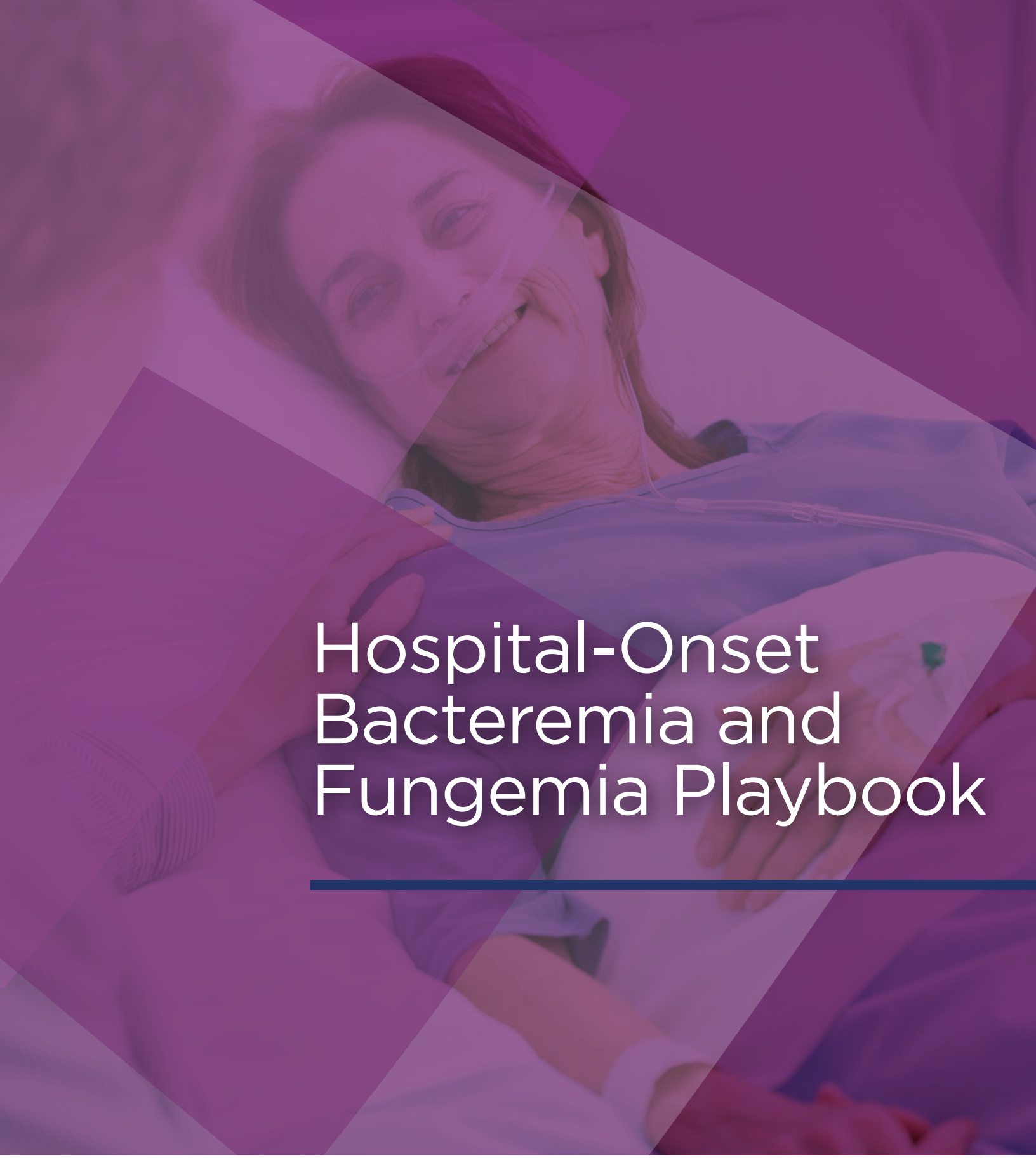

Hospital-Onset Bacteremia and Fungemia Playbook

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ACKNOWLEDGEMENTS

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NQF thanks the many individuals listed in **Appendix A** who contributed their technical expertise to inform this Playbook. The conclusions, findings, and opinions expressed by individuals who contributed to this publication are based on specialized expertise and are not intended to reflect the official position of any contributor's affiliated organization.

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Impact Statement

PURPOSE

Hospital-onset bacteremia and fungemia (HOB) is any bloodstream infection where bacterial or fungal pathogens are detected from a blood culture specimen collected on day four or later of hospital admission.[1] HOB includes bloodstream infections from all sources and covers a wider range of infections than those that have been the focus of quality efforts over the past two decades.

HOB is a type of healthcare-associated infection (HAI), an infection that patients acquire while being treated in an acute care setting. HAIs result in more than 70,000 deaths and $28 billion in direct medical costs every year, and they can severely damage patients' trust and exacerbate clinician burnout.[2-5] While HAIs have decreased due to improvements in preventing, identifying, and treating specific procedure- and device-related infections, organizations have found it difficult to sustain these gains.

As the Centers for Disease Control and Prevention (CDC) refines a new quality measure addressing HOB, NQF developed this *Hospital-Onset Bacteremia and Fungemia Playbook* to augment current infection prevention and control (IPC) practices; provide healthcare organizations with practical guidance for developing highly effective, sustainable HOB prevention programs; and offer helpful resources for clinical care teams to effectively identify and treat pathogens when HOB does occur.

KEY TAKEAWAYS

Healthcare organizations can build on existing HAI programs to address HOB—they do not need to start anew. They can and should draw from decades of IPC research, best practice guidelines, and existing policies or prevention bