration for alternative devices
- Insertion & maintenance of catheters & lines
- Application, care & maintenance of dressings
- Knowledge of definition of CR-BSI
- Catheter culturing technique
- Maintenance of log/book to track patients
- Nursing / Physician chart documentation
- Dating of dressings
- Dating insertion site
- Indications for insertion
- Attire during insertion
- Risk by site of insertion
- Replacement and Relocation of device
- Guidewire changes
- Replacement of dressing
- Replacement of administration sets
- Hang time for parenteral fluids

COMMUNICATION BETWEEN PROVIDERS
- BSI surveillance rounds
- CVC insertion observation
- Dressing observation
- Communicate monitoring findings to appropriate staff
- Review CR-BSI data with staff
- Indications for insertion
- Attire during insertion
- Risk by site of insertion
- Replacement and Relocation of device
- Guidewire changes
- Replacement of dressing
- Replacement of administration sets
- Hang time for parenteral fluids

PRODUCTS & DEVICES
- Catheters (coatings)
- Dressings
- Skin antiseptic
- Dressing K

DOCUMENTATION
- Maintenance of log/book to track patients
- Dating of dressings
- Dating insertion site

POLICY & PROCEDURE
- BSI surveillance rounds
- CVC insertion observation
- Dressing observation
- Communicate monitoring findings to appropriate staff
- Review CR-BSI data with staff
- Indications for insertion
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R. Garcia, 2002
Prevention by Use of Bundles: The 100,000 Lives Campaign

- Institute for Healthcare Improvement initiative to reduce healthcare errors and infections
- *Implemented January 2005*
- Addresses specific healthcare-acquired infections
  - CVC-associated BSI
  - “Central line bundle”
    - Hand hygiene
    - Maximal sterile barriers upon insertion
    - Chlorhexidine skin antisepsis
    - Optimal catheter site selection
    - Daily review of line necessity with prompt removal of unnecessary lines

http://ihi.org/IHI/Programs/Campaign/Campaign.htm
Blood Culture Collection & Handling

- Surveillance
- Preventive Initiatives
- System Analysis
BCC Effect on CLABSIis

- LCBI 1: so called NHSN “recognized pathogens” such as *S. aureus* or *Enterococcus* have been identified as contaminants (6.4% and 16.1% respectively) in major study; when a “pathogen” is not related to an infection at another site, as occurs when a contaminant is identified, then the event is a CLABSI.

- LCBI 2: clinical situations, e.g., patient’s venous condition, limited CVAD lumen access, clinician’s workload may restrict “ideal” blood draws from separate sites or at different times.

- There exists no “gold standard” for determining true infection vs. contamination of BCs....this limitation may impact the variability in identifying reportable CLABIs.

<table>
<thead>
<tr>
<th>Organism</th>
<th>Probability That the Organism Is a True Pathogen</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gram positive aerobic bacteria</strong></td>
<td></td>
</tr>
<tr>
<td><em>Staphylococcus aureus</em></td>
<td>High</td>
</tr>
<tr>
<td>Coagulase-negative staphylococci</td>
<td>Low/intermediate</td>
</tr>
<tr>
<td><em>Enterococcus</em> spp.</td>
<td>Intermediate/high</td>
</tr>
<tr>
<td>Viridens group streptococci</td>
<td>Intermediate</td>
</tr>
<tr>
<td>Beta-hemolytic streptococci</td>
<td>High</td>
</tr>
<tr>
<td><em>Streptococcus pneumoniae</em></td>
<td>High</td>
</tr>
<tr>
<td><em>Bacillus</em> spp.</td>
<td>Low</td>
</tr>
<tr>
<td><em>Corynebacterium</em> spp.</td>
<td>Low</td>
</tr>
<tr>
<td><strong>Gram-negative aerobic bacteria</strong></td>
<td></td>
</tr>
<tr>
<td><em>Eschericia coli</em></td>
<td>High</td>
</tr>
<tr>
<td><em>Klebsiella pneumoniae</em></td>
<td>High</td>
</tr>
<tr>
<td><em>Enterobacter cloacae</em></td>
<td>High</td>
</tr>
<tr>
<td><em>Pseudomonas aeruginosa</em></td>
<td>High</td>
</tr>
<tr>
<td><em>Acinetobacter baumanii</em></td>
<td>Intermediate/high</td>
</tr>
<tr>
<td><strong>Anaerobic bacteria</strong></td>
<td></td>
</tr>
<tr>
<td><em>Clostridium</em> spp.</td>
<td>Intermediate</td>
</tr>
<tr>
<td><em>Propionbacterium</em> spp.</td>
<td>Low</td>
</tr>
<tr>
<td><em>Bacteroides fargilis</em> group</td>
<td>High</td>
</tr>
<tr>
<td><strong>Yeast</strong></td>
<td></td>
</tr>
<tr>
<td><em>Candida</em> spp.</td>
<td>High</td>
</tr>
</tbody>
</table>

Are we preventing the preventable?

