# Leveraging Data to Drive Diagnostic Stewardship, Improve Accuracy of SEP-1 Data and Reduce Antibiotic Resistance.

# Speaker’s Financial Disclosures

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# Learning Objectives and Focus

Review the pillars of Quality, Diagnostic Safety, Stewardship and Excellence

Demonstrate how data can provide knowledge of point of care practices to produce optimal outcomes

Identify tools and methods to mitigate false positive blood cultures leading to diagnostic stewardship, AMS and quality outcomes

Apply new knowledge of data gathering,  analytics and reporting to implement and sustain change for optimal clinical outcomes and reimbursement

Describe how to organize and prioritize data projects around the Quadruple Aim Plus One

Understand the interdependency of diagnostic safety, antimicrobial stewardship and quality outcomes

Apply your understanding of why leveraging data is necessary for diagnostic stewardship, clinical quality outcomes and reimbursement

# The Criticality of Measurement and Management

"If you cannot **measure it**, you cannot **improve it**"

**Lord Kelvin** aka **William Thomson**
(thermodynamics and absolute zer0)

Data for data's sake is useless

# Key Points of An Urgent Necessity: Safer, Smarter Care

Medical Quality Management Theory and Practice:
"Data Analytics for the Improvement of Healthcare Quality"

From the patient perspective, there is an urgent necessity to apply actionable clinical intelligence to data for improved practice performance

Accurate, holistic, actionable data is essential for diagnostic accuracy, cost reduction, Healthcare Workforce wellbeing, health equity, quality outcomes and population health

From the hospital perspective, there is an urgent need to apply business intelligence, making sure optimal efficiencies and outcomes are achieved to enhance and sustain financial viability and profitability in a value-based care model

Information must be holistically accurate, timely, and actionable

Translating analytics and analyses into practice measures to achieve optimal outcomes needs to become the new norm

Measuring both outcomes and costs with accuracy and precision is a timely necessity

# CMS National Quality Strategy Goals

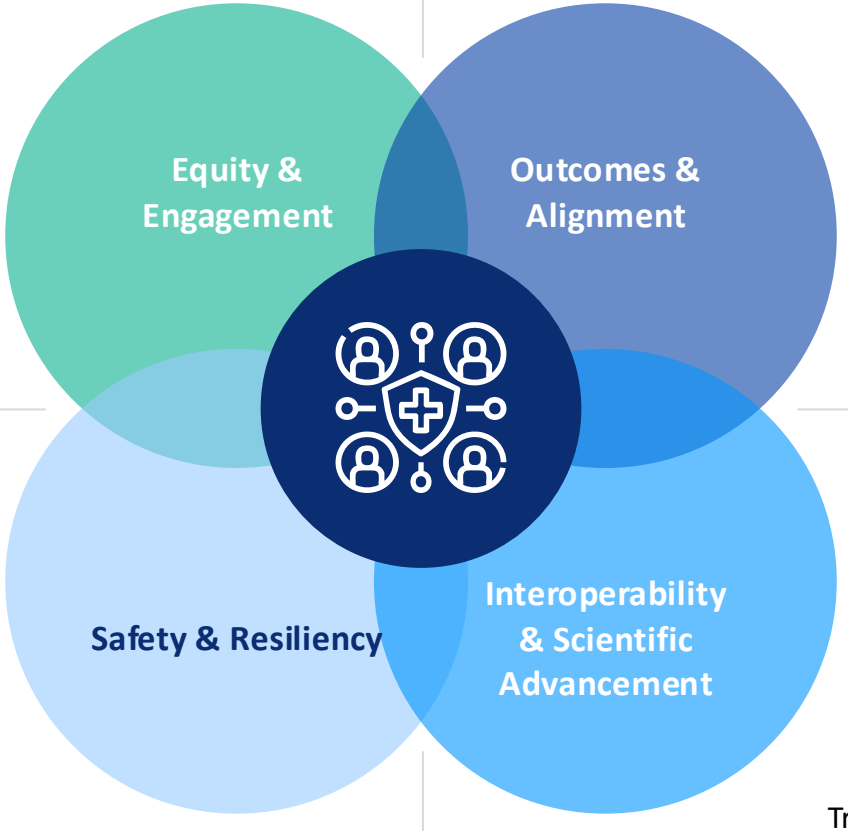
## The Eight Goals of the CMS National Quality Strategy are Organized into Four Priority Areas:

**Equity**
Advance health equity and whole-person care

**Engagement**
Engage individuals and communities to become partners in their care

**Safety**
Achieve zero preventable harm

**Resiliency**
Enable a responsive and resilient health care system to improve quality




**Outcomes**
Improve quality and health outcomes across the care journey

**Alignment**
Align and coordinate across programs and care settings

**Interoperability**
Accelerate and support the transition to a digital and data-driven health care system

**Scientific Advancement**
Transform health care using science, analytics, and technology

# Careful Interpretation of Data is a “Must”

## Cursing Helps You Win:

A data team reported that sales calls with no cursing in them led to a deal 42 percent of the time, compared with 48 percent when the sales rep cursed. When both the sales rep and the customer cursed, that figure jumped to 50 percent.

**Data = Information**
(cursing led to higher sales)

**Context with Data = Evidence for Direction** (both parties were comfortable enough with their relationship to curse, the trusted relationship led to higher sales)

# Making the IHI Quadruple Aim Plus One the Goal of Leveraging Data

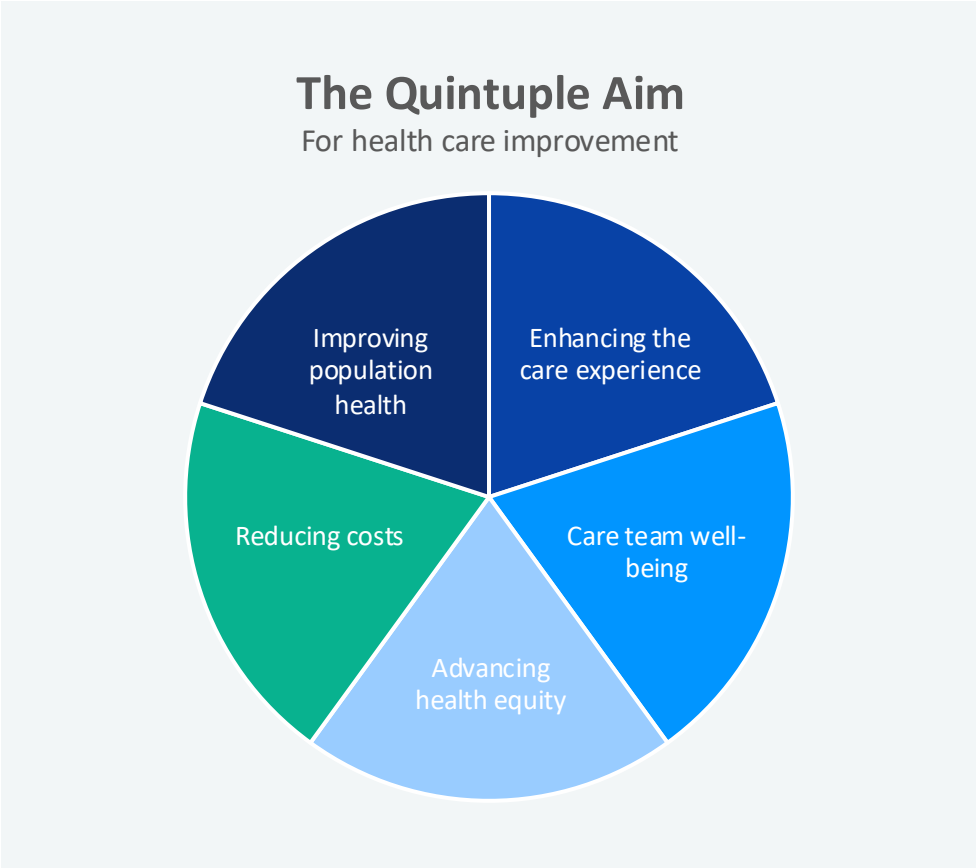
01 Enhancing patient experience; diagnostic accuracy and quality outcomes

02 Improving population health

03 Reducing costs

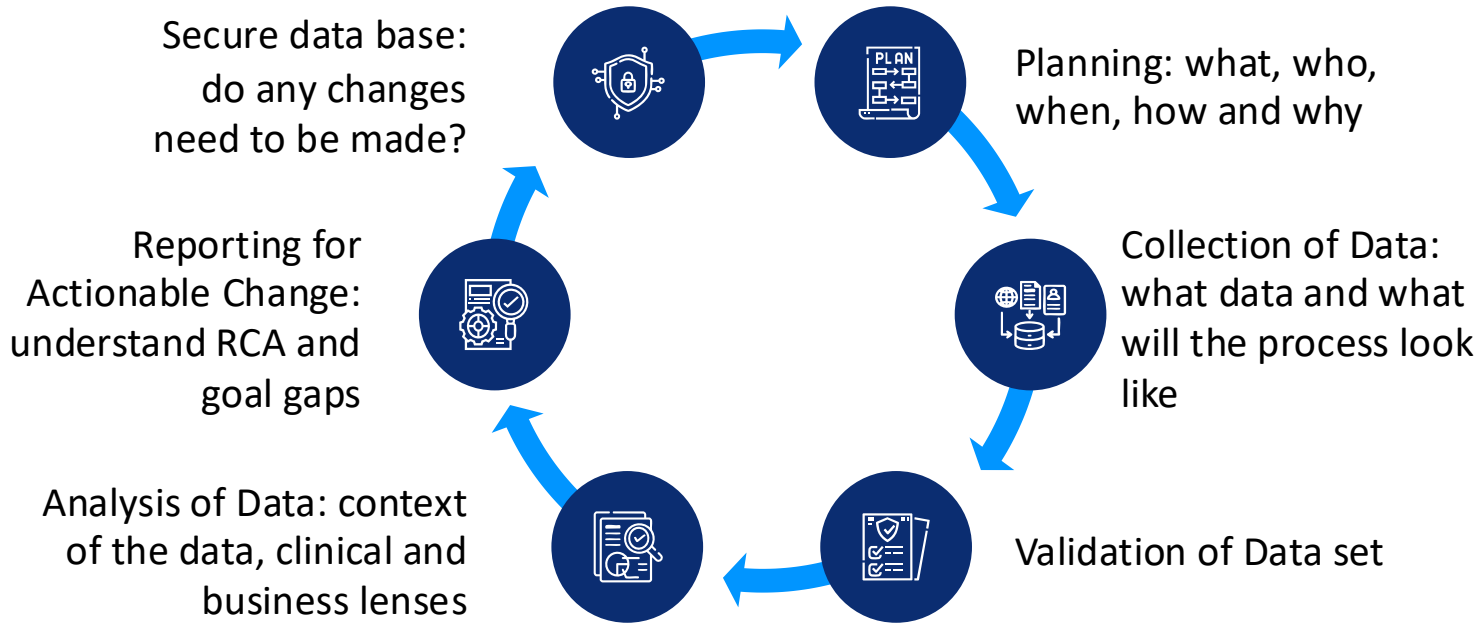
04 Improving the work life of health care providers by providing them with the tools and resources needed for quality patient outcomes.

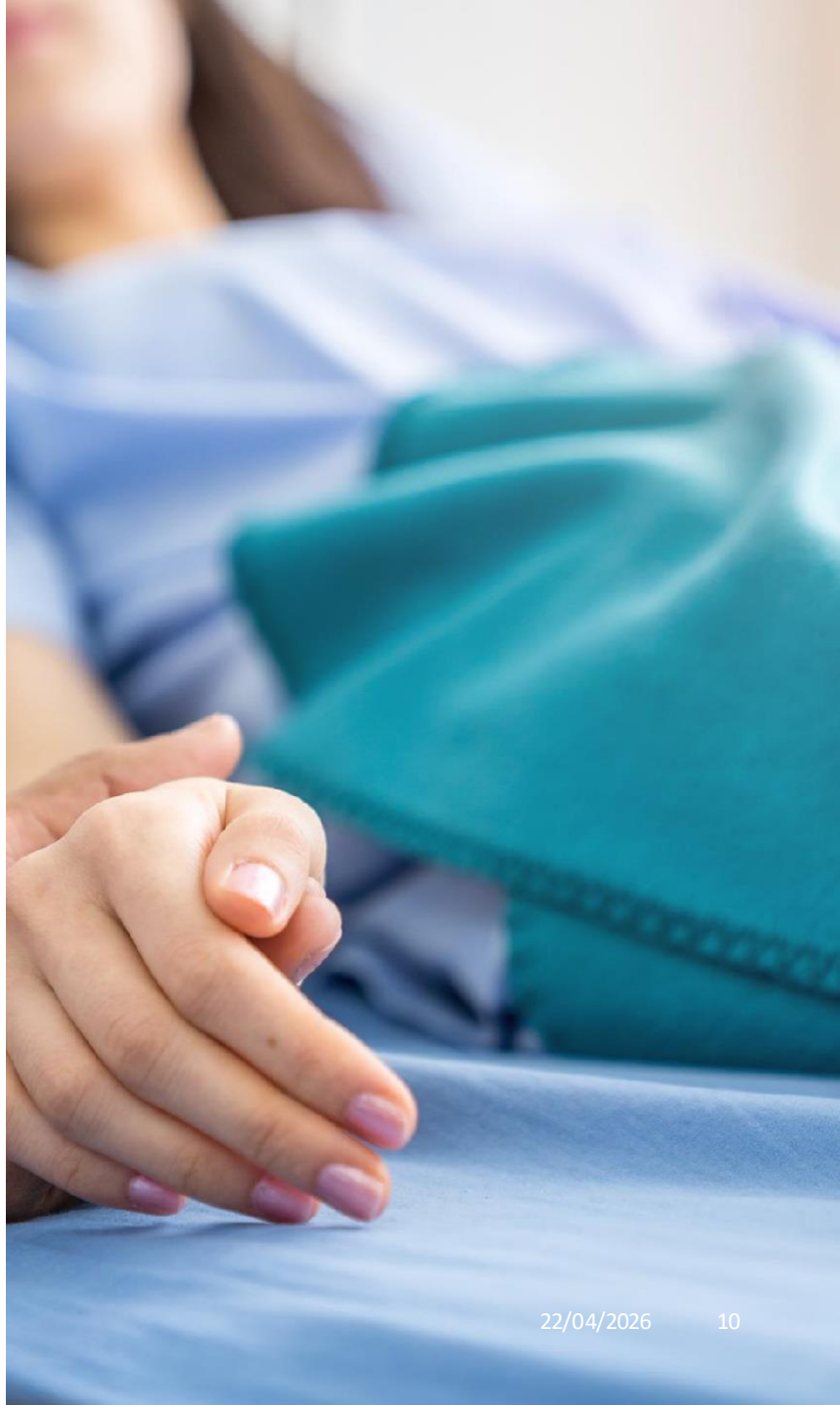
05 Advancing Health Equity



# The Cycle of Clinical Data Management for Improved Outcomes

AHA Leveraging Data for Healthcare Innovation



# AHA Leveraging Data for Healthcare Innovation; Limitations of Large Language Models

Rushing a diagnosis leads to error!

**We must advance utilizing:**

Collaborative intelligence (AI)

Statistical methods

Predictive modeling

Machine learning algorithms

**In Order To:**

Identify patterns

Trends

Correlations

**Allowing For:**

Proactive decisions

Accurate diagnoses

Quality outcomes



Reese, J. et al. On the limitations of large language models in clinical diagnosis. 2024 medRxiv preprint doi: https://doi.org/10.1101/2023.07.13.23292613

# AHA Leveraging Data for Healthcare Innovation; Limitations of Large Language Models

Data must be coalesced into intelligible information for practice change- supplying root cause to healthcare errors

Additional data analyses to extract relevant and useful information pertaining to the sequelae of misdiagnoses is needed. Keep away from information bias; only seeing what you are looking for.


Reese, J. et al. On the limitations of large language models in clinical diagnosis. 2024 medRxiv preprint doi: https://doi.org/10.1101/2023.07.13.23292613

# AHA Leveraging Data for Healthcare Innovation; Limitations of Large Language Models

Current large language models have limited reasoning and contain factual inaccuracies. They are incomplete and may be diagnostically inaccurate, in part secondary to each modality (each contributor) having their own limited expertise and experience.

Broad expertise, situational understanding with  a holistic approach is needed when developing models for diagnostic accuracy.

Goal: Diagnostic accuracy, earlier interventions, improved care, operational efficiencies and cost-effective delivery of high-quality care


Reese, J. et al. On the limitations of large language models in clinical diagnosis. 2024 medRxiv preprint doi: https://doi.org/10.1101/2023.07.13.23292613

# Examples of Leveraging Meaningful Data for Healthcare Quality Improvements

## Diagnostic Error Management; Blood Culture Contamination

01 **Using data to identify patients with diagnostic error:**
Root Causes and Impact

02 **Impact:**

- Patient Flow Management/ED Boarding
- Antibiotic Utilization Management
- AKI, CDI, Resistant Organism Formation, AU AR Reporting, AKI Reporting
- HAI and HAC management

### Quality Improvement Initiatives:

Monitoring key performance indicators (KPIs) to track progress on quality improvement goals and identify areas for improvement. A continuous cycle!

# Why the focus on diagnostic safety and stewardship?

Patient Harm Spurring

Recent and Upcoming Patient

Advocacy Measures

# National Academy of Medicine (f.k.a. Institute of Medicine)

**Diagnostic errors are a significant but underappreciated challenge to health care quality”**

Getting the right diagnosis is a key aspect of health care: it provides an explanation of a patient’s health problem and informs subsequent health care decisions”

Diagnostic errors persist through all settings of care and harm an unacceptable number of patients.”

