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Practice Forum

# A national survey of interventions and practices in the prevention of blood culture contamination and associated adverse health care events

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The scientific literature indicates that blood culture contamination often leads to inappropriate antimicrobial treatment, adverse patient occurrences, and potential reporting of false-positive central line–associated bloodstream infections. The findings of a national infection prevention survey of blood culture practices and related interventions in hospitals support the need for infection preventionists to expand their participation in the review of topics related to the ordering and collection of blood for culture.



## BACKGROUND

Benefits derived from optimizing practices in the collection and handling of blood cultures (BCs) include the accurate identification of pathogens causing bacteremia and sepsis and minimizing bacterial contamination of the sample which may lead to false-positive results and subsequent inappropriate treatment. In addition, optimal BC practices increase the accuracy of reportable central line–associated bloodstream infection (CLABSI) surveillance events and reduce unnecessary health care financial expenditures.

A recent review of interventions and practices to improve BC collection identified diverse issues, including the appropriate indications for drawing BCs, drawing of BCs from venipuncture sites versus intravascular catheters, antisepsis of drawing sites, obtaining samples through needleless connectors used in intravascular catheters, and the proper inoculation of BC bottles.[1]

Despite extensive information on the adverse impact of improperly collected BCs, to our knowledge, there exists limited national data describing what preventive practices exist in U.S. hospitals to avoid such events. This article presents the findings of a national survey of hospitals on BC collection practices.

## METHODS

### *Study design and participants*

The target population for this study was hospital infection prevention professionals (IPs). The sampling frame was hospitals within systems represented by members of the National Corporate Infection Prevention Director Network. The group is comprised of corporate IP directors for multihospital systems in the United States. The hospitals in each of these systems in turn have ≥1 IPs who manage the infection prevention program. A proposal for the survey was made to members of the National Corporate IP Director Network in March 2015. On approval by group members, an e-mail was forwarded by the network facilitator to all corporate IP directors in the group explaining the purpose of the survey inclusive of instructions for completion. The corporate directors were in turn asked to distribute the e-mail to the IPs in their system hospitals starting in March 2016. A second e-mail was sent 4 weeks later to the corporate IP directors requesting that they forward the e-mail to their system hospitals to ensure responses from those hospital IPs who had not done so to that point. Respondents were limited to 1 representative per hospital. Respondents were directed to a Web-based survey site (SurveyMonkey, San Mateo, CA), to be completed

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**Table 1**
Characteristics of the respondent U.S. hospitals

| Facility characteristic* | % (n) |
|---|---|
| Hospital type (n = 89) | |
| Community | 65 (58) |
| Teaching university affiliated | 17 (15) |
| Children's | 3 (3) |
| Other | 15 (13) |
| Census region (n = 86) | |
| Northeast | 20 (17) |
| South | 10 (9) |
| Midwest | 28 (24) |
| West | 42 (36) |
| Total beds (n = 84) | |
| <150 | 33 (28) |
| 150-500 | 54 (45) |
| >500 | 13 (11) |

*n*, number of responses.
*Not all hospitals responded to all questions.

online. Respondent anonymity and confidentiality were maintained via a secure online database.

### *Study instrumentation*

The study instrument was a questionnaire designed to identify the type and regional location of participating hospitals, obtain BC contamination (BCC) rates, and assess the degree to which hospitals applied interventions and strategies aimed at maximizing proper collection and handling of BCs and reducing associated adverse events. The survey contained a total of 40 questions: 3 questions related to hospital characteristics, 7 questions intended to identify data on BCC, and an additional 30 questions addressing collection and handling practices and education and training methods. Most questions required dichotomous (yes or no) responses.

### *Data collection*

Eighty-nine responses were received from hospitals overseen by 32 of the 70 corporate IP directors. The response rate was 71.2% (89/125).

## RESULTS

### *Facility characteristics*

Table 1 summarizes the facility characteristics of the responding hospitals. Community hospitals accounted for most responders at 65%, followed by university-affiliated teaching hospitals at 17%. Hospital bed size was well distributed with 54% in the middle range of 150-500 beds.