The Blood Culture Factor
Major Guidelines Addressing BCs


- **Infusion Nurses Society.** Infusion Nursing Standards of Practice. J Inf Nurs (Supp.) Jan/Feb 2011;Vol 34, No. 1S. p. S1-S110.
Optimizing Blood Culture Collection: Elements in the Process
Clinical Indications for BCs

- Obtain BCs for specific clinical conditions:
  - Patients with...
    - fever (≥38°C)
    - hypothermia (≤36°C)
    - leukocytosis
    - an absolute granulocytopenia
    - ...or combination of these markers
  - Sepsis
  - Meningitis
  - Suspected catheter-related bacteremia
  - Infectious endocarditis
  - Arthritis
  - Osteomyelitis
  - Fever of unknown origin

Universal Decolonization

- Large study, 74 adult ICUs, 43 hospitals
- Strategy of using intranasal mupirocin and daily chlorhexidine gluconate using impregnated cloths was most effective
- 45% reduction in BCC rate
- Three other studies showed 58.1%, 41.3%, and 53.0% BCC rate reduction, respectively


**“Blood for BCs should be drawn via peripheral venipuncture unless clearly necessary”**

When CRBSI is Suspected

- **Non-neutropenic adults:** Draw 2 sets of BCs, one from the line and one peripheral.
  

- **Adult patient with fever and neutropenia:** Draw at least two sets, with a set collected from simultaneously from each lumen of an existing catheter, and a peripheral vein site.
  
Needleless Connectors & Hubs

- “...the NC should be changed in the following circumstances...prior to drawing a sample for BC from the VAD,...”
- No studies published examining BCC rates when drawing directly from an IV hub or new NC

Sterile Gloves

- Sterile Gloves: 6-month, cluster randomized trial, 17 medical units, interns drawing BCs via venipuncture, Korea
- Use of sterile gloves reduced BCC by 50%

<table>
<thead>
<tr>
<th>Variable</th>
<th>Blood Culture, n</th>
<th>Probability of Contamination</th>
<th>Contamination Rate, % (n/n)</th>
<th>Adjusted Odds Ratio (95% CI)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Routine Sterile Gloving</td>
<td>Optional Sterile Gloving</td>
<td></td>
</tr>
<tr>
<td>General wards</td>
<td>7027</td>
<td>Likely or possible</td>
<td>0.6 (27/3528)</td>
<td>1.2 (42/3499)</td>
<td>0.64 (0.39–1.04)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Likely only</td>
<td>0.6 (20/3528)</td>
<td>1.0 (36/3499)</td>
<td>0.55 (0.32–0.96)</td>
</tr>
<tr>
<td>Hematology wards</td>
<td>2446</td>
<td>Likely or possible</td>
<td>0.4 (5/1203)</td>
<td>0.5 (6/1243)</td>
<td>0.85 (0.26–2.81)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Likely only</td>
<td>0.2 (3/1203)</td>
<td>0.5 (6/1243)</td>
<td>0.52 (0.13–2.07)</td>
</tr>
<tr>
<td>Intensive care unit</td>
<td>1047</td>
<td>Likely or possible</td>
<td>0.4 (2/534)</td>
<td>2.3 (12/513)</td>
<td>0.18 (0.04–0.80)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Likely only</td>
<td>0.2 (1/534)</td>
<td>1.0 (5/513)</td>
<td>0.19 (0.02–1.66)</td>
</tr>
<tr>
<td>Randomization group</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Routine to optional sterile gloving</td>
<td>5397</td>
<td>Likely or possible</td>
<td>0.7 (20/2729)</td>
<td>1.3 (34/2668)</td>
<td>0.59 (0.34–1.05)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Likely only</td>
<td>0.5 (14/2729)</td>
<td>1.0 (26/2668)</td>
<td>0.54 (0.28–1.04)</td>
</tr>
<tr>
<td>Optional to routine sterile gloving</td>
<td>5123</td>
<td>Likely or possible</td>
<td>0.6 (14/2536)</td>
<td>1.0 (26/2587)</td>
<td>0.55 (0.29–1.05)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Likely only</td>
<td>0.4 (10/2536)</td>
<td>0.8 (21/2587)</td>
<td>0.48 (0.23–1.03)</td>
</tr>
<tr>
<td>Overall</td>
<td>10,520</td>
<td>Likely or possible</td>
<td>0.6 (34/5265)</td>
<td>1.1 (60/5255)</td>
<td>0.57 (0.37–0.87)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Likely only</td>
<td>0.5 (24/5265)</td>
<td>0.9 (47/5255)</td>
<td>0.51 (0.31–0.83)</td>
</tr>
</tbody>
</table>