# The Six Pillars of Healthcare Quality

## Safety

- First do no harm
- Do not add to the burden of healthcare

## Effectiveness

- Match science to care; avoid use of what is not helpful and assure use of what is helpful
- Evidence-based care

## Patient-Centeredness

- People should be in control of their own care

## Timeliness

- Avoid delays; misdiagnoses
- Communicate accurate and timely diagnoses to patients

## Efficiency

- Avoid waste

## Equity

- Close the gap of justice
- The biggest predicter of life expectancy is race and location

Institute of Medicine (IOM). Crossing the Quality Chasm: A New Health System for the 21st Century. Washington, D.C: National Academy Press; 2001.

# BMJ 2024

## Conclusion

An estimated **795 000** Americans become permanently disabled or die annually across care settings **because dangerous diseases are misdiagnosed**.

**Just 15 diseases account** for about half of all serious harms, so the problem may be more tractable than previously imagined

ORIGINAL RESEARCH

# Burden of serious harms from diagnostic error in the USA

David E Newman-Toker,[1,2] Najlla Nassery,[3] Adam C Schaffer,[4,5] Chihwen Winnie Yu-Moe,[5] Gwendolyn D Clemens,[6] Zheyu Wang,[6,7] Yuxin Zhu,[1,6] Ali S. Saber Tehrani,[1] Mehdi Fanai,[1] Ahmed Hassoon,[1,2] Dana Siegal[8,9]

► Additional supplemental material is published online only. To view, please visit the journal online (http://dx.doi.org/10.1136/bmjqs-2021-014130).

For numbered affiliations see end of article.

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## ABSTRACT

**Background** Diagnostic errors cause substantial preventable harms worldwide, but rigorous estimates for total burden are lacking. We previously estimated diagnostic error and serious harm rates for key dangerous diseases in major disease categories and validated plausible ranges using clinical experts.

**Objective** We sought to estimate the annual US burden of serious misdiagnosis-related harms (permanent morbidity, mortality) by combining prior results with rigorous estimates of disease incidence.

**Methods** Cross-sectional analysis of US-based nationally representative observational data. We estimated annual incident vascular events and infections from 21.5 million (M) sampled US hospital discharges (2012–2014). Annual new cancers were taken from US-based registries (2014). Years were selected for coding consistency with prior literature. Disease-specific incidences for 15 major vascular events, infections and cancers ('Big Three' categories) were multiplied by literature-based rates to derive diagnostic errors and serious harms. We calculated uncertainty estimates using Monte Carlo simulations. Validity checks included sensitivity analyses and comparison with prior published estimates.

**Results** Annual US incidence was 6.0 M vascular events, 6.2 M infections and 1.5 M cancers. Per 'Big Three' dangerous disease case, weighted mean error and serious harm rates were 11.1% and 4.4%, respectively. Extrapolating to all diseases (including non-'Big Three' dangerous disease categories), we estimated total serious harms annually in the USA to be 795 000 (plausible range 598 000–1 023 000). Sensitivity analyses using more conservative assumptions estimated 549 000 serious harms. Results were compatible with setting-specific serious harm estimates from inpatient, emergency department and ambulatory care. The 15 dangerous diseases accounted for 50.7% of total serious harms and the top 5 (stroke, sepsis, pneumonia, venous thromboembolism and lung cancer) accounted for 38.7%.

**Conclusion** An estimated 795 000 Americans become permanently disabled or die annually across care settings because dangerous diseases are misdiagnosed. Just 15 diseases account for about half of all serious harms, so the problem may be more tractable than previously imagined.

**WHAT IS ALREADY KNOWN ON THIS TOPIC**

⇒ Diagnostic errors are known to be common, costly and often catastrophic in their health outcomes for patients.
⇒ Nevertheless, current estimates of the aggregate burden of serious harms resulting from medical misdiagnosis vary widely.

**WHAT THIS STUDY ADDS**

⇒ This study provides the first national estimate of permanent morbidity and mortality resulting from diagnostic errors across all clinical settings, including both hospital-based and clinic-based care (0.6–1.0 million each year in the USA alone).
⇒ It does so via an approach that extrapolates from disease-based estimates for the most common dangerous conditions that often cause serious harms when missed—vascular events, infections and cancers.

**HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY**

⇒ Because the overall burden of serious misdiagnosis-related harms is quite large, improving diagnosis of dangerous diseases most often responsible—stroke, sepsis, pneumonia, venous thromboembolism and lung cancer—constitutes an urgent public health imperative.

Linked

► http://dx.doi.org/10.1136/bmjqs-2023-016496

Check for updates



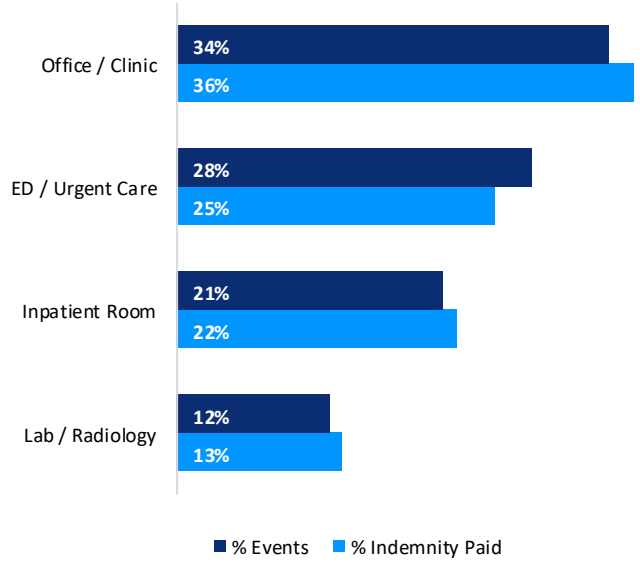
**To cite:** Newman-Toker DE, Nassery N, Schaffer AC, *et al*. *BMJ Qual Saf* 2024;**33**:109–120.

## INTRODUCTION

Diagnostic error is a major source of preventable harms worldwide across clinical settings,[1–6] but epidemiologically valid estimates of overall misdiagnosis-related morbidity and mortality are lacking. The US National Academy of Medicine describes improving diagnosis in healthcare as a 'moral, professional, and public health imperative'.[7] In its 2015 report, the National Academy concluded that 'most people will experience at least

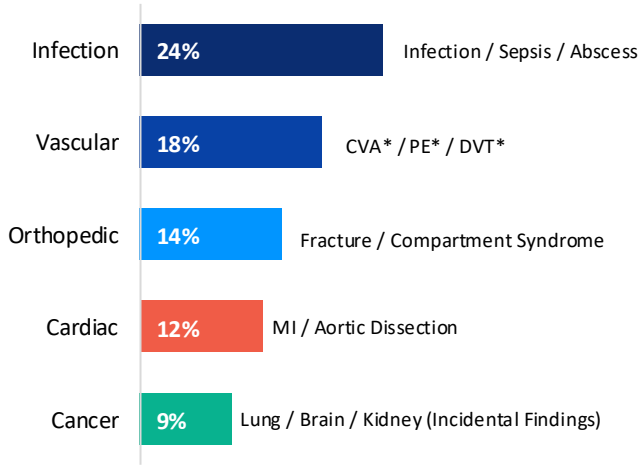
# Location, Top Categories and Average Indemnity Paid for Diagnostic Error

## TOP LOCATIONS FOR DIAGNOSTIC-RELATED EVENTS



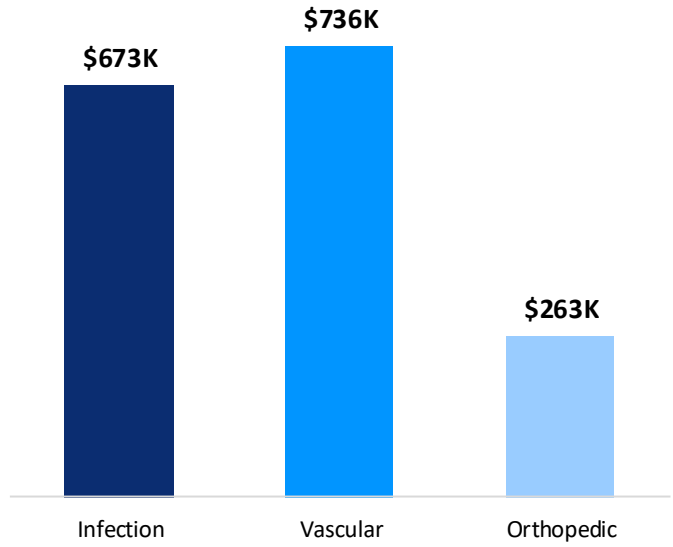

N=1,610 diagnostic-related events closed 2019-2023

## TOP MISSED DIAGNOSTIC CATEGORIES IN THE ED




N=40 missed diagnoses in ED events closed 2019-2023.
An event can have more than one final diagnosis.
*Cerebral Vascular Accident (CVA), Pulmonary Edema (PE), Deep Vein Thrombosis (DVT)

## AVERAGE INDEMNITY PAID FOR TOP 3 DIAGNOSTIC CATEGORIES




N=89 missed diagnosis events in the ED closed 2019-2023 with an indemnity payment

# Diagnostic Stewardship Leads to AMS and Quality Outcomes

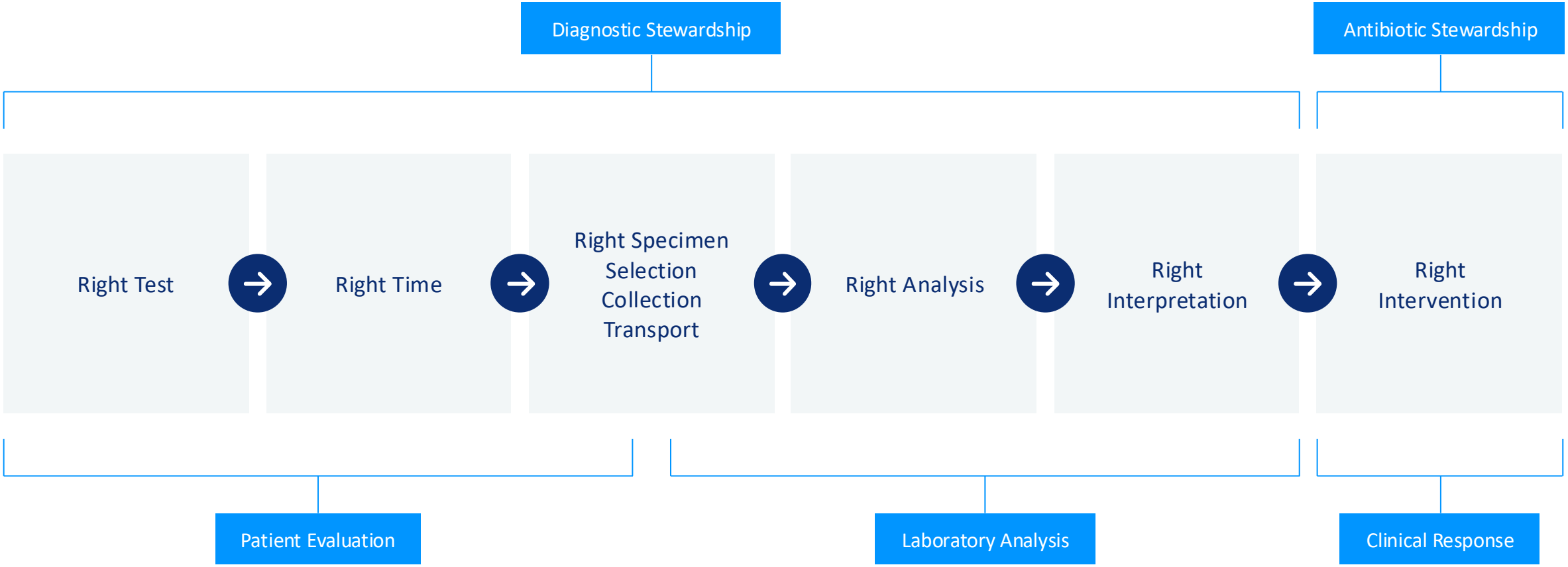



**Figure 1.** Interaction of diagnostic stewardship and antibiotic stewardship resulting in positive patient outcomes.

Miller, J Michael (2024) Guide to Utilization of the Microbiology Laboratory for Diagnosis of Infectious Diseases: 2024 Update by the Infectious Diseases Society of America (IDSA) and the American Society for Microbiology (ASM), Clinical Infectious Diseases, 2024;, ciae104, https://doi.org/10.1093/cid/ciae104
https://academic.oup.com/cid/advance-article/doi/10.1093/cid/ciae104/7619499

# National Academy of Medicine;
## The Purpose of Measurement; Improving Diagnoses in Healthcare

Establish the incidence and nature of the problem of diagnostic error


Determine the causes and risks of diagnostic error

Evaluate interventions

Education and training

Accountability


National Academies of Sciences, Engineering, and Medicine. 2015. Improving Diagnosis in Health Care. Washington, DC: The National Academies Press. https://doi.org/10.17226/21794

# CDC: Core Elements of Hospital Diagnostic Excellence Programs

## Hospital Leadership Commitment and Accountability

Commitment to the staff and board that improving diagnosis is a priority for the hospital and ensuring the entire organization is accountable for progress.

Dedicating the necessary human, financial, technological, and information technology resources.

## Multidisciplinary Expertise

Creating inclusive and multidisciplinary diagnostic teams that include laboratory and radiology testing experts.

## Patient, Family, and Caregiver Engagement

Engaging patients, their families, and caregivers as partners in diagnostic excellence, including identifying effective ways to communicate diagnostic test results and other information.

## Actions

Improving diagnosis through **1) diagnostic stewardship, 2) strengthening systems and processes, and 3) identifying, monitoring, and learning from diagnostic safety events**.

Improving teamwork and coordination within the hospital and across the continuum of care.

## Education

Educating healthcare personnel, patients, and family/caregivers about diagnosis and testing.

## Tracking and Reporting

Monitoring and reporting the activities of the diagnostic excellence program.

# Diagnostic Stewardship Leads to Antimicrobial Stewardship

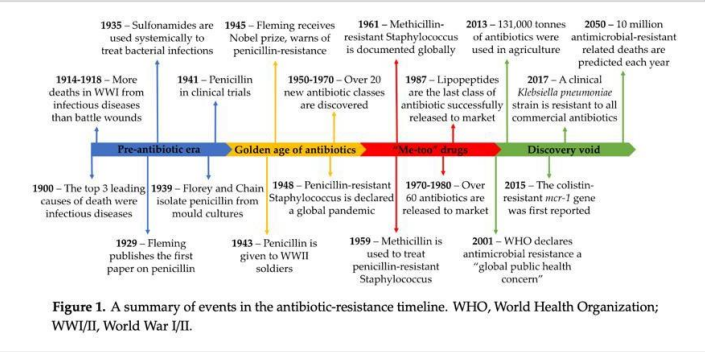



**Figure 1.** A summary of events in the antibiotic-resistance timeline. WHO, World Health Organization; WWI/II, World War I/II.

This pattern of resistance, first emerging in hospitals and then spreading to the community, is now a well-established pattern that recurs with each new wave of antimicrobial resistance

## 1942

Penicillin-resistant staphylococci were recognized, first in hospitals and subsequently in the community.

## 1944

94% of staph isolates were **susceptible** to penicillin by 1950 half were **resistant**

## 1945

Fleming received the Nobel prize and warned of antibiotic resistance, predicting that high public demand would create an era of abuse

## 1960

Fleming received the Nobel prize and warned of antibiotic resistance, predicting that high public demand would create an era of abuse

Lobanovska,, Yale J Biol Med. 2017 Mar; 90(1): 135–145.Published online 2017 Mar 29
J Antimicrob Agents 2000 Nov16 Suppl 1:53-10; doi: 10.1016/s0924-8579(00)00299-5.Antibiotic resistance staphylococci
WHO A summary of events in the antibiotic-resistance timelinez

# Global burden of bacterial AMR in 2019, a systematic analysis

## 2022 The Lancet

**4.95 million**
deaths associated with drug-resistant bacterial infections in 2019

**1.27 million**
deaths directly caused by AMR

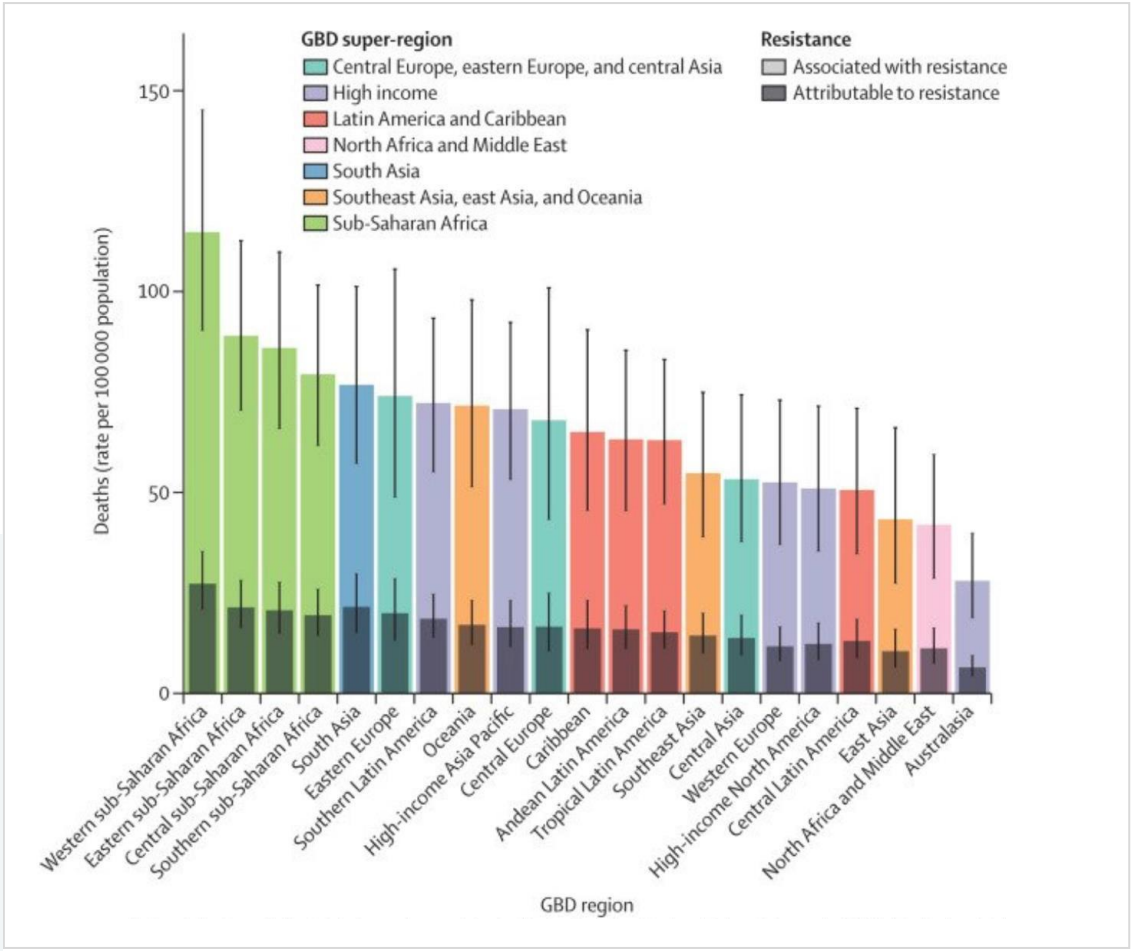
US:
**172,900**
deaths associated with AMR

US:
**41,900**
deaths attributable to AMR

*"**By 2050, 10 million people will die from antibiotic resistant infections** if there are not changes…that will make antibiotic resistance the leading cause of death, ahead of cancer. This fundamentally challenges the very future of medicine. We know the problem is bad now, but the projections of what's going to happen if we don't do something are terrifying"*

**Arjun Srinivasan, MD,**
Associate Director HAI Prevention Division of Healthcare Quality Promotion, CDC

*2024 Lancet: 169 million deaths associated with AMR between 2025 and 2050*
*That is a little less than the total population of England, Ireland, Scotland, Wales, France and Spain combined*



# Only Four Ways to Stop Antibiotic Resistance

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

## 01 Prevention

Prevent an infection from happening (CDI)

## 02 Spread

Prevent its spread (E-LOS)

## 03 Antimicrobial Stewardship

Improve antibiotic use
(prevent unnecessary/inappropriate)

## 04 Development

Develop new drugs and diagnostic tests

Diagnostic Stewardship can help achieve three of these four ways to stop resistance

# The Criticality of Antibiotics

## Issues with antibiotics

01 No new class of antibiotics has been developed since 1980’s (Daptomycin)

02 Antibiotic resistance and our high-risk patients critically dependent on antibiotics

### Organ transplant

>33,000 organ transplants were completed in 2016/US

### Chemotherapy

>650,000 people receive outpatient chemotherapy each year/US

### Chronically ill

~30,000,000 with diabetes

### Renal patients

>500,000 received dialysis in 2016/US

Richard Baltz, Pewtrusts.org lead developer of Daptomycin
Llor, Carl Ther Adv Drug Saf 2013 Dec; 5(6):229-241
Milken Institute School of Publich Health Antibiotic Resistance Action Network
2019 AR Threat Report CDC

# Diagnostic Stewardship With Blood Cultures Leads to AMS and Quality Patient Outcomes

**The Impact**

## Blood culture contamination can have a devastating impact…

### ~1.4 million

patients impacted by false-positive blood culture results annually in the United States, the MAJORITY of which are treated with antibiotics1

### $6 billion +

is spent by our healthcare system each year on unnecessary treatment associated with false-positive blood culture results2

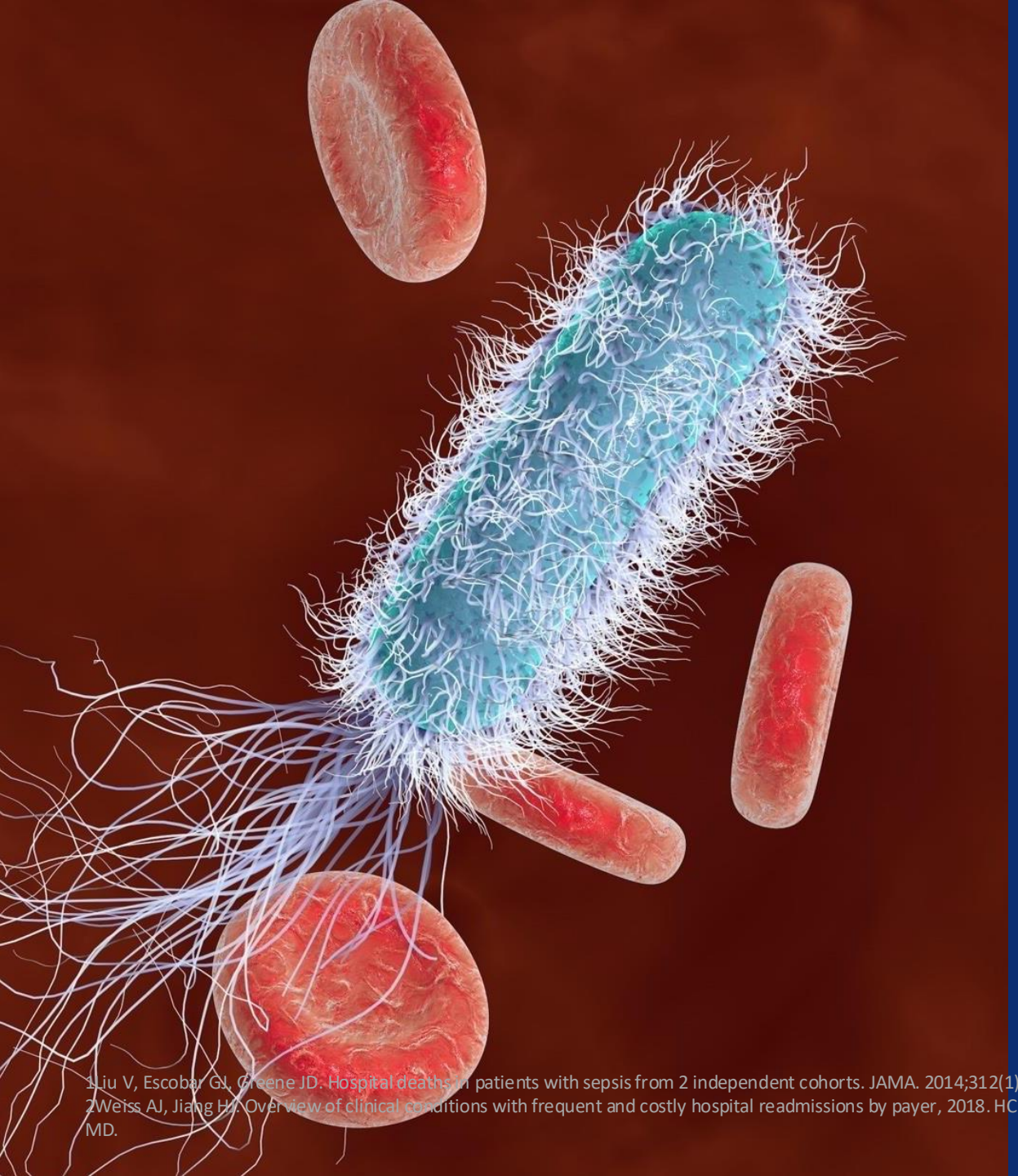
### 3 million +

antibiotic-resistant and C. *difficile* infections each year and 48,000 people die based on the CDC's 2019 report3

### 1 in 5 patients

experience adverse drug event (ADE) associated with antibiotic administration in acute care hospital setting4

1Patton RG. Blood culture contamination definitions can obscure the extent of blood culture contamination: a new standard for satisfactory institution performance Is needed. Infect Control Hosp Epidemiol. 2016;37(6):736-8. doi:10.1017/ice.2016.30. 2Geisler BP, Jilg N, Patton RG, Pietzsch JB. Model to evaluate the impact of hospital-based interventions targeting false-positive blood cultures on economic and clinical outcomes. J Hosp Infect. 2019;102(4):438-444. doi:10.1016/j.jhin.2019.03.012. 3CDC. Antibiotic Resistance Threats in the United States, 2019. Atlanta, GA: U.S. Department of Health and Human Services, CDC; 2019. doi:http://dx.doi.org/10.15620/cdc:82532. 4Tamma PD, Avdic E, Li DX, Dzintars K, Cosgrove SE. Association of adverse events with antibiotic use in hospitalized patients. JAMA Intern Med. 2017;177(9):1308–1315. doi:10.1001/jamainternmed.2017.1938.



# Sepsis is the **#1 cause of death**, readmissions, and costs in U.S. hospitals[1,2]

… and blood cultures remain the gold standard for diagnosing bacteremia/fungemia which may lead to sepsis

1Liu V, Escobar GJ, Greene JD. Hospital deaths in patients with sepsis from 2 independent cohorts. JAMA. 2014;312(1):90 -92. doi:10.1001/jama.2014.5804.
2Weiss AJ, Jiang HJ. Overview of clinical conditions with frequent and costly hospital readmissions by payer, 2018. HCUP Statistical Brief #278. July 2021. Agency for Healthcare Research and Quality, Rockville, MD.

# Sepsis; A New Definition: “A life threatening organ dysfunction caused by a dysregulated host immune response to infection”: *AND detailed report on its cause is fundamental*[3]

- Effects 1.7 million in the US annually
- 350,000 US Adult Patients Deaths
- 11 million deaths worldwide = 20% of all deaths(2017)
- AHRQ:  US cost: $20 billion as of 2011 increasing to $62 billion with inpatient and SNF care of sepsis patients in 2019
- 50% of survivors experiencing post-sepsis syndrome and other lingering effects, including amputations
- Readmissions are 3 times more likely and 3 times more costly

National Institute of General Medical Sciences Sepsis

HHS Study: Journal of Critical Care Medicine,  2019

Nature, Scientific Report 2021

Sepsis Alliance

# Five Factors Improving the Delivery of Recommended Sepsis Practices

- Healthcare knowledge of recommended practices
- Healthcare understanding of the risks and benefits of treatments
- Healthcare team strong collaboration
- Healthcare staff being empowered and supported
- Adequate staffing

# Improving Outcomes

Recognize sepsis early

Implement evidence-based management of sepsis

Support the recovery of patients after sepsis

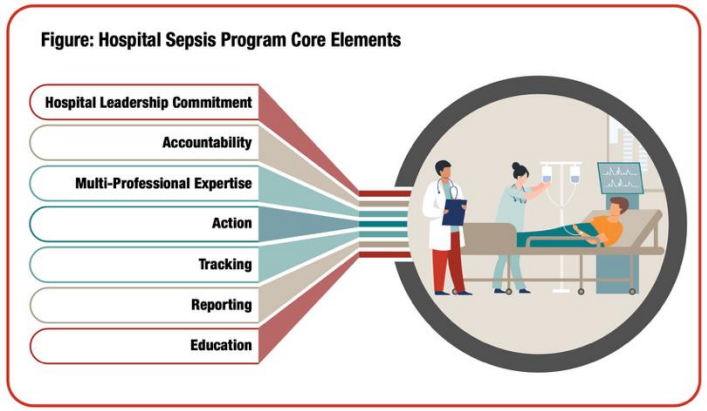
Monitor the impact of hospital-based interventions to improve care and outcomes


CDC Hospital Sepsis Program Core Elements 2023

# Hospital Leadership Commitment

CMO, CNO leadership support (dedicating necessary human, financial and tech resources) is critical for success

- Sepsis program manager with time to manage program
- Analytic and technology resources
- Relevant staff has time to contribute to program
- Sepsis is a hospital priority
- Tie in sepsis work to other QI projects, eg. ED triage, AMS, Transitions of care, SEP 1 Bundle
- Clear communication re sepsis priority to hospital staff and patients
- Support of training and education of sepsis evidence-based practices
- Support of participation in regional and national collaboratives

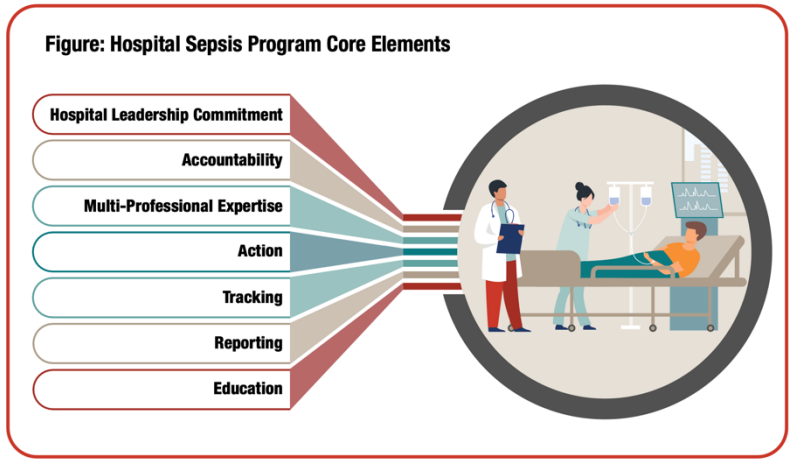



CDC Hospital Sepsis Program Core Elements 2023

# Accountability

Appointing a leader or co-leaders responsible for outcomes

- Co-leadership by a physician and nurse is strongly recommended
- Set ambitious but achievable goals for improved sepsis care an outcomes (review by practice, sepsis outcomes and clinical practice guidelines)
- Assess progress on goals at regular intervals-seek continuous improvement
- Include sepsis program an outcomes in annual performance reviews for leaders
- Identify unit-level physician and nurse champions
- Report program activities and outcomes to senior leadership and post on hospital quality dashboard.

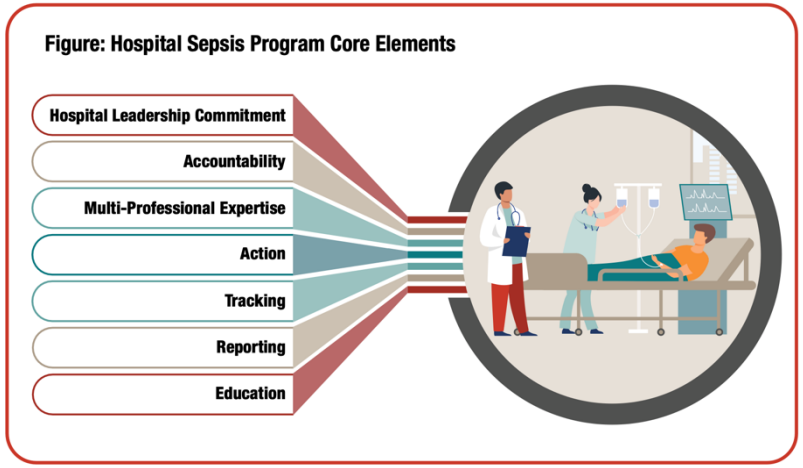



CDC Hospital Sepsis Program Core Elements 2023

# Multi-Professional Expertise

Engaging key partners throughout the hospital and healthcare system

- Dedicated sepsis coordinator
- Collaborate across hospital locations
- Engage in multi-professional experts (AMS, critical care, emergency med, hospital med, ID, nursing, and possibly surgery, oncology, obstetrics, pediatrics, pharma and social work)
- Ensure flexibility for treatment (eg consult with antimicrobial stewardship pharmacist)
- Engage relevant support services  (data analytics, IT, QI, patient safety, quality improvement process such as plan, do, study, act)

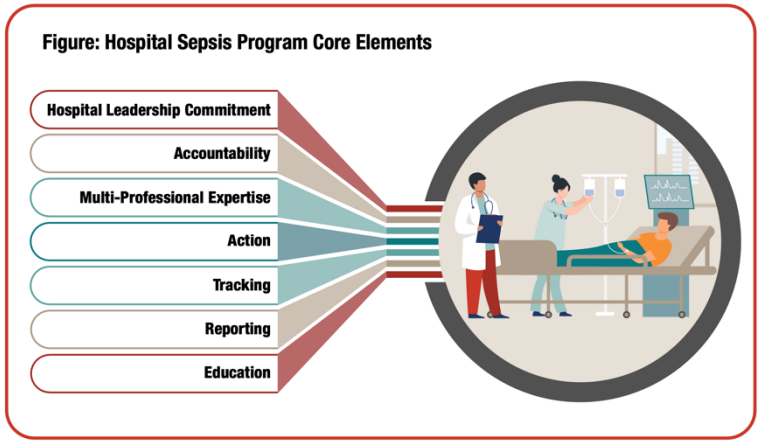



CDC Hospital Sepsis Program Core Elements 2023

# Action

Implementing structures and processes to improve the identification of, management of, and recovery from sepsis

- Implement a standardized process to screen for sepsis, for early management https://www.cdc.gov/sepsis/core-elements/resources.html.
- Develop, maintain (and regularly update) a hospital guideline or a standardized care pathway for sepsis management. Ideally cover the continuum of hospital care https://www.cdc.gov/sepsis/core-elements/resources.html.
- Hospital order sets for management of sepsis
- Structures and processes to facilitate prompt delivery of antimicrobials
- Structures and processes to support effective hospital hand-offs for sepsis patients
- Rapid response teams trained in sepsis recognition and care
- A “Code Sepsis” protocol
- Peri-discharge evaluation for post sepsis syndrome
- Post discharge care coordination and anticipatory guidance
- Prevention of HAIs