### *BCC data*

Responses to questions regarding BCC are provided in Table 2. Nearly half of hospitals (46%) collected <10,000 BCs; 16% collected >30,000 per year. Fourteen percent of hospitals reported their BCC rates as >3%, with 5% of responders not knowing their current rate. Of the 11 hospitals that reported contamination rates ≥3%, 4 collected <10,000 BCs, 5 collected 10,000-30,000 BCs, and 2 collected >30,000 BCs per year. The survey indicated that most hospitals had a microbiology laboratory that calculated a BCC rate (87%) for at least 1 patient unit. A similar percentage of IP departments received data on BCC (88%). Variance exists in BCC rate data being relayed to patient units.

**Table 2**
BCC data

| Survey Question | % (n) |
|---|---|
| No. of BCs drawn per year (n = 82) | |
| >30,000 | 16 (13) |
| 10,000-30,000 | 38 (31) |
| <10,000 | 46 (38) |
| Does microbiology laboratory calculate a BCC rate? (n = 85) | |
| Yes | 87 (74) |
| No | 13 (11) |
| Are BCC rates calculated for the following? (n = 75) | |
| Each patient unit including the ED | 72 (54) |
| Each patient unit excluding the ED | 3 (2) |
| Only some patient units | 8 (6) |
| Other | 17 (13) |
| What is the hospital's overall BCC rate? (n = 76) | |
| >5% | 5 (4) |
| 3%-4.9% | 9 (7) |
| <3% | 80 (61) |
| Do not know | 5 (4) |
| If calculated, how often are BCC rates calculated by the micro laboratory? (n = 75) | |
| Monthly | 72 (54) |
| Quarterly | 15 (11) |
| Every 6 mo | 3 (2) |
| Annually | 8 (6) |
| Other | 3 (2) |
| Are BCC rates communicated to the IP department? (n = 75) | |
| Yes | 88 (66) |
| No | 12 (9) |
| Are BCC rates communicated to each patient unit? (n = 77) | |
| Yes | 53 (41) |
| No | 47 (36) |
| In your hospital, have BSIs been reported as CLABSIs by NHSN definition, but may have been caused by possible BCC? (n = 80) | |
| Yes | 59 (47) |
| No | 41 (33) |

*BC*, blood culture; *BCC*, blood culture contamination; *BSI*, bloodstream infection; *CLABSI*, central line–associated bloodstream infection; *ED*, emergency department; *IP*, infection prevention professional; *n*, number of responses; *NHSN*, National Healthcare Safety Network.

Of interest, nearly 60% of hospitals responded that CLABSIs reported by their institutions to the Centers for Disease Control and Prevention's National Healthcare Safety Network (NHSN) may have been attributed to specimens that were probably contaminated.

### *BC indications, collection, and handling issues*

Table 3 summarizes the survey findings addressing issues related to BC indications and collection and handling. The survey indicated that approximately half the hospitals had defined clinical indications for initial BCs orders, with two-thirds having no policy for follow-up BCs. Eighty percent of hospitals required BCs to be drawn prior to administration of antibiotics.

A minority of hospitals (34%) use dedicated phlebotomy teams to draw BCs, with only 15% providing such service to all their patient units. Of the 11 hospitals that reported contamination rates ≥3%, 6 did not use a dedicated phlebotomy team, 3 used a dedicated team on specific units, and 2 used a dedicated team for all units.

The survey inquired on specific BC collection practices. Approximately 90% of hospitals emphasized the need to draw BCs via a venipuncture route rather than through a central venous access device (CVAD) and using a different venipuncture site for each BC set. When the CVAD is suspected of being the source of infection, 68% of responders indicated that BCs drawn from the line would be paired with a BC drawn peripherally.

About half of the hospitals (53%) use a BC collection kit that is commercially purchased or packaged in-house. Seventy-two percent of responders used a dedicated transfer device rather than a needle