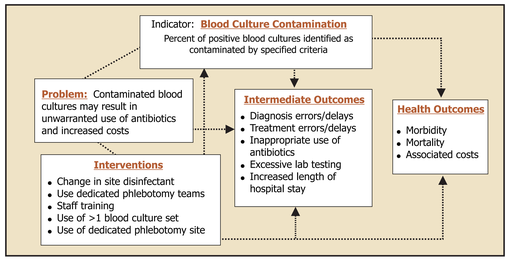
IQLM Quality Indicator Evaluations*

IQLM Quality Indicators Workgroup

INSTITUTE FOR QUALITY IN LABORATORY MEDICINE

Blood Culture Contamination



Primary Sources
ASM, CAP, CLSI

Definition
Percentage of positive blood cultures identified as contaminated, which is not uniformly defined. Useful criteria for determining if a microorganism is a contaminant include:
- Identity of the organism
- Presence of the microorganism in a single blood culture when multiple cultures drawn
- No growth of the same microorganism as found in blood from another normally sterile site
- Patient symptoms

Population/Care Settings
All patient populations/care settings with blood culture results.

Rationale/Evidence
False positive results are routine in blood cultures, and the trade off of sensitivity for specificity is often considered justified because of the risk of failing to detect an active infection. Thus, controlling blood culture contamination is necessary to reduce undesirable clinical outcomes (i.e., associated with inappropriate use of antibiotics, excessive laboratory testing, and associated costs including longer and more costly hospital stays, and laboratory and pharmacy charges). Published studies have demonstrated that several measures may significantly reduce false positive rates, and contamination is affected by various factors including:
- Type of skin disinfectant used
- Method of draw
- Site from which culture is drawn
- Blood culture volumes
- Dedicated phlebotomy teams for collecting blood culture specimens

IOM Domains
Safety, Effectiveness, Timeliness, Efficiency

Numerator Description
Number of positive blood cultures identified as "contaminated," which is not uniformly defined. Criteria used to define if a microorganism is a contaminant include:
- Identity of the microorganism
- Presence of the microorganism in a single blood culture when multiple cultures are drawn
- No growth of the same microorganism as that found in the blood from another normally sterile site
- Patient symptoms

Also, data can be collected to identify possible sources of contamination, which may include:
- method of draw (e.g. 2 needle, direct needle into broth)
- type of disinfectant used
- definition of contaminate
- site from which culture drawn (e.g. IV catheter vs. dedicated venipuncture site)
- blood culture volumes

Denominator Description
Total number of positive blood cultures drawn

Data Sources
Primary source is laboratory results.
Additional sources for numerator include laboratory, infection control, and medical records. Information on possible sources of contamination is generally survey-based.

IMPORTANCE

Health
Prevalence/ Incidence and seriousness of indicator-related medical/health quality problem(s) and their associated costs

- Average blood culture contamination rate is about 2.5% (range 1-5%), and in many teaching hospitals it exceeds 6%; American Society of Microbiology (ASM) standards indicate it should not exceed 3%.
- Positive blood culture result can be false 20-50% of time.
- Physicians rely heavily on blood culture results to diagnose and monitor febrile patients.
- Erroneous results from blood culture contamination can have serious patient outcomes due to false positive results, including:
  - administration of excessive antibiotics
  - excessive length of hospital stays (average 4.5 days longer)
  - Associated costs

Potential For Improvement
Evidence of variation in quality

Average blood culture contamination rate is about 2.5% (range 1-5%), and in many teaching hospitals it exceeds 6%; American Society of Microbiology standards indicate it should not exceed 3%.

Actions taken to improve performance and evidence of effectiveness

- Studies showed significant reduction in blood culture contamination rate from:
  - changing site disinfectant
  - using dedicated phlebotomy teams
  - staff training
  - bottle top decontamination before use
- Conflicting results as to collection of higher blood volume per culture reducing contamination rates
- Contamination rates were also influenced by
  - number of blood culture sets drawn
  - site from which blood culture drawn (separate, dedicated phlebotomy site vs. intravenous catheter) influenced results.