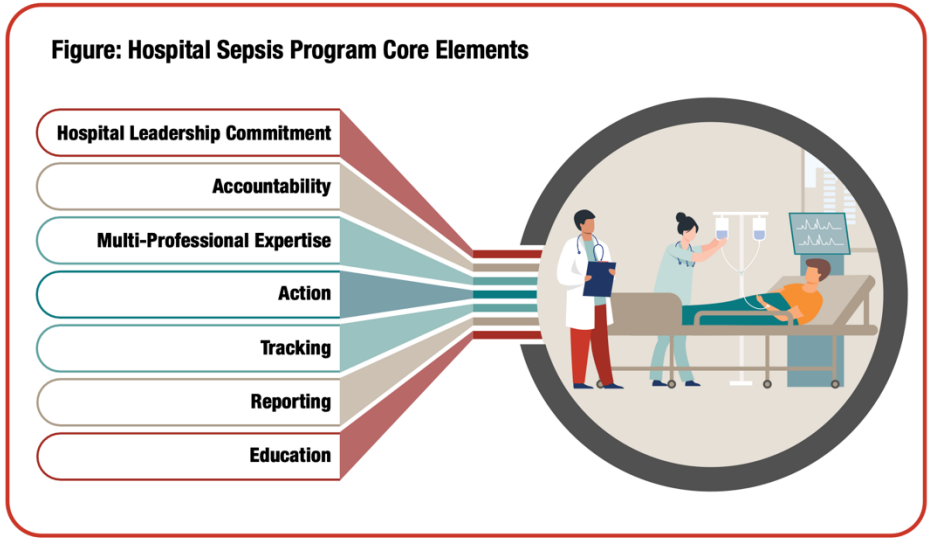



CDC Hospital Sepsis Program Core Elements 2023

# Tracking

Measuring  sepsis epidemiology, management , and outcomes to assess the impact of sepsis initiatives and goal progress

- TRACK:
  - Sepsis epidemiology metrics; case volume, HO vs CO,
  - Sepsis management metric; Antimicrobial timing and fluid admin. timing
  - Sepsis outcomes; mortality ICU admits, LOS
  - Progress towards achieving sepsis program goals
  - Use usability and impact of sepsis program tools
  - Chart reviews for feedback, outcome metrics, education, RCA,

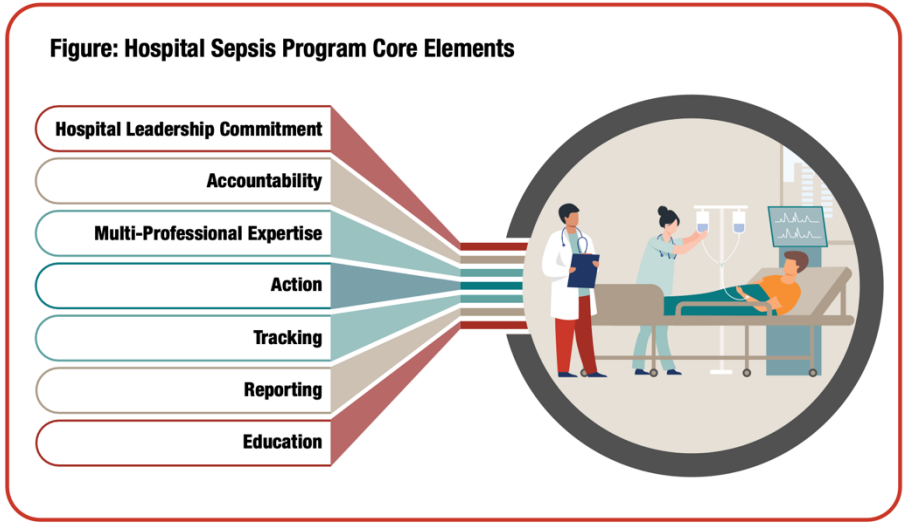



CDC Hospital Sepsis Program Core Elements 2023

# Reporting

Providing information on sepsis management and outcomes to relevant partners

- Regular reports to hospital, unit and clinical leadership and staff; unit level data, trends, comparative benchmarking data to self and other standards
- Focused feedback to individual clinicians on a timely basis. Include real-time feedback positive and learning opportunities
- Public recognition for excellent sepsis care
- Live sepsis dashboard



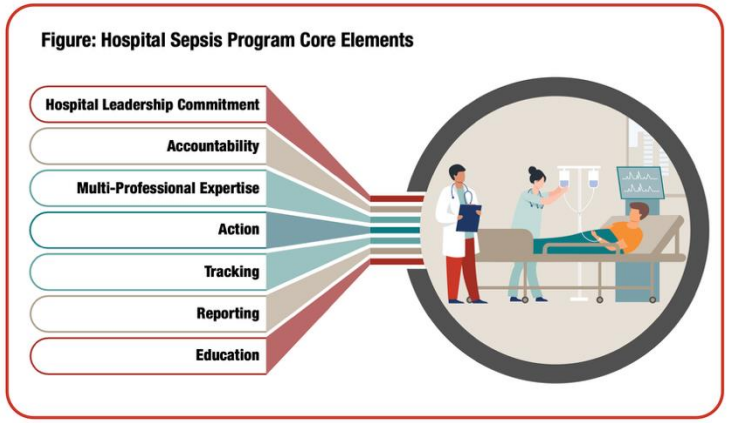

CDC Hospital Sepsis Program Core Elements 2023

# Education

Providing sepsis education to healthcare professionals, patients, family and caregivers

https://www.cdc.gov/sepsis/education/index.html.

- Include sepsis–specific training and education in hiring and on-boarding process for healthcare staff and trainees
- Provide annual sepsis education to clinical staff
- Provide written and verbal education on sepsis to patients, families, caregivers prior to discharge
- Post information on recognition of sepsis in prominent areas for patient-facing staff
- Hold hospital lectures, grand rounds or annual meeting focused on sepsis
- Include sepsis recognition and treatment in annual nursing competencies




CDC Hospital Sepsis Program Core Elements 2023

# The Purpose of Blood Cultures

## Confirm

the presence of microorganisms in the bloodstream

## Identify

the microbial etiology of the bloodstream infection

## Help

determine the source of infection (e.g., endocarditis)

## Provide

an organism for susceptibility testing and optimization of antimicrobial therapy

# Blood Culture Definitions

01 Blood culture contamination (BCC) is defined as the recovery of **normal skin flora (common commensal)** from a **single blood culture. More than one set should be obtained**

02 Culture is defined as a specimen of blood that is submitted for bacterial or fungal culture. **This is irrespective of the number of bottles or tubes into which THE specimen is divided.**

03 A BCC rate represents **common commensal organism occurrence in one set of blood cultures**

04 **Blood Culture Set:** the combination of blood culture bottles or tubes **into which a single blood specimen is inoculated**

05 **Required volume is essential and assumed**

Hall and Lyman, CMR: Updated Review of Blood Culture Contamination; 2006
CLSI: M47A Principles and Procedures for Blood Cultures, Approved Guideline

# Identity of the Organism

Bates et al. found that the identity of the organism was the most important predictor for differentiating contaminated blood culture results from results indicating bacteremia

## Common Commensal Organisms or Probable Contaminants:

- Coagulase-negative staphylococci (CoNS)
- Propionibacterium spp. (Cutibacterium)
- Aerococcus
- Micrococcus
- Bacillus spp. [not B. anthracis]
- Corynebacterium spp. [diphtheroids]
- Alpha-hemolytic streptococci

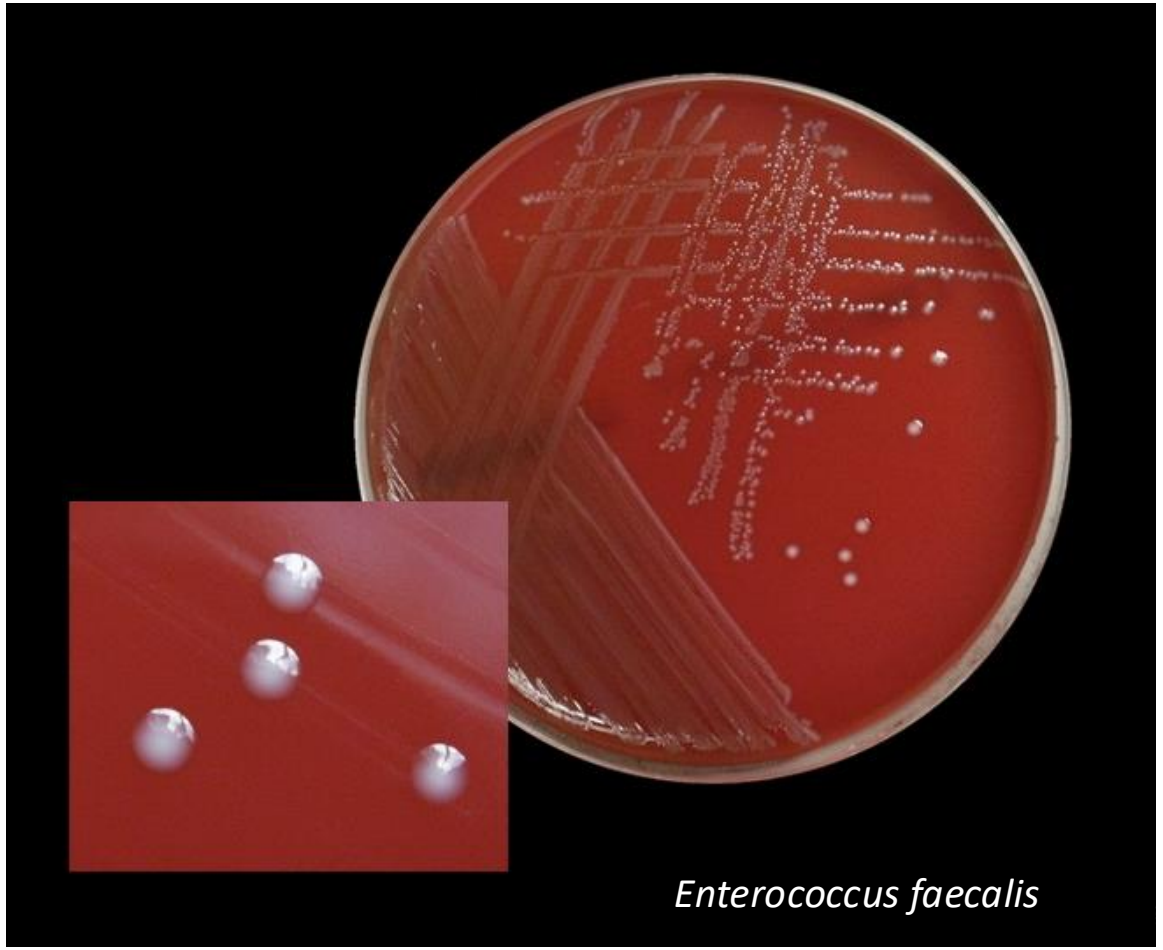
# Identity of the Organism - Usually a True Bacteremia or Fungemia

**However:** these organisms when ONLY skin dwelling and captured as part of the blood sample will cause a False-positive CLABSI on our CVC Patients. With HOB reporting they will also cause a FP HOB

Non-Common Commensal Organisms:

- Enterococcus
- VRE
- MRSA
- Candida
- E.coli

Any organism NOT found on the NHSN Common Commensal list is considered a recognized pathogen for NHSN reporting purposes

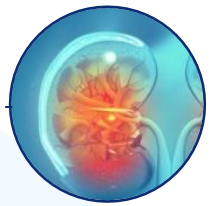


# False-positive blood cultures increase many harmful patient safety risks and mortality

The Impact

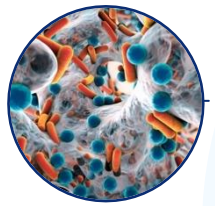
## Unnecessary Antibiotics

Up to 200,000 course of unneeded antibiotics



## Acute Kidney Injury (AKI)

36%-40% incidence with Vancomycin and Zosyn
1.2 million acquire AKI during hospital stay, 300,000 deaths. 3.5 das ELOS and $7 K cost



## Antibiotic-Resistant Infections

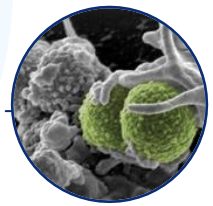
>2.8 million AR infections each year >35,000 deaths

## Extended Length of Stay

avg. 2.2 days
Nearly 1M extra hospital days

## Risk of C. *difficile*

30% reduction in broad-spectrum antibiotics could lower CDI by 26%. Prolonged use = 11% daily increase for CDI. The higher the ASI (broader spectrum), the higher the risk, each daily unit = 22% increase in hCDI risk AJIC 2026



## Exposure to HAIs & HACs

Prevalence of 1 in 31 patients on any given day
11.5% mortality rate

## Misdiagnosed Patient

Black patients have a 30% increased risk for blood culture contamination

## False-Positive CLABSIs

Incidence 30-45% of all CLABSI. Consider FP MRSA, FP HOB.
For every increase of 1% in BCC, CLABSI increases 9%, Valeria Fabre, Hopkins JCM, 52 hospitals, 19 states 360,000 blood cultures 2025

## Increased Mortality

Increase of 74% in patient mortality rate from 4.6% to 8%


Klucher J, Davis K, Lakkad M, Painter JT, Dare RK. Risk factors and clinical outcomes associated with blood culture contamination. Infect Control Hosp Epidemiol. 2022;43(3):291-297. doi:10.1017/ice.2021.111
Lewington, et al. Kidney Int. 2013. DOI: 10.1038/ki.2013.153
https://www.qualityforum.org/Qps/MeasureDetails.aspx?standardID=1980&print=1&entityTypeID=1
Tompkins, getting to zero ICHE https://doi.org/10.1017/ice.2022.284
Doern GV, Carroll KC, Diekema DJ, et al. A comprehensive update on the problem of blood culture contamination and a discussion of methods for addressing the problem. Clin Microbiol Rev 2020;33:1–21.
IHME University of Washington, https://www.healthdata.org/antimicrobial-resistance.
CDC HAI and Antimicrobial Use Prevalence Surveys EMERGING INFECTIONS PROGRAM: HAI - COMMUNITY INTERFACE (HAIC)
HCUP Statistical Brief #145 2009 AHRQ CDI Readmission Rate
Verheyen High 30 Day Readmission Rates AJIC 2019
Huang , Shao-Tsung, Utilizing antibiotic spectrum index to calculate hospital-onset CDI in treating adults with CO BSI, AJIC, Volume 54, Issue 3 P267-27 March 2026

# Overlooked Impact of Diagnostic Error with Blood Culture Contamination

| Condition | Impact | Average Cost |
|---|---|---|
| **Unnecessary Antibiotics** | • Up to 450% more Vancomycin<br>• Antibiotic utilization may lead to resistant organism development | • Incalculable resistant organism HAI cost<br>• AU and AR reporting |
| **Risk of CDI** | • 30% reduction in broad-spectrum antibiotics could lower CDI by 26%<br>• Vancomycin and Zosyn both implicated in causation of CDI<br>• Vancomycin and Zosyn are the "go to" therapy for rule out Sepsis patients | • HAC CDI cost of care and treatment ~$20K/event<br>  • $17K cost of care (as last reported by AHRQ)<br>  • $3K cost of DIFICID to treat<br>• Incalculable cost of HAC SIR penalty, up to 1% of CMS total revenue |
| **Acute Kidney Injury** | • Up to a 40% increase in risk of AKI with Vancomycin and Zosyn tx<br>• 1.2million patients acquire during hospital stay; 300,000 die in US annually<br>• 30% of AKI patients need dialysis making that patient 100Xs more likely to have a Staph BSI<br>• Vancomycin and Zosyn are the "go-to" tx for rule out Sepsis patients | • HAC CLABSI cost of care ~$48K/event (as last reported by AHRQ)<br>• Incalculable cost of HAC SIR penalty, up to 1% of CMS total revenue<br>• 2025 IPPS e-quality reporting measure for hospital onset AKI<br>• AKI alone $7K without a CVC/Dialysis |
| **Extended Length of Stay** | • Avg. 2.2 days of extended stay, impacting bed availability<br>• Mitigating BCC could free 1,000,000 bed days in the U.S.<br>• For each HAC patient prevented, bed could turn over 4.6x making the<br>• hospital more revenue and more profitable | • Avg. cost of BCC ~$4K/event (inclusive of ELOS, Lab, ABTx, etc.)<br>• Incalculable bed opportunity cost |
| **Exposure to HAIs & HACs** | • 1/31 patients develop an HAI/HAC<br>• 10% die during hospitalization<br>• 33% are readmitted within 30 days, which counts as an all cause<br>• 30-day readmission | • HAC readmission penalty, up to 3% total CMS revenue<br>• Incalculable readmissions cost |
| **False-Positive CLABSI**<br>**False-Positive MRSA** | • 30-45% of all CLABSIs are found to be false-positive CLABSIs<br>• Financial cost to a hospital = # CLABSIs x 0.4 x $48,000 minimum cost<br>• FP MRSA per AHRQ Strategies to Prevent HAI | • HAC CLABSI cost of care CLABSI ~$48K/event (as last reported by AHRQ)<br>• Incalculable cost of HAC SIR penalty, up to 1% of CMS total revenue<br>• Invasive MRSA cost of care ~$30K per CID VA Study by Nelson 2021 |
| **In-Patient Mortality Risk** | • 74% increase in in-patient mortality risk with BCC from 4.6% to 8% | • Incalculable cost of mortality risk |
| **Medical Liability Risk**<br>**HCAPHS**<br>**CMS Star Ratings** | • Increased risk of medical liability with HAC<br>• Star Ratings Mortality, Safety, Readmission, Patient Experience,<br>• Timely and Effective Care | • Incalculable cost |