### Normal flora of oral cavity

- Actinobacillus
- Actinomyces
- Fusobacterium
- Haemophilus
- Lactobacillus
- Micrococcus
- Mycoplasma
- Propionibacterium
- Streptococcus viridens grp

### NHSN reported CLABSI pathogens (top eight)

2. *S. aureus*
3. *E. faecalis*
4. Candida other than albicans
5. *Klebsiella*
6. *E. faecium*
7. *C. albicans*

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Antisepsis of Skin

- Systematic review of RCTs: *Alcoholic chlorhexidene gluconate solutions are associated with lower rates of BCC*

Central Line Procedure
BC Bottles: Disinfection

- The septa of BC bottles are not sterile
- “…the rubber septum on the BC bottle should be disinfected with 70% alcohol and allowed to dry”
- Do not use iodine products

Discarding Initial Volume

- Practice of discarding the initial aliquot of blood before inoculating blood culture bottle
- Not addressed in guidelines
- Studies indicate that discarding initial aliquot of blood reduces contamination only when drawing via venipuncture not a central line; theory is that bacteria present on skin increases contamination

BC Bottles: Volume of Blood

Drawing the correct volume of blood is the single most important factor in maximizing the yield of true pathogens when collecting blood for culture, fill each bottle to the “fill” line.

### Recommended Volumes of Blood

- **Adults**: 20-30 mL of blood per culture set
- **Pediatrics** (blood culture set may use only 1 bottle):

<table>
<thead>
<tr>
<th>Weight of Patient (kg)</th>
<th>Total Patient Blood Volume (mL)</th>
<th>Recommended Volume of Blood for Culture (mL)</th>
<th>Total Volume for Culture (mL)</th>
<th>% of Total Blood Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤1</td>
<td>50–99</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>1.1–2</td>
<td>100–200</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>2.1–12.7</td>
<td>&gt;200</td>
<td>4</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>12.8–36.3</td>
<td>&gt;800</td>
<td>10</td>
<td>10</td>
<td>2.5</td>
</tr>
<tr>
<td>&gt;36.3</td>
<td>&gt;2200</td>
<td>20–30</td>
<td>20–30</td>
<td>1.8–2.7</td>
</tr>
</tbody>
</table>

In order to minimize contamination, when collecting blood for multiple laboratory tests during a single procedure, blood for culture should be collected first.
BC Bottles: Distribution of Sample

- **Aerobic** bottle: contains broth media that enhances the growth of bacteria that require oxygen to survive.
- **Anaerobic** bottle: contains broth media that enhances growth of bacteria from body sites where oxygen is limited.
- Majority of organisms grow in aerobic conditions (90% vs. 10%......therefore....)
## BC Bottles: Number of Sets

- **Draw two or more sets when possible**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>N=80</td>
<td>N=282</td>
<td>N=181</td>
<td>N=687</td>
<td>N=285</td>
</tr>
<tr>
<td>2</td>
<td>88</td>
<td>&gt;99</td>
<td>82</td>
<td>90</td>
<td>82</td>
</tr>
<tr>
<td>3</td>
<td>99</td>
<td>&gt;99</td>
<td>96</td>
<td>98</td>
<td>92</td>
</tr>
<tr>
<td>4</td>
<td>-</td>
<td>&gt;99</td>
<td>100</td>
<td>&gt;99</td>
<td>-</td>
</tr>
</tbody>
</table>

Cumulative % positive

BC Bottles: Antibiotic-Absorbing Resin Media

- BCs should be obtained prior to starting antibiotics
- 28-63% of patients are on antibiotics prior to BC collection
- Use BC bottles that have antibiotic-absorbing resin media

BC Bottles: Labeling
BC Bottles: Transport

- Transport to lab within 2 hours of collection

- Specimens should be held at room temperature but never refrigerated or frozen

### Checklist of BC Process Elements

#### Table 4. Checklist of Elements to Consider in a Blood Culture Collection and Handling Policy.

<table>
<thead>
<tr>
<th>Policy element</th>
<th>Comment</th>
<th>CLSI (19)</th>
<th>CDC (43)</th>
<th>ENA (45)</th>
<th>NPSLAB (46)</th>
<th>IKA (19B)</th>
<th>Onderwaard (149)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Establish clinical indications for BCs</td>
<td>Consider adding selection list to electronic medical record (EMR)</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>56</td>
</tr>
<tr>
<td>Establish clinical indications for follow-up BCs</td>
<td>Consider adding selection list to electronic medical record (EMR)</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>56</td>
</tr>
<tr>
<td>Use a procedure checklist outlining critical elements in the process</td>
<td>A checklist can be used to identify adherence to established policy and for re-emphasis of suggested practice</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>153</td>
</tr>
<tr>
<td>Use universal decontamination using 2% CHG cloths</td>
<td>Universal decontamination has been reported to reduce BCC in most studies</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>51-55</td>
</tr>
<tr>
<td>Program should start with assessment and intervention in the Emergency Department</td>
<td>BCCs are associated with higher numbers of BCs and rates of BCCs, EDs admit patients to all hospital services</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>57; 76, 88, 134-141</td>
</tr>
<tr>
<td>Educate all personnel collecting BCs</td>
<td>Education sessions should provide information on adverse outcomes of contaminant rates, benefits of identifying true pathogens, and best practice elements when obtaining BCs</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>15; 125, 136, 144, 146</td>
</tr>
<tr>
<td>Use a dedicated phlebotomy team for collecting samples via venipuncture</td>
<td>Phlebotomy teams are associated with lower contamination rates; coverage should be provided for the Emergency Department at least on a part-time basis</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>11, 12, 35, 52, 143</td>
</tr>
<tr>
<td>Draw blood cultures before administration of antibiotics</td>
<td>Antibiotics may suppress growth of true pathogens</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>43, 46, 47</td>
</tr>
<tr>
<td>Use a BC kit</td>
<td>Kits assist in standardizing the items as required in the hospital policy</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>75-87</td>
</tr>
<tr>
<td>Perform hand hygiene with soap and water or sanitizer</td>
<td>Hand hygiene solution packets may be provided in BC kits</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>71</td>
</tr>
<tr>
<td>Collect via venipuncture rather than intravascular catheter</td>
<td>BCs collected via venipuncture are associated with lower blood culture contamination rates</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>55-64</td>
</tr>
<tr>
<td>Select a different venipuncture site for each BC set</td>
<td>Improves ability to recognize contaminants. Second site draw requires separate hand hygiene procedure and new supplies</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>33</td>
</tr>
<tr>
<td>For suspected CRBSI, draw a set from catheter paired with a set obtained from a peripheral vein site</td>
<td>The definitive diagnosis of CRBSI requires a positive peripheral blood culture with concordant microbial growth</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>55-64</td>
</tr>
<tr>
<td>Use a closed blood collection system</td>
<td>Reduces potential for introducing microorganisms</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>11</td>
</tr>
<tr>
<td>After identifying collection site, disinfect the rubber septum of the BC bottle using 70% alcohol or chlorhexidine</td>
<td>The septa of BC bottles are not sterile. Disinfection of the blood culture septum should be performed prior to the start of drawing blood (e.g., antiseptic to dry before inoculation). Lineate should not be used to disinfect the septa. CLSI and ENA recommend using 70% alcohol; IKA recommends chlorhexidine</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>75, 76, 97, 101-111</td>
</tr>
<tr>
<td>Perform skin antiseptic: use either alcohol or mixture of iodine or an alcoholic CHG solution</td>
<td>Studies indicate that an alcoholic CHG solution is most effective in reducing BCCs</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>75, 76, 97, 101-111</td>
</tr>
<tr>
<td>Follow manufacturer’s instructions for application of antiseptic to skin</td>
<td>Maximal antiseptic effect is achieved when the solution is used as recommended</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>92</td>
</tr>
<tr>
<td>Follow manufacturer’s instructions for coverage area for specific product used</td>
<td>Maximal antiseptic effect is achieved when the solution is used as recommended</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>92</td>
</tr>
<tr>
<td>Follow manufacturer’s instructions for drying time for specific product used</td>
<td>Maximal antiseptic effect is achieved when the solution is used as recommended</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>92</td>
</tr>
<tr>
<td>After skin disinfection, do not palpate the site again; if necessary use a sterile glove</td>
<td>Transfer of microorganisms to the venipuncture site may occur when re-palpating the site with finger or when using non-sterile glove</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>113</td>
</tr>
<tr>
<td>Remove a needless connector before drawing blood for cultures from a catheter hub</td>
<td>Needles left in catheter hubs may harbor bacteria in internal mechanisms and therefore may be source of contaminant organisms</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>46, 74</td>
</tr>
<tr>
<td>Disinfect the hub of the catheter lumen using 70% alcohol or an alcoholic CHG solution</td>
<td>Most effective disinfectant to use has not been studied, use a “scrub the hub” procedure using a disinfectant wipe (as per manufacturer’s instructions)</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>48</td>
</tr>
<tr>
<td>Collect appropriate volume of blood for adults and children</td>
<td>Collecting the correct volume of blood has direct impact on yield of true pathogens</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>116-122</td>
</tr>
<tr>
<td>Use diversion of initial volume when collecting blood via venipuncture</td>
<td>May prevent introduction of contaminant organisms contained on skin particles</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>128-130</td>
</tr>
</tbody>
</table>
Thank you!

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