SCIENTIFIC ACCEPTABILITY

Strength of Evidence
Quality Problem

- Published studies, reviews, and clinical practice guidelines (e.g. CLSI, ASM) have demonstrated that reducing blood culture contamination rates improves quality of care and reduces healthcare costs.
- Physicians acting on a potentially contaminated blood culture must choose to either ignore a potentially life-threatening result, or fight an infection that may not exist, including unnecessary and potentially harmful and costly care (e.g. administration of antibiotics, extending patient hospital stay, and more tests).

Indicator

- No evidence found directly linking reduction in percent contaminated blood cultures to changes in health outcomes.
- Studies showed direct evidence of increased hospital stays, cost, and separation from family resulting from blood culture contamination.

Reliability/Validity

- Non-standardized definitions of "contamination" cannot consistently and accurately represent this concept, and produce credible results over time and across multiple organizations.
- Study results comparable for pre- and post-interventions among variables and facilities.

FEASIBILITY

Explicit specifications and standardized data requirements
Criteria for what constitutes "contamination" have not been uniformly or consistently defined (see the Numerator Description), preventing standardized implementation and production of accurate and comparable results..

Implementable
(for large numbers)

- Main data sources (laboratory results and medical records) are accessible and timely.
- Numerous health care organizations (e.g., CAP, ASM), hospitals, and medical centers have measured blood culture contamination rates, conducted studies of variables associated with blood culture contamination, and the outcomes related to health and cost.
- No standardized data sources are available across laboratory testing sites.

Reasonable cost/benefit of measurement

- No information found estimating measurement cost; however, measurement requires relatively minor modification to current practice.
- Financial costs associated with blood culture contamination include:
  - 20% increase in laboratory charges
  - 39% increase in IV antibiotic charges
  - False positive episodes led to:
    - 50% longer hospital stays (4 days)
    - 44% increase in laboratory charges
    - 82% increase in pharmacy charges.

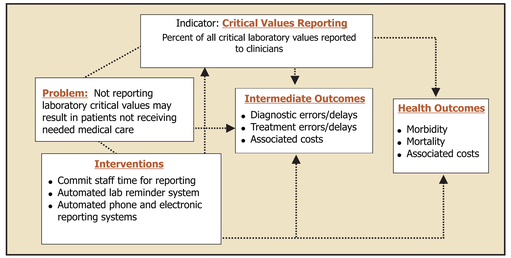
USEFULNESS

Comprehensible and relevant to users, decision makers and stakeholders

- Results of studies easily understood and of clinical and economic significance to users (physicians, laboratory personnel, medical centers, insurers) who act on indicator
- Blood culture contamination is universally identified by microbiologists and physicians as an area of concern.
- Best practice guidelines (e.g. ASM) include identification of blood culture contamination rates for internal quality improvement.
- Studies have shown significant costs associated with blood culture contamination.
- Not a quality measure in AHRQ's National Healthcare Quality Report

Health care system control
Interventions for controlling blood culture contamination rates can be operationalized into actions addressing processes and/or outcomes under control of health care systems, including physicians, laboratories, nursing and other personnel, pharmacies, and insurers.

Critical Values Reporting



Primary Sources
CAP, CLIA, JCAHO

Definition
Percent of all critical laboratory values reported to clinicians
- Critical laboratory values are defined as results requiring immediate notification to the clinician for necessary patient evaluation or treatment.
- No standard list has been developed of laboratory tests for which critical values exist.
- Due to variation in test methods, patient population, and individual patient characteristics, no universal definition of critical value limits for any laboratory test has been defined.

Population/Care Settings
All patients with laboratory tests with critical values in all health care settings.

Rationale/Evidence
- No studies found effects of critical values reporting on patient outcomes, however reporting of critical values has been shown to influence patient therapy.
- Every facility is required by CLIA to have a system for identifying and reporting "imminent life-threatening test results, panic or alert values."
- JCAHO 2005 National Patient Safety Goals include timely communication of laboratory test critical values (Requirement 2A).
- Although no cost data specific to the indicator were found, based on average time for notification, a large hospital laboratory estimate of slightly less than one full-time equivalent would be required.