J. Shepard et al. / Could the prevention of health care lass ociated infections increase hospital cost? The financial impact of health care-associated infections from a hospital management perspective American Journal of Infection Control 48 (2020) 255!260
Murray, The Lancet: Global burden of bacterial AMR in 2019 a systematic analysis; 2016
Frœhlich M, Maymonah B, Bailey L, Ford F, LeMaitre B, Psevdos G. Antimicrobial stewardship programachieved marked decrease in clostridium difficile infections in a veterans hospital. Am J Infect Control. 2020;48(9):1119-1121.doi:10.1016/j.ajic.2019.12.023.
Owens RC, Donskey CJ, Gaynes RP, Loo VG, Muto CA. Antimicrobial-associated risk factors for Clostridium difficile infection. Clin Infect Dis. 2008;46(Suppl 1):S19-31.doi:10.1086/521859.
Khalili H, Bairami S, Kargar M. Antibiotics induced acute kidneyinjury: incidence, risk factors, onset time and outcome. Acta Med Iran. 2013;51(12):871-8.
Zwang O, Albert RK. Analysis of strategies to improve cost effectiveness of blood cultures. J Hosp Med. 2006;1(5):272-6.doi:10.1002/jhm.115.
Rha B, See I, Dunham L, et al. *Vital Signs:* Health Disparities in Hemodialysis-Associated *Staphylococcus aureus* Bloodstream Infections — United States, 2017–2020. MMWR Morb Mortal Wkly Rep 2023; 72:153–159. DOI: http://dx.doi.org/10.15585/mmwr.mm7206e1.
Klucher J, Davis K, Laikad M, Painter JT, Dare RK. Risk factors and clinical outcomes associated with blood culture contamination. Infect Control Hosp Epidemiol. 2022;43(3):291-297. doi: 10.1017/ice.2021.111.
1Tompkins, LS, et al. Getting to zero: impact of a device to reduce blood culture contamination and false-positive central line-associated blood stream infections, ICHE 2022, 1-5. doi: 10.1017/ice.2022.284
2Boyce JM, Nadeau J, Dumigan D, et al. Obtaining blood cultures by venipuncture versus from central lines: impact on blood culture contamination rates and potential effect on central line-associated bloodstream infection reporting. Infect Control Hosp Epidemiol. 2013;34(10):1042-7.doi:10.1086/673142.
3Shuman EK, Washer LL, Arndt JL, et al. Analysis of central line-associated bloodstream infections in the intensive care unit after implementation of central line bundles. Infect Control Hosp Epidemiol. 2010;31(5):551-3.doi:10.1086/652157
Nelson et al., National Estimates of Healthcare Costs Associated With Multidrug-**Resistant Bacterial Infections Among Hospitalized Patients in the United** *Clinical Infectious Diseases*, Volume 72, Issue Supplement_1, 1 January 2021, Pages S17–S26, https://doi.org/10.1093/cid/ciaa1581
AHRQ Prevent HAIs Strategies to Prevent Blood Culture Contamination ICUs and non-ICUs

# What is a False-Positive CLABSI?

- A False-Positive CLABSI is defined in the literature as meeting the NHSN Surveillance Definition of a CLABSI with little to no clinical manifestation of bacteremia/fungemia
- This usually occurs when a **non-common** commensal organism like VRE or Candida is picked up from the skin during a **peripheral venipuncture** for blood culture collection and grows out in one bottle. **Gram positive organisms. Required aerobic volume (3 bottles)**
- This is different than an unnecessarily reported CLABSI when there is a primary infection at another site and a culture was not obtained from the primary site or other studies completed to show origin of infection

# Past Strategies for CLABSI Prevention

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

1. Education and Insertion Bundles: Hand Hygiene, Maximal Barrier Precautions, CHG use, Optimal Site Selection, Observers, Checklists and Kits
2. Maintenance Bundles: CHG Bathing, Dressing, Connector and Tubing Protocols, Port Protectors, Assessing Catheter Necessity
3. Vascular Access Teams and Nurse/Patient Ratios
4. Daily Rounding and Auditing

2011 IPPS Hospitals' Mandatory Enrollment in NHSN and CLABSI Reporting
2015 CLABSI HAC Penalties started ICT 2011

# Interventions for CLABSI Prevention

## Socio-adaptive Interventions

- Help empower teams
- Address implementation challenges
- Offer solutions to overcome barriers
- Promote safety culture, team building and leadership
- Promote engagement
- Promote understanding of the technical components to the end-users
- Allow translation of technical components into practice
- Permit modifications to fit local culture, population and workflows

## Technology and Data Driven Interventions

- CLIP
- Hand Hygiene monitoring
- CHG Cleansing, CVCs and Dressings
- Maximal Barrier
- Site Selection
- US guidance
- Observers
- Port Cleansing and Protectors-IPA
- Dressing, Tubing and Connector change protocols
- Line Necessity
- Rounding and Audits
- **Limit CVC access for blood sampling: U of Iowa AJIC 2025**
- **Stop processing blood cultures after patient death: U of Pittsburgh AJIC 2025 (Trauma Centers with organ donation patients may be an exception)**

# Hospitals report HACs to NHSN

CAUTI

SSI

CLABSI

*C. difficile*

MRSA BSI

CLABSI, CDI and MRSA BSI are significantly impacted by **BC contamination**
*(non-common & common commensal organisms)*

National SIR for CLABSIs increased 46% / 47% during COVID (24% 2020 average increase)

(Q3/Q4 '20 vs. Q3/Q4 '19)[1] AND remained 7% higher than pandemic levels for 2021. 2022 had a 9% decrease still leaving us at a 22% average increase over pre- pandemic levels. **2023 had a 13% decrease and we remain 9% over pre-pandemic rates.**

**2024 we had a 9% decrease in CLABSI rates putting us at a pre-pandemic levels.**

National SIR for MRSA increased 23% / 34% during COVID (15% 2020 average increase)

(Q3/Q4 '20 vs. Q3/Q4 '19[1] AND remained 14% higher than pandemic levels for 2021. 2022 saw a 16% decrease still leaving us at an average 13% increase over pre-pandemic levels. **2023 had a 16% decrease making us finally below our pre-pandemic rates. 2024 had another 7% decrease in MRSA HAI.**

**CDI decreased by 11% in 2024**

[1]Weiner-Lastinger LM, Pattabiraman V, Konnor RY, et al. The impact of coronavirus disease 2019 (C
healthcare-associated infections in 2020: summary of data reported to the NHSN.
Infect Control Hosp Epidemiol. 2021;1-14. doi:10.1017/ice.2021.362.A39:B40.
CDC 2023 HAI Progress Report

# False-Positive CLABSI Reporting

**“42% of reported CLABSIs represented contaminants”[1]**

**30% of reported CLABSIs were suspected to represent blood culture contamination”[2]**

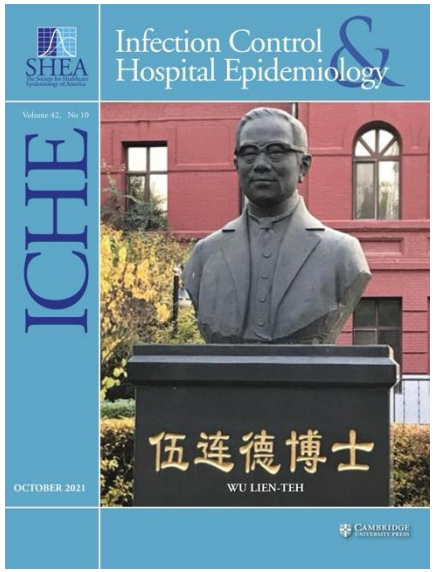
**45% of reported CLABSIs most likely represented contaminated blood cultures rather than true CLABSIs”[3]**

[1]Tompkins, LS, et al. Getting to zero: impact of a device to reduce blood culture contamination and false-positive central line-associated blood stream infections. ICHE Sept.2023

[2]Boyce JM, Nadeau J, Dumigan D, et al. Obtaining blood cultures by venipuncture versus from central lines: impact on blood culture contamination rates and potential effect on central line-associated bloodstream infection reporting. Infect Control Hosp Epidemiol. 2013;34(10):10427. doi:10.1086/673142.

[3]Shuman EK, Washer LL, Arndt JL, et al. Analysis of central line-associated bloodstream infections in the intensive care unit after implementation of central line bundles. Infect Control Hosp Epidemiol. 2010;31(5):551-3. doi:10.1086/652157.

Clinical Infectious Diseases




False-Positive CLABSI Reporting
(CMS NHSN Surveillance Definition LCBI1)

# Potential CMS Revenue Loss

## Non-Payment

***No payment*** from day of HAC diagnosis to discharge

- CDI ($9-25K)
- CLABSI ($27-68K)
- MRSA (invasive MRSA $30K)

## HAC

***Penalty: Up to 1%*** of annual reimbursement

(Top 25% of worst offenders get max penalty)

- CDI
- False-positive CLABSI
- False-positive MRSA

## Readmissions

***Penalty: Up to 3%*** of annual reimbursement

- 33% chance of 30-day readmission with a HAC BSI patient

## VBP

***Loss: Up to 2%*** of annual reimbursement

- Top 25% of hospitals receive $ back plus $ from their competing hospitals in the lower 75%

Goal of ZERO blood culture contamination can help prevent up to 6% CMS revenue loss plus cost of initial care

* Using 2015 AHRQ Data Published in 2017
AJIC 2024 https://doi.org/10.1016/j.ajic.2024.07.014 CLABSI,CAUTI, SSI cost and LOS increased 150% 2019-2024

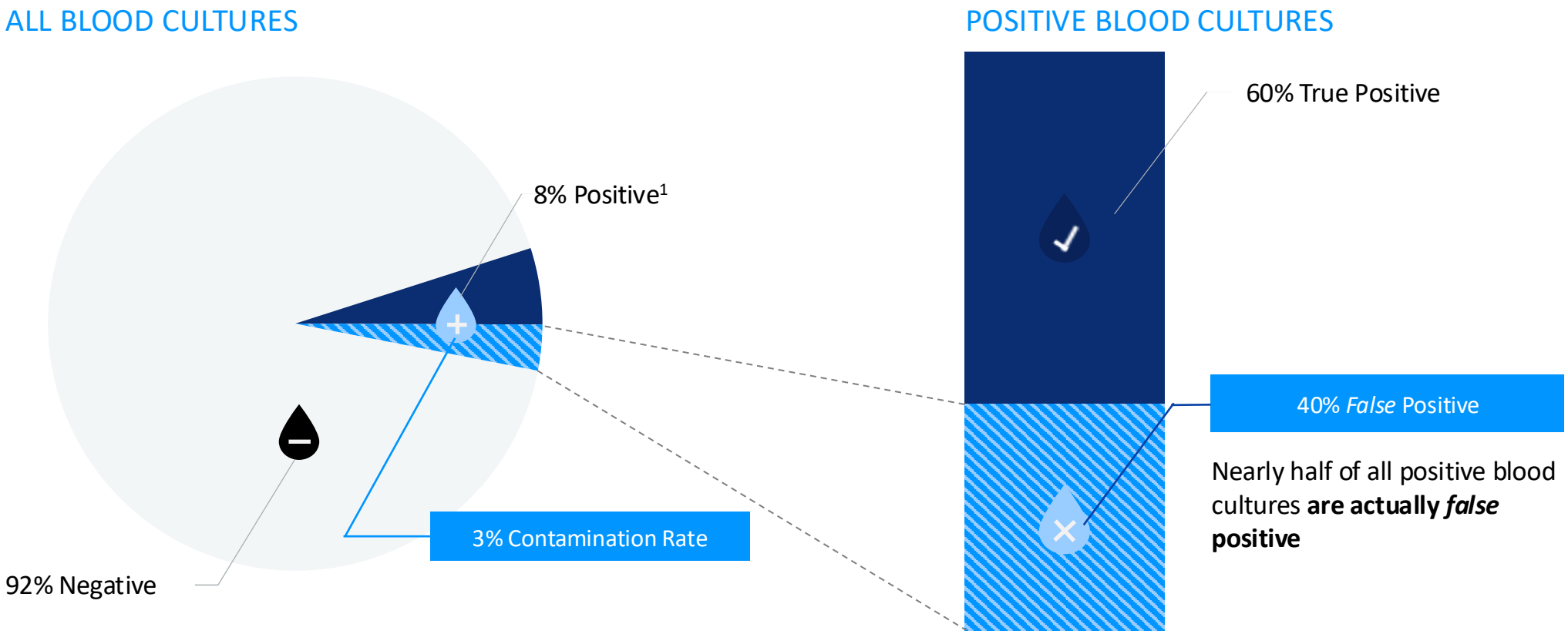
# The Trifecta for CLABSI SIR Mitigation

Insertion Bundle and Checklist- mitigate true positives

Maintenance Bundle and Checklist- mitigate true positives

Blood Culture Collection Bundle and Checklist- mitigate false positives

# Test Results for Sepsis are Frequently Wrong, which can lead to Misdiagnosis and Probable Mistreatment




False positives are a **preventable error** and can lead to a misdiagnosis of sepsis

1. Zwang O, Albert RK. Analysis of strategies to improve cost effectiveness of blood cultures. J Hosp Med. 2006;1(5):272-6. doi:10.1002/jhm.115.

# Major steps toward CMS adoption of CDC/NQF Blood Culture Quality Measure

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

NATIONAL QUALITY FORUM

**CDC-initiated** blood culture quality measure developed and submitted to NQF, April 2022

Published evidence-based guidelines including Diversion Devices and citing a **1% goal** for blood culture contamination, 2022

NQF Consensus Standards Approval Committee (CSAC) formally **endorsed** the **CDC's** blood culture quality measure in December 2022

**Finding:** On a national scale, BCC results in nearly 1,000,000 extra hospital days, 200,000 courses of unneeded antibiotics and over $1 billion in excess costs, Up to 40% of patients with contaminated blood cultures are started on antibiotics resulting in nephrotoxicity, CDI, allergic reaction, AMR, ELOS, HAI/HAC, Costs, and unnecessary utilization of resources.

# New National ‘Goal’

for blood culture contamination


New CLSI M47 2022 goal with best practices for blood culture contamination rates in the U.S.[1]

THE RIGHT ‘STANDARD’ FOR PATIENTS

1CLSI. M47 2nd Edition Principles and Procedures for Blood Cultures; 2022.


# CDC Representative referred to Blood Culture Contamination as a “Patient Safety” Eve0nt

“Blood culture contamination is considered to be a patient safety event. So, we need to think about what you would do if there was a patient fall, which is also a patient safety event.”

Bunn, JD. Diagnostic Excellence: A New Quality Tool to Prevent Blood Culture Contamination [PowerPoint Presentation]. Presented December 13, 2023. https://reach.cdc.gov/event/diagnostic-excellence-new-quality-tool-prevent-blood-culture-contamination

Journal of Applied Laboratory Medicine;

# Bunn and Cornish, Blood Culture Contamination and Diagnostic Stewardship January 2025

Given that diagnostic stewardship (DS) is an approach to reduce diagnostic errors, it is integral to antibiotic stewardship. DS can also be incorporated with antibiotic stewardship efforts to ensure the proper test is performed for the right patient at the right time (28). DS aims not just to ensure the correct test is done but also to ensure the right test is done correctly. Hospita ls and hea lthcare

SPECIAL REPORT

## Blood Culture Contamination and Diagnostic Stewardship: From a Clinical Laboratory Quality Monitor to a National Patient Safety Measure

Jake D. Bunn [a,*] and Nancy E. Cornish[a]

Laboratory analysis of blood cultures is vital to the accurate and timely diagnosis of bloodstream infections. However, the reliability of the test depends on clinical compliance with standard operating procedures that limit the risk of inconclusive or incorrect results. False-negative blood culture results due to inadequate volumes of blood can result in misdiagnosis, delay therapy, and increase patients' risk of developing or dying from bloodstream infections. Likewise, commonly occurring bacteria or fungi on human skin (i.e., commensal organisms) can contaminate the blood culture during collection and increase the risk of false positives, compromising care and leading to unnecessary antibiotic therapy and prolonged hospitalization.

In December 2022, a Centers for Medicare & Medicaid Services (CMS) consensus-based entity (CBE) endorsed the Centers for Disease Control and Prevention's (CDC) proposal for a new patient safety measure to address these concerns. CDC developed this quality measure to promote the standardization of blood culture best practices and improve laboratory diagnosis of bloodstream infections nationally. This special report will emphasize the importance of standardizing blood culture collection and describe the need for a national patient safety measure, new quality tools, and next steps.

### INTRODUCTION

Blood cultures are the gold standard of bloodstream infection diagnosis and are based on the detection of viable microorganisms present in blood. The process begins when a blood culture test request is entered by the clinical care team. The clinical or laboratory staff then draw blood from the patient and inoculate the blood into blood culture bottles. These bottles are then incubated for a predetermined period, usually 5 days. If a viable microorganism is present in the bottles, the laboratory will detect it and will use gram stain to perform initial organism identification.

A positive gram stain from a blood culture is considered a panic or alert value also known as a critical value (1). Panic values are test results that a laboratory must immediately alert to the individual or entity requesting the test when any test result indicates an imminently life-threatening condition. Timely reporting of panic values is required by the Clinical Laboratory Improvement Amendments of 1988 (CLIA) (2). Once the clinical care team notification is complete and

[a]Centers for Disease Control and Prevention (CDC), Office of Laboratory Systems and Response (OLSR), Divsion of Laboratory Systems (DLS), Atlanta, GA, United States.
*Address correspondence to this author at: Centers for Disease Control and Prevention (CDC), 1600 Clifton Road, NE, MS V24-3, Atlanta, GA 30329-4027, United States. E-mail qxh1@cdc.gov.
Disclaimer: The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of Centers for Disease Control and Prevention.
Received June 07, 2024; accepted October 07, 2024.
https://doi.org/10.1093/jalm/jfae132
Published by Oxford University Press on behalf of Association for Diagnostics & Laboratory Medicine 2025.

# CDC and CMS Action Plan

**CBE ID** 3658
**Title** Adult Blood Culture Contamination Rate; A national measure and standard for clinical laboratories and antibiotic stewardship programs
**Endorsement Status** Endorsed

**2026**

Review blood culture contamination and volume literature and update measure as needed Once 3% contamination rate benchmark has been in place for 3 years ask for evidence that institutions are putting interventions into place to reduce contamination rates in collaboration with their antibiotic stewardship program.

**Interventions such as education and training programs, use of initial specimen diversion devices, adjusting skin disinfectants used prior to phlebotomy, or other interventions described in the following CMR article Table 2.**

Begin collecting blood culture contamination rate data for patients ≤18 years of age.

**2026 – 2029**

Review blood culture contamination and volume literature and update measure as needed. **Collect contaminated blood culture and single set blood culture data with intervention implemented**.

Introduce blood volume as a required measure with at least 40 to 60 mL collected per septic episode (per 24-hour period) as the goal

**2029**

Review blood culture contamination and volume literature and update measure as needed **Complete actions to make this measure required by CMS for hospitals to measure and report blood culture contamination rate and volume for all blood cultures collected, and act on the results to improve quality by reducing the contamination rate and optimizing the volume collected.**

Doern GV, et al Practical Guidance for Clinical Microbiology Laboratories: A Comprehensive Update on the Problem of Blood Culture Contamination and a Discussion of Methods for Addressing the Problem. Clin Microbiol Rev. 2019 Oct 30;33(1):e00009-19. doi: 10.1128/CMR.00009-19. PMID: 31666280; PMCID: PMC6822992.

# Training and Education on “Best Practices” Alone for Blood Culture Collection Will Not Solve the Problem

## Controllable

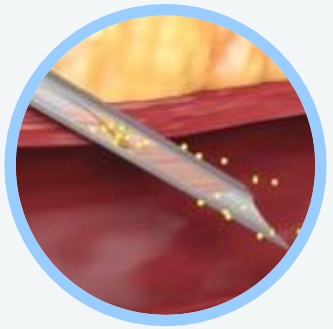
**Human Factor**(s)

Risk of contamination during assembly, preparation of supplies and skin prep

## Uncontrollable

**Skin Flora**

You can disinfect but not sterilize the skin. Up to 20% of skin flora remains viable in the keratin layer of the skin even after skin prep[1]



**Skin Plug and Fragments**
(uncontrollable factors)

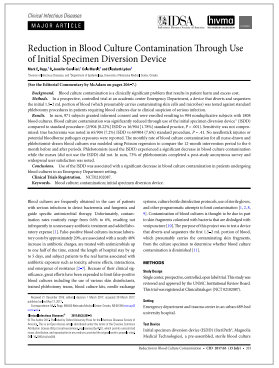
will enter the culture specimen bottle and commonly will contain viable microorganisms (when present)

Active diversion of the **initial 1.5-2.0 mL of blood** using a closed system ISDD has been clinically proven to reduce blood culture contamination[2,3]

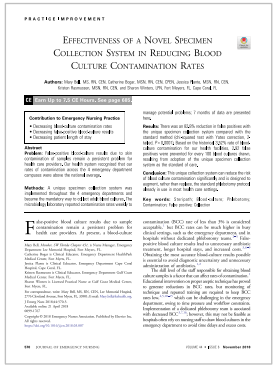
[1]Anjanappa T, Arjun A. Preparative skin preparation and surgical wound infection. J Evid Based Med. 2015;2(2):131-154. [2]Rupp ME, Cavalieri RJ, Marolf C, Lyden E. Reduction in blood culture contamination through use of Initial Specimen Diversion Device. Clin Infect Dis. 2017;65(2):201-205. 3Bell M, Bogar C, Plante J, Rasmussen K, Winters S. Effectiveness of a novel specimen collection system in reducing blood culture contamination rates. J Emerg Nurs. 2018;44(6):570-575.

# ISDD: Nine Peer-Reviewed Published Studies

***Clinical Infectious Diseases***
2017 (July)


Reduction in Blood Culture Contamination Through Use of Initial Specimen Diversion Device

***Journal for Emergency Nursing***
2018 (Nov)


Effectiveness of a Novel Specimen Collection System in Reducing Blood Culture Contamination Rates

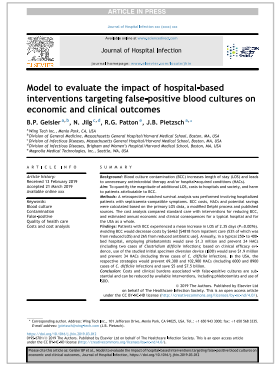
***Journal of Clinical Microbiology***
2019 (Jan)


Estimated Clinical and Economic Impact through Use of a Novel Blood Collection Device To Reduce Blood Culture Contamination in the Emergency Department: a Cost-Benefit Analysis

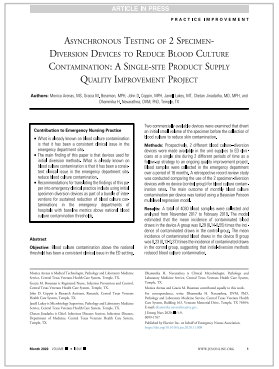
***American Journal Infection Control***
2019 (Jan)


Reducing blood culture contamination using an initial specimen diversion device

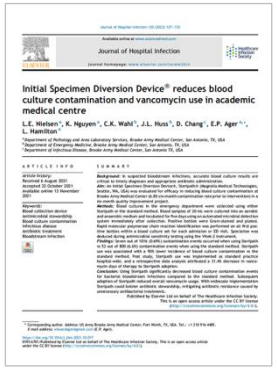
***Journal of Hospital Infection***
2019 (Mar)


Model to evaluate the impact of hospital-based interventions targeting false-positive blood cultures on economic and clinical outcomes

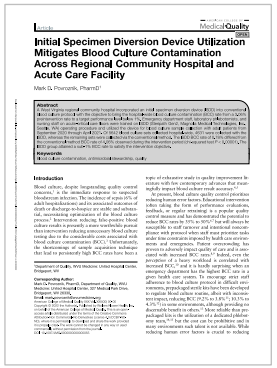
***Journal for Emergency Nursing***
2021 (Mar)


Asynchronous Testing of 2 Specimen-Diversion Devices to Reduce Blood Culture Contamination: A Single-site Product Supply Quality Improvement Project

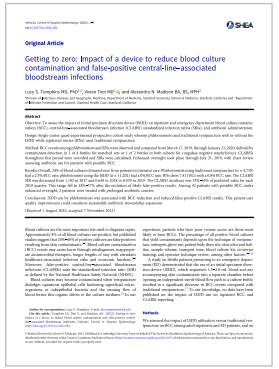
***Journal of Hospital Infection***
2021 (Nov)


Initial Specimen Diversion Device® reduces blood culture contamination and vancomycin use in academic medical centre

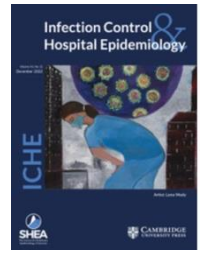
***American Journal Medical Quality***
2022 (April)


Initial Specimen Diversion Device Utilization Mitigates Blood Culture Contamination Across Regional Community Hospital and Acute Care Facility

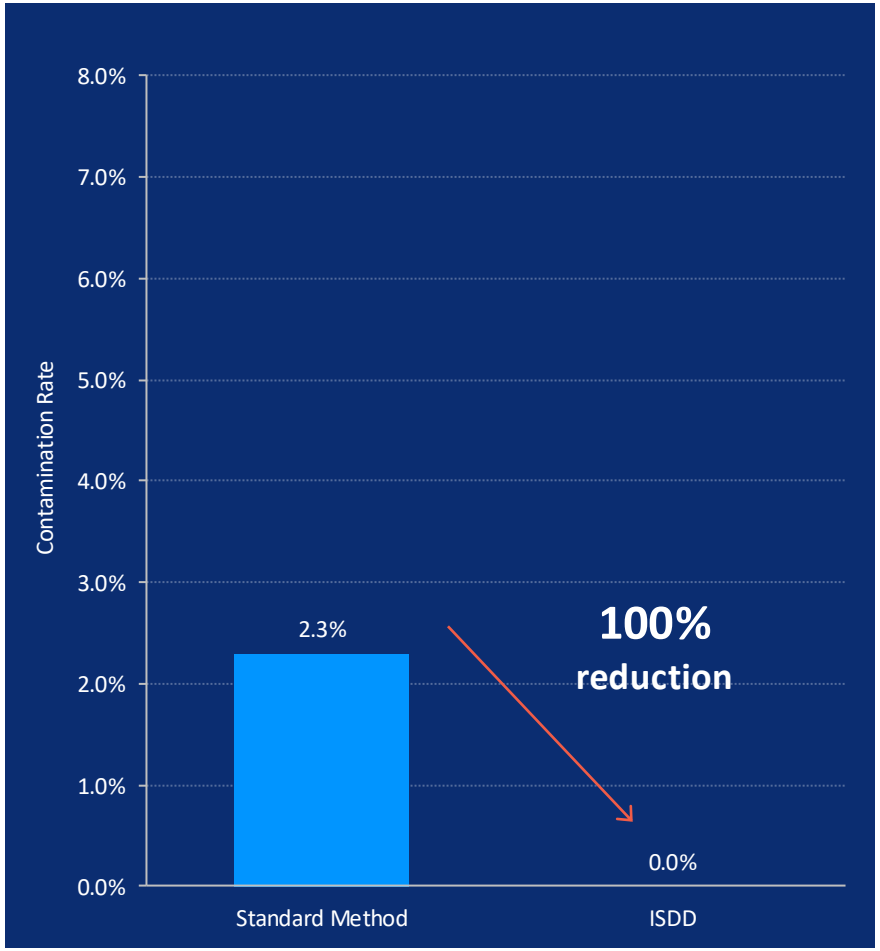
***Infection Control & Hospital Epidemiology***
2022 (December)


Getting to zero: Impact of a device to reduce blood culture contamination and false-positive central-line–associated bloodstream infections

# Diagnostic Safety and Stewardship and False-positive CLABSIs: Getting to Zero



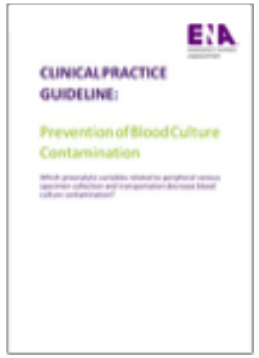

| | |
|---|---|
| **TITLE:** | Getting to Zero: Impact of a Device (Steripath) to Reduce Blood Culture Contamination and False-Positive Central Line-Associated Bloodstream Infections |
| **CONFERENCE** | ***Infection Control & Hospital Epidemiology (2022)*** |
| **INSTITUTE:** | **Stanford Health Care** |
| **AUTHORS:** | Lucy Tompkins, MD, PhD, et al |
| **DESIGN:** | Single-center, prospective, controlled study<br>March 2019–January 2020 (10-months) |
| **METHOD:** | Blood cultures were obtained **hospital-wide** by **Phlebotomy team** using the Steripath Gen2 compared to standard method. |
| **RESULTS:** | **100%** reduction in blood culture contamination<br>ISDD: **0.0% (0/11,202)** contamination rate<br>Standard method: **2.3% (111/4,759)** contamination rate |
| | **12-Fold** decrease in NHSN/CMS reportable **False-Positive CLABSIs**<br>ISDD: **1**<br>Standard method: **12**<br>**CLABSI SIR** fell by **30-50%** when contaminants were removed |




Tompkins LS, Tien V, Madison AN. Getting to zero: impact of a device to reduce blood culture contamination and false-positive central line-associated blood stream infections. Infect Control Hosp Epidemiol. 2022;1-5.

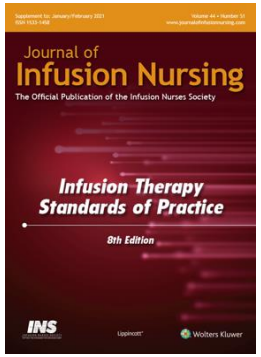
# *Only one device and diversion volume* referenced to reduce blood culture contamination, based on high-quality, technology-specific evidence ~1mL diversion.

EMERGENCY NURSES ASSOCIATION



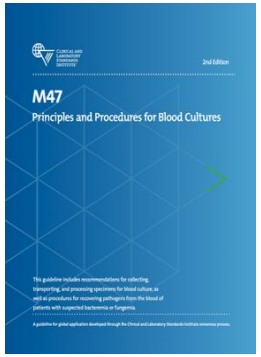

**1.0–2.0 mL** diversion volume

INFUSION NURSES SOCIETY
SETTING THE STANDARD FOR INFUSION CARE®



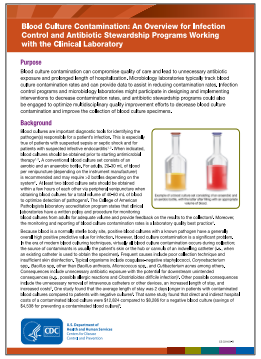

**Diversion Devices** "…demonstrated reduction in blood culture contamination"

CLSI



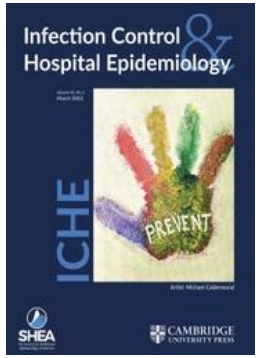

**1% goal** for blood culture contamination and Diversion Devices[1]

CDC




**1% goal** for blood culture contamination and Diversion Devices[2]

SHEA
The Society for Healthcare Epidemiology of America




Blood Culture **Diversion** Technique and **Devices**

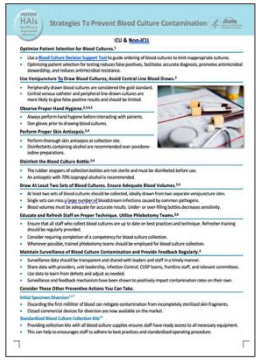
AMERICAN SOCIETY FOR MICROBIOLOGY


"…should implement using a **Diversion Device** as part of the procedure for drawing peripheral BCs"

IDSA
Infectious Diseases Society of America


"…[products] allow diversion and discard of the **first few milliliters of blood**… "and Diversion Devices"

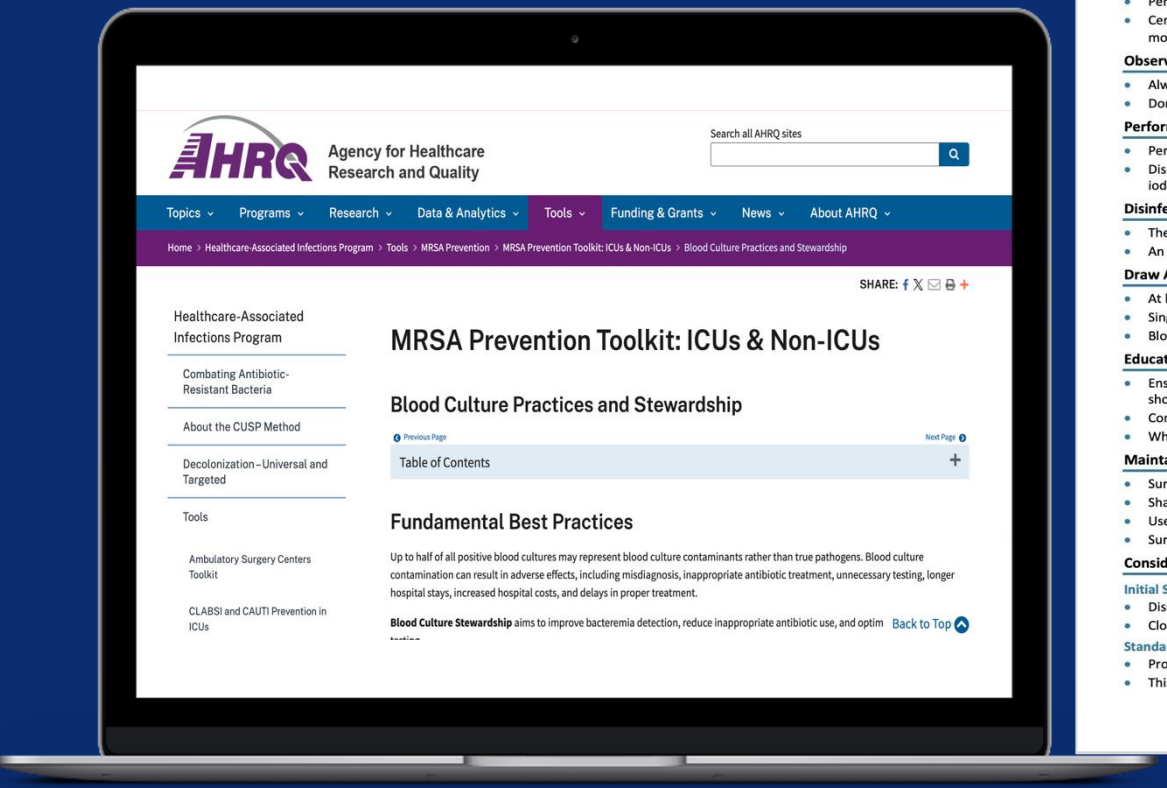
AHRQ




"Discarding the **first milliliter of blood**…"and Diversion Devices

1. M47 ED2 2022. 2. 2022 CDC Guidelines.

# AHRQ MRSA Prevention Toolkit and Strategies to Prevent Blood Culture Contamination



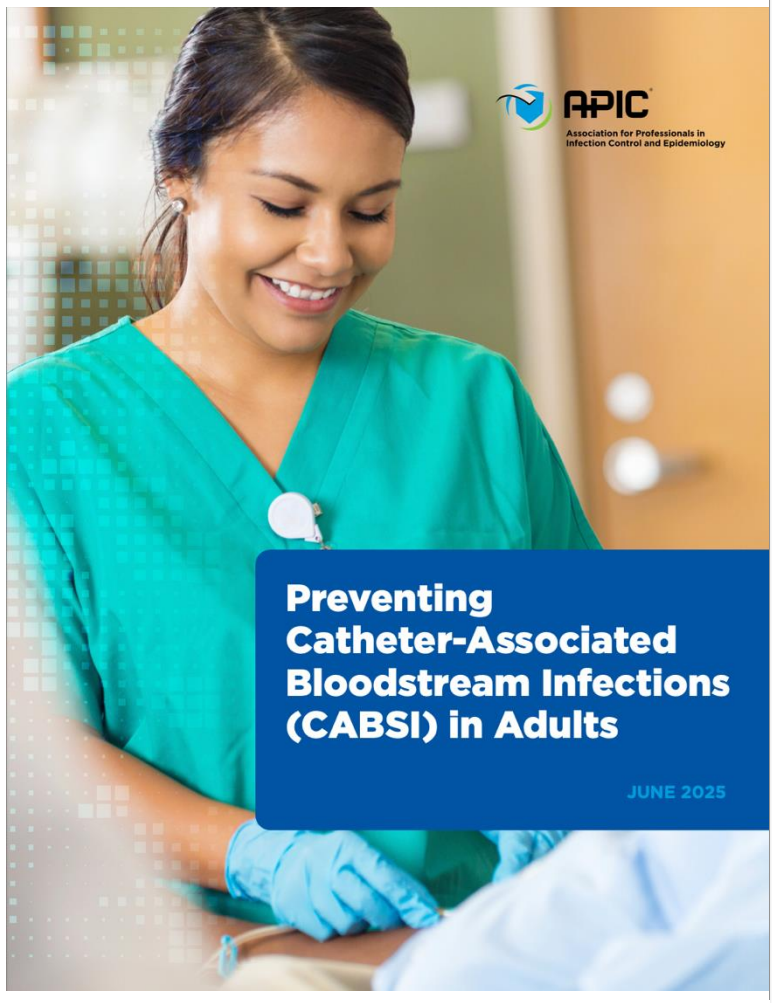


## Consider These Other Preventive Actions You Can Take.

### Initial Specimen Diversion[1 2 7]

- Discarding the first milliliter of blood can mitigate contamination from incompletely sterilized skin fragments.
- Closed commercial devices for diversion are now available on the market.

# A New Guideline: APIC on CABSI Citing CDC, ASM, INS, IDSA AHRQ specimen diversion to mitigate contamination from the skin




**SBAR: Specimen Diversion Impact on Bloodstream Infection**
APIC CRPI | Last updated 5/2/25

APIC RESEARCH NETWORK

## 1 Situation:

An evidence-based guideline or expert consensus statement is not currently available to answer the question: Among hospitalized patients who have a blood culture collected, what is the impact of specimen diversion (e.g., diversion device, bypass, waste tube) on bloodstream infections?

## 2 Background:

- A literature search identified 121 articles utilizing common search terms (Table 1).
  - Nine articles[1-9] remained after full-text review and application of restrictions (Table 2).
  - One of the articles was a systematic literature review1 which utilized nine articles for a meta-analysis (including four articles identified during our literature review).
    - » In 83,325 collected blood cultures, it was found that initial blood culture diversion devices were associated with lower frequency of blood culture contamination (p= 0.29).
- Below are highlights from the remaining four articles[6-9]:

| ELEMENT | FINDINGS |
|---|---|
| **Type of device assessed** | One study utilized a specimen diversion device; Three studies utilized a waste tube |
| **Size of study** | Study populations ranged from 810 to 27,145 samples |
| **Endpoints** | Blood culture contamination rate was an outcome measure in all four studies |
| **Results** | All four studies showed a statistically significant reduction in the blood culture contamination rate |

- The Centers for Disease Control and Prevention (CDC) outlines the risks associated with blood culture contamination in the following document: Blood Culture Contamination: An Overview for Infection Control and Antibiotic Stewardship Programs Working with the Clinical Laboratory, including increased length of stay and increased cost.
- American Society for Microbiology states "institutions (facilities) that draw blood cultures should consider implementing a diversion device as part of the procedure for drawing peripheral blood cultures (evidence quality: II, recommendation strength: moderate)".[10]
- Infusion Therapy Standards of Practice 2024 states "studies have demonstrated reduction in blood culture contamination with use of a diversion device." (Standard 41, Blood Sampling).[11]
- In a joint guide by the Infectious Diseases Society of America and the American Society for Microbiology mention the benefits of device diversion to reduce skin contaminants.[12]
- The Agency for Healthcare Research and Quality suggests considering initial specimen diversion to mitigation contamination from the skin.[13]



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| | | |
|---|---|---|
| **Blood culture collection products** | Blood culture collection kits | Having appropriate supplies available and packaged together increases the likelihood of compliance. |
| | Diversion device and waste tubes | Diversion devices or waste tubes can be utilized as a strategy for reducing the risk of blood culture contamination at the time of collection. |

# Evidence-Based Blood Culture Best Practices

| | |
|---|---|
| **Patient Selection** | Blood cultures should only be performed in patients with a reasonable likelihood of bacteremia/fungemia |
| **Skin Disinfection** | Use a CHG and alcohol-containing disinfectant to scrub the phlebotomy site; allow for adequate scrub and drying time |
| **Blood Culture Bottle Top Disinfection** | Disinfect blood culture vial tops with alcohol by scrubbing with friction for 15 seconds |
| **Consideration** | Leave an IPA or sterile pad on top of the BC bottle until ready to inoculate with blood; IPA takes 5 seconds to dry |
| **Phlebotomy Site** | Do not draw blood cultures through indwelling vascular catheters unless the catheter is thought to be the source of infection; draw a second set from a peripheral venipuncture; consider time to positivity |
| **Sets** | Always draw two sets from different sites |
| **Volume** | Is the single most important factor for organism detection |
| **Standardized Kits** | Use of standardized kits and procedures has proven helpful in preventing contamination |
| **Phlebotomy Teams** | Educate and train individuals who perform blood cultures in aseptic technique |
| **Surveillance and Feedback** | Monitor blood culture contamination and provide data to individuals and patient care units |
| **Multidisciplinary Teams** | Sustained improvement in blood culture contamination is best achieved through a team approach |
| **ISDD** | Use of ISDDs that divert 1mL or more of blood have been shown to decrease contamination to less than 1% |

*Content based on recent publication released by Dr. Mark Rupp: Doern GV, Carroll KC, Diekema DJ, Garey KW, Rupp ME, Weinstein MP, Sexton DJ. A comprehensive update on the problem of blood culture contamination and a discussion of methods for addressing the problem. Clinical Microbiology Reviews. January 2020.* UNMC, ENA and INS

# Evidence-Based Checklist for Adult Peripheral Blood Culture Collection Summary

- Utilize astute patient selection and check order.
- Identify and inform patient.
- Ensure environmental surfaces used are disinfected.
- Perform hand hygiene. Use aseptic non touch technique throughout entire process.
- Mask self and patient.
- Prepare to draw 2-3 sets of blood cultures within a short time frame. Each set to be drawn from a different site. Avoid single bottle sets and drawing more than 3 sets within a 24 hour period if possible.
- Select a site opposite of any infusion or if not possible, distal to any infusion. The cubital fossa is a preferred site.
- Each set to be drawn from a different venipuncture or new start PIV and include one aerobic and one anaerobic bottle per policy.
- Mark bottles for fill volume and fill to that volume. Most manufacturers require 8-10mL per bottle.
- Disinfect venipuncture site with 2% Chlorhexidine and Alcohol product per manufacturer's directions.
- Remove bottle cap and scrub bottle septum with a 70% alcohol prep pad for a full 15 seconds.
- Consider covering bottle top with a sterile 1x1 or new alcohol prep pad and leave on until placing bottle in adapter.
- Select site and apply single patient tourniquet - validate site, then remove tourniquet and don clean gloves.
- Consideration: Sterile set up with sterile barrier, gloves and tourniquet. Don gloves, apply barrier, apply tourniquet and perform venipuncture procedure.
- Draw blood cultures first, making sure to draw the recommended volume into the aerobic bottle first.
- Divert and sequester initial milliliter of blood drawn for culture into a sterile receptacle to minimize the risk of contamination. Use of ISDDs have been shown to reduce blood culture contamination rates to less than 1%.
- Finish procedure, applying a sterile dressing and light pressure after completing blood draw. Place sharps in sharp's disposal containers compliant with local and federal regulations.
- Label bottles in presence of the patient, agitate gently per manufacturer's instructions, and place in biohazard bag and send to lab immediately.

At the 2022 SHEA Spring Conference HOB was introduced.

# The target launch date was **Spring 2023**

**Purpose:**

Surveillance for broader reduction of BSI regardless of organism (eg. MRSA) or association with Device (eg. CLABSI)

**Definitions:**

HOB Blood culture collected on day 4 or later with pathogenic bacteria or fungi

**Timeline:**

**Voluntary Reporting Now**

**Serious:**

24% patient mortality compared to patients without HOB (negative cultures)

- ELOS: 27 vs. 13 days
- Higher cost $44k vs $26k

**Common:**

Up to 77,000-115,000 annual US events (0.23%-0.34% of admissions)

**Preventability:**

**Multiple studies now available**

# How Hospitals Will Calculate HOB

## Numerator and Denominator

- **N** Bacteremia or Fungemia from blood culture on day 3 or later
- **N** Must not be a common commensal
- **N** May also be identified by genus and species by non-culture based microbiologic testing

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- **D** Expected number of HOB events based on predictive models and location data as predictors (like CLABSI SIR)

### Numerator and Denominator

- Blood Culture
- BCC
- Community onset HOB
- Matching Commensal HOB
- Non-measure HOB

## NHSN HOB: Surveillance Metrics

| Measure | Numerator | Denominator |
|---|---|---|
| **Primary Metric: HOB Event** | | |
| HOB Event | Pathogenic bacteria or fungi from blood culture on hospital day ≥4 (excluding patients with prior matching cultures and HOB events) | Total no. of inpatient admissions |
| **Complementary Metrics: For Quality Improvement, NHSN Risk Adjustment** | | |
| Blood Culture Utilization | Testing Prevalence: Admissions with at least 1 blood culture<br>Testing Intensity: Total blood cultures patients with at least 1 blood culture | |
| Blood Culture Contamination | Skin commensal organism in 1 of 2 blood cultures sets | Total no. of blood culture sets |
| Community-Onset Bacteremia & Fungemia Event | Pathogenic bacteria or fungi from blood culture prior to hospital day 4 (excluding patents with prior cultures and COB events) | Total no. of inpatient admissions |
| Matching Commensal HOB Event | Skin commensal from ≥2 blood cultures AND ≥4 days of antibiotic treatment | Total no. of inpatient admissions |
| Non-Measure HOB Event | HOB events among patients with conditions that highly predict non-preventability | Total no. of inpatient admissions |

# Study Review

Incidence of HOB is at least double that of CLABSI

Acute care units have the highest percentage of HOB

**34%** of HOBs did NOT meet criteria due to a positive blood culture taken on admission

**48%** of HOBs occur in the presence of peripheral lines only

# Preventability

## AJIC 2024

Contents lists available at ScienceDirect

American Journal of Infection Control

journal homepage: www.ajicjournal.org

Major Article

### Etiology and utility of hospital-onset bacteremia as a safety metric for targeted harm reduction

Matthew A. Stack MD [a,*], Lana Dbeibo MD [a], William Fadel PhD [a], Kristen Kelley RN, CIC [b], Joshua Sadowski [b], Cole Beeler MD [a]

[a] Indiana University School of Medicine, Indianapolis, IN
[b] Indiana University Health, Indianapolis, IN

Key Words:
Hospital-acquired infections (HAIs)
CLABSIs
Bloodstream infections (BSIs)
Quality improvement
Hospital reimbursement
National Health Care Safety Network (NHSN)

**Background:** Hospital acquired infections (HAIs) are a major driver of morbidity and cost in health systems. Central line–associated bloodstream infections (CLABSIs) require intensive surveillance and review. All-cause hospital-onset bacteremia (HOB) may be a simpler reporting metric, correlates with CLABSI, and is viewed positively by HAI experts. Despite the ease in the collection, the proportion of HOBs that are actionable and preventable is unknown. Moreover, quality improvement strategies targeting it may be more challenging. In this study, we describe the bedside provider-perceived sources of HOB in order to provide insight into this new metric as a target for HAI prevention.

**Methods:** All cases of HOBs in 2019 from an academic tertiary care hospital were retrospectively reviewed. Information was collected to assess provider-perceived etiology and associated clinical factors (microbiology, severity, mortality, and management). HOB was categorized as preventable or not preventable based on the perceived source from the care team and management decisions. Preventable causes included device-associated bacteremias, pneumonias, surgical complications, and contaminated blood cultures.

**Results:** Of the 392 instances of HOB, 56.0% (n = 220) had episodes that were determined not preventable by providers. Excluding blood culture contaminates, the most common cause of preventable HOB was secondary to CLABSIs (9.9%, n = 39). Of the HOBs that were not preventable, the most common sources were gastrointestinal and abdominal (n = 62), neutropenic translocation (n = 37), and endocarditis (n = 23). Patients with HOB were generally medically complex with an average Charlson comorbidity index of 4.97. This translated into a higher average length of stay (29.23 vs 7.56, $P < .001$) and higher inpatient mortality (odds ratio 8.3, confidence interval [6.32-10.77]) when compared to admissions without HOB.

**Conclusions:** The majority of HOBs were not preventable and the HOB metric may be a marker of a sicker patient population making it a less actionable target for quality improvement. Standardization across the patient mix is important if the metric becomes linked to reimbursement. If the HOB metric were to be used in lieu of CLABSI, large tertiary care health systems that house sicker patients may be unfairly financially penalized for caring for more medically complex patients.



### The number one cause of preventable HOB is blood culture contamination:

"Preventable causes included device-associated bacteremias, pneumonias, surgical complications, and contaminated blood cultures."

"Excluding blood culture contaminates, (with non-common commensal organisms) the most common cause of preventable HOB was secondary to CLABSIs".

| Preventable HOB cause | N (%) |
|---|---|
| Contaminant | **55 (14.0%** |
| Central venous catheter (CVC) | **39 (9.9%)** |
| Surgical Intervention (Surg) | **26 (6.6%)** |
| HAP/VAP | **16 (4.1%)** |
| PIV catheter-related infection (PIV) | **13 (3.3%)** |
| Miscellaneous* | **9 (2.3%)** |
| CAUTI | **7 (1.8%)** |
| No source defined | **4 (1.0%)** |

# Study Review HOBSI Organisms and Prevalence

## ICHE 2023

| Microorganism[a] | CLABSI (N=403), No. % | Non-CLABSI HOB (N=1,574),No. % | All HOB including CLABSI (N=1,977), No. % |
|---|---|---|---|
| Enterobacteriaceae | 67 (16.6) | 575 (36.5) | 642 (32.5) |
| S. *aureus* | 50 (12.4) | 403 (25.6) | 453 (22.9) |
| Enterococcus spp. | 64 (15.9) | 248 (15.8) | 312 (15.8) |
| Environmental GNB | 34 (8.4) | 179 (11.4) | 213 (10.8) |
| Candida albicans and C. *auris* | 52 (12.9) | 123 (7.8) | 175 (8.9) |
| Other *Candida* spp[a] | 53 (13.2) | 117 (7.4) | 170 (8.6) |
| CoNS | 83 (20.6 | 0 | 83 (4.2) |
| Other GPB | 33 (8.2) | 0 | 33 (1.7) |
| Other GNB | 18 (4.4) | 0 | 17 (0.9) |
| Other commensal | 17 (4.2) | 0 | 17 (0.9) |
| No microorganism | 12 (3.0) | 0 | 12 (0.6) |

Note. CLABSI, central-line-associated bloodstream infection; CoNS, coagulase-negative staphylococci; GNB, gram-negative bacteria; GNP, gram-positive bacteria; HOB, hospital-onset bacteremia.
[a]See Supplementary Table S2 (online) for a full list of included microorganisms.

**Table 3.** Microorganisms Identified in CLABSI and Non-CLABSI HOB Admissions

## ICHE 2019 Study

- **Staph aureus:** 15%
- **Escherichia coli:** 12%
- **CoNS:** 11% (Matching Commensal HOB Event)
- **Klebsiella:** 10%
- **Enterococcus:** 9%
- **Strep:** 8%
- **Candida:** 8%
- **Enterobacter** 5%

## BMJ 2023 Study

*S. aureus*

23% academic and community /

36% community hospitals

Followed by:

- Enterococcus
- Escherichia coli
- Candida
- Klebsiella pneumoniae
- P aeruginosa

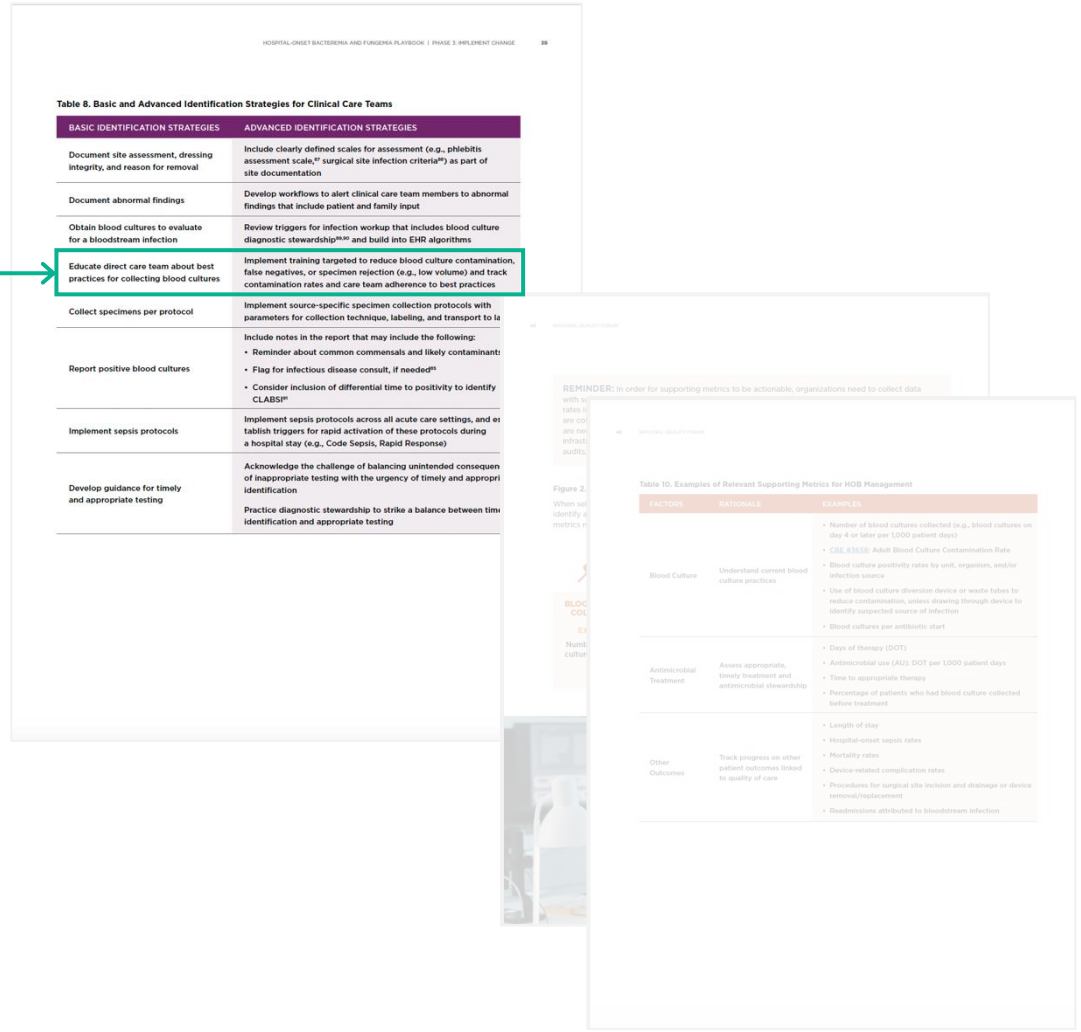
Yu, ICHE: https://doi.org/10.1017/ice.2023.132 Published online by Cambridge University Press
,Dantes R. et al Infect Control Hosp Epidemiol . 2019 March ; 40(3): 358–361. doi:10.1017/ice.2018.339.
Leekah S. et al. BMJ Qual Saf 2024;0 1-12: doi 10.1136/bmjqs 2023-016831

"…guide to help organizational leaders and clinical care teams in acute care settings implement or improve HoB prevention, identification, and treatment initiatives.

The release of the HOB Playbook comes as the Centers for Disease Control and Prevention (CDC) is taking steps to address HOB by refining a recently endorsed quality measure"[1]

*Implement training targeted to reduce blood culture contamination, false negatives, or specimen rejection (e.g., low volume) and track contamination rates and care team adherence to best practices."*

Page 39



HOSPITAL-ONSET BACTEREMIA AND FUNGEMIA PLAYBOOK | PHASE 3: IMPLEMENT CHANGE 39

**Table 8. Basic and Advanced Identification Strategies for Clinical Care Teams**

| BASIC IDENTIFICATION STRATEGIES | ADVANCED IDENTIFICATION STRATEGIES |
|---|---|
| Document site assessment, dressing integrity, and reason for removal | Include clearly defined scales for assessment (e.g., phlebitis assessment scale,[87] surgical site infection criteria[88]) as part of site documentation |
| Document abnormal findings | Develop workflows to alert clinical care team members to abnormal findings that include patient and family input |
| Obtain blood cultures to evaluate for a bloodstream infection | Review triggers for infection workup that includes blood culture diagnostic stewardship[89,90] and build into EHR algorithms |
| Educate direct care team about best practices for collecting blood cultures | Implement training targeted to reduce blood culture contamination, false negatives, or specimen rejection (e.g., low volume) and track contamination rates and care team adherence to best practices |
| Collect specimens per protocol | Implement source-specific specimen collection protocols with parameters for collection technique, labeling, and transport to la |
| Report positive blood cultures | Include notes in the report that may include the following:<br>• Reminder about common commensals and likely contaminant<br>• Flag for infectious disease consult, if needed[91]<br>• Consider inclusion of differential time to positivity to identify CLABSI[91] |
| Implement sepsis protocols | Implement sepsis protocols across all acute care settings, and es tablish triggers for rapid activation of these protocols during a hospital stay (e.g., Code Sepsis, Rapid Response) |
| Develop guidance for timely and appropriate testing | Acknowledge the challenge of balancing unintended consequen of inappropriate testing with the urgency of timely and appropri identification<br>Practice diagnostic stewardship to strike a balance between tim identification and appropriate testing |

1. National Quality Forum (NQF). Hospital Onset-Bacteremia and Fungemia Playbook. Washington, DC: NQF, 2024.

NATIONAL QUALITY FORUM
Driving measurable health improvements together

Standard of Care

"…guide to help organizational leaders and clinical care teams in acute care settings implement or improve HoB prevention, identification, and treatment initiatives.

The release of the HOB Playbook comes as the Centers for Disease Control and Prevention (CDC) is taking steps to address HOB by refining a recently endorsed quality measure"[1]

**REMINDER:** In order for supporting metrics to be actionable, organizations need to collect data with sufficient granularity. For example, a facility-wide metric focusing on blood culture contamination rates is helpful for understanding overall trends over time, but additional information on which staff are collecting samples, most frequent sites of collection, rationale for obtaining specific cultures, etc., are needed for the HOB Team to identify more specific targets for additional training or changes to infrastructure. It may be helpful for the HOB Team to supplement metrics with periodic observational audits, to fully understand any discrepancies between facility guidelines and on-the-ground practice.

**Figure 2. Illustration: Metrics for Key HOB-Related Processes**

When selecting supporting metrics, organizations may choose to monitor processes key to HOB and identify a range of metrics throughout the "life cycle" of these processes. For example, this figure illustrates metrics related to blood cultures, from initial sample collection to treatment.

| BLOOD SAMPLE COLLECTION | CONTAMINATION | INTERPRETATION | APPROPRIATE TREATMENT |
|---|---|---|---|
| EXAMPLE: | EXAMPLE: | EXAMPLE: | EXAMPLE: |
| Number of blood cultures collected | Blood culture contamination rate | Number of common commensals identified as contaminant | Days of therapy avoided from un-necessary treatment of contaminated blood cultures |



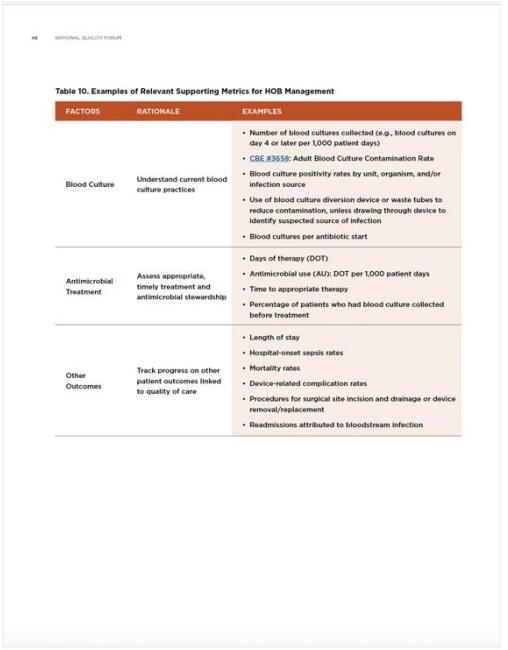


**Table 10. Examples of Relevant Supporting Metrics for HOB Management**

| FACTORS | RATIONALE | EXAMPLES |
|---|---|---|
| Blood Culture | Understand current blood culture practices | • Number of blood cultures collected (e.g., blood cultures on day 4 or later per 1,000 patient days)<br>• CBE #3558: Adult Blood Culture Contamination Rate<br>• Blood culture positivity rates by unit, organism, and/or infection source<br>• Use of blood culture diversion device or waste tubes to reduce contamination, unless drawing through device to identify suspected source of infection<br>• Blood cultures per antibiotic start |
| Antimicrobial Treatment | Assess appropriate, timely treatment and antimicrobial stewardship | • Days of therapy (DOT)<br>• Antimicrobial use (AU): DOT per 1,000 patient days<br>• Time to appropriate therapy<br>• Percentage of patients who had blood culture collected before treatment |
| Other Outcomes | Track progress on other patient outcomes linked to quality of care | • Length of stay<br>• Hospital-onset sepsis rates<br>• Mortality rates<br>• Device-related complication rates<br>• Procedures for surgical site incision and drainage or device removal/replacement<br>• Readmissions attributed to bloodstream infection |

*Use of blood culture diversion device or waste tubes to reduce contamination, unless drawing through device to identify suspected source of infection"*

*In order for supporting metrics to be actionable, organizations need to collect data with sufficient granularity…a facility-wide metric focusing on blood culture contamination rates is helpful…but additional information on which staff are collecting samples, etc. are needed…to identify more specific targets for additional training…"*

1. National Quality Forum (NQF). Hospital Onset-Bacteremia and Fungemia Playbook. Washington, DC: NQF, 2024.

# Data Analytics: Patient Clinical and Practice Management; A Call For Action from ICHE Podcast With Drs. Rupp, Tompkins, Navas and Romo

https://podcasts.apple.com/us/podcast/episode-56-initial-specimen-diversion-devices-isdds/id1459545889?i=1000698315835 [podcasts.apple.com]

## Blood Culture Contamination and Data Analytics

This involves using data analytics tools to analyze both clinical patient information,  practice management data and RCA.

An analytics software program that extracts actionable insights to a patient and provider level can be used to identify areas for improvement both clinically and financially.

NHSN reporting; CDI, MRSA, CLABSI, HOB

Bed availability; ELOS

Antimicrobial utilization and resistant organism reporting

AKI

In-patient mortality

# Generate Action and Drive Practice Change With Data Analytics

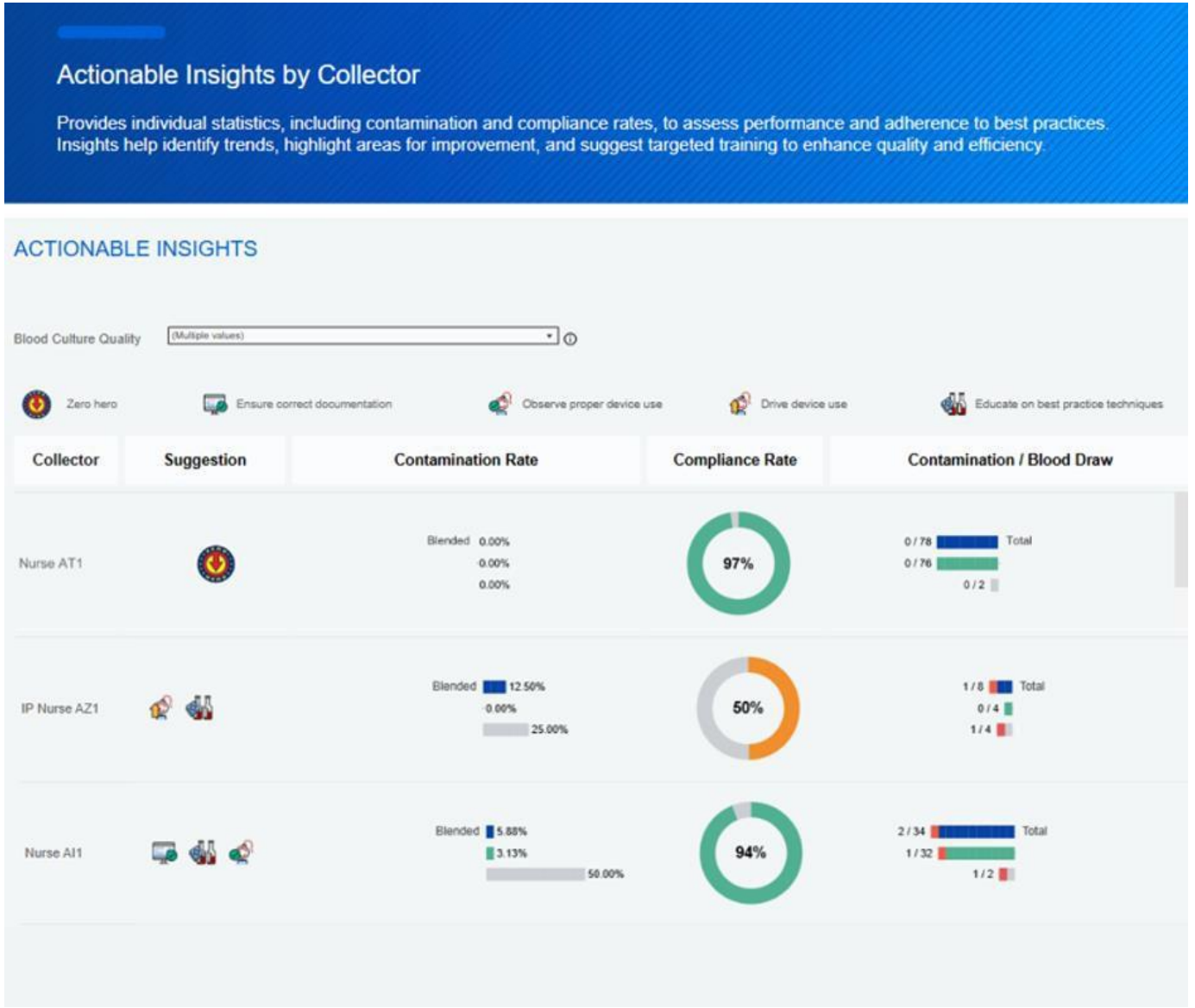
## Isolate the source of contamination events

- Within a department
- By a specific drawer

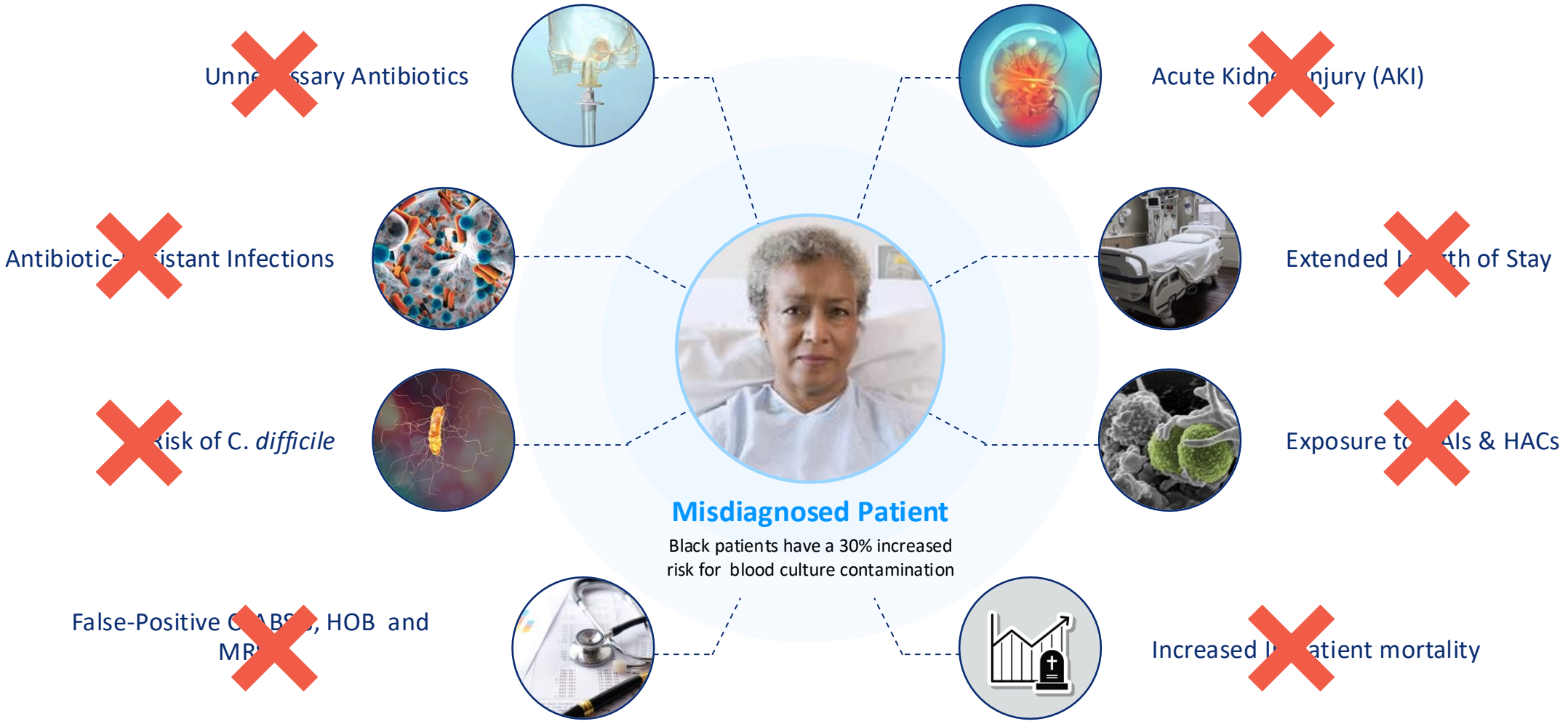
## Assess the cause of contamination event

- Compliance with best practice technique
- Compliance with device utilization
- Device use re-education

## Execute focused remediation plan



# Leveraging Data for Diagnostic Stewardship and AMS Results in Quality Outcomes and Hospital Revenue



“The names of the patients whose lives we save can never be known. Our contribution will be what did not happen to them. And, though they are unknown, we will know that mothers and fathers are at graduations and weddings they would have missed, and that grandchildren will know grandparents they might never have known, and holidays will be taken, and work completed, and books read, and symphonies heard, and gardens tended that, without our work, would never have been.”

*Donald Berwick, MD, Founder of IHI*

# THANK YOU

FOR ALL OF YOUR WORK MITIGATING MISDIAGNOSES, LEADING TO PATIENT SAFETY AND QUALITY!

# Contact Information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