IOM Domains
Safety, Effectiveness, Timeliness, Efficiency

Numerator Description
Number of critical values in the denominator successfully reported to a clinician within a given time period. Terms not specifically defined:
- "successfully reported"
- "clinician"
- "time period"

Denominator Description
Number of laboratory test critical values (i.e. results requiring immediate clinician notification for necessary patient evaluation or treatment)
- No standard list of laboratory tests included
- Critical value limits for each laboratory test are not uniformly defined.
- The terms "immediate" and "necessary patient evaluation or treatment" are not uniformly defined.

Data Sources
Laboratory information systems

IMPORTANCE

Health
Prevalence/ Incidence and seriousness of indicator-related medical/health quality problem(s) and their associated costs

- No evidence found addressing the overall percentage of critical values reported, or its relationship to intermediate or health quality outcomes, or associated costs.
- Total critical values frequency of 0.1% of reported laboratory test results.
- As there is no common definition for critical limits for each test, for many tests these limits
  - vary by several-fold and
  - are institution-specific
- Reporting of critical values is considered important because they may represent life-threatening situations, and ensure clinicians are promptly notified.

Potential For Improvement
Evidence of variation in quality

- No evidence found addressing overall variation or substandard performance of percentage of critical values reported
- In a CAP Q-Probes survey of laboratory critical values policies and procedures, critical values were reported for
  - 95% of positive blood cultures
  - 91% of positive cerebrospinal fluid cultures
  - 96% of toxic therapeutic drug levels
- 2001 survey of hospital coagulation laboratories, 0.8% of hospitals did not report critical values.

Actions taken to improve performance and evidence of effectiveness

- No evidence found of effectiveness of actions to improve critical values reporting, or that ongoing monitoring increased the rate of critical values reporting over time.
- Laboratories not currently measuring critical values reporting can implement a monitoring program.
- Actions can be taken by laboratories measuring critical values to successfully report a higher proportion.

SCIENTIFIC ACCEPTABILITY

Strength of Evidence
Quality Problem

- No evidence was found relating reporting of critical values to any intermediate or health outcome, or associated costs.
- In a single study surveying nursing supervisors and physicians, greater than 60% of staff interviews and medical record reviews indicated critical values resulted in a change in therapy.
- JCAHO 2005 National Patient Safety Goals include timely communication of laboratory test critical values (Requirement 2A).

Indicator
No evidence was found demonstrating that improvement in critical values reporting positively impacts health care processes or outcomes relating to health, or is associated with recognized quality of care measures.

Reliability/Validity
Non-standardized terms and definitions for critical values reported (see Numerator and Denominator Descriptions) cannot consistently and accurately represent these concepts, and produce credible results over time and across multiple organizations.

FEASIBILITY

Explicit specifications and standardized data requirements
Critical values reported have not been uniformly or consistently defined (see Numerator and Denominator Descriptions), preventing standardized implementation and production of accurate and comparable results.

Implementable
(for large numbers)

- Critical values reporting has been implemented by a large number of hospital laboratories.
- CLIA regulations require critical values reporting protocols.
- Organizations that have used critical values reporting include CAP and JCAHO.
- JCAHO 2005 National Patient Safety Goals include timely communication of laboratory test critical values (Requirement 2A).
- No standardized data sources are available across laboratory testing sites.

Reasonable cost/benefit of measurement

- No information found addressing costs or benefits associated with this indicator
- Information on critical values reporting system time requirement estimates include:
  - Critical values calls took an average of 6 minutes for inpatients and 14 minutes for outpatients
  - Slightly less than one full-time equivalent would be required for notification of critical values in a large hospital laboratory.

USEFULNESS

Comprehensible and relevant to users, decision makers and stakeholders

- Critical values reporting may be meaningful to hospital clinicians since in one study:
  - o critical values resulted in changes in patient therapy more than 60% of the time
  - o 95% of physicians surveyed found critical values lists valuable
- As currently implemented, critical values reporting is used for internal quality improvement.
- No evidence found linking critical values reporting to outcomes leading to improvement in health care.
- JCAHO 2005 National Patient Safety Goals include timely communication of laboratory test critical values (Requirement 2A).
- Not a quality measure in AHRQ's National Healthcare Quality Report.

Health care system control

- A system of critical values reporting can be operationalized into actions addressing processes under the control of the health care system.
- Critical value reporting verification can be documented using the laboratory information system.

*Seven IQLM Quality Indicator evaluations and refererences are available in poster handouts and at the IQLM website (www.iqlm.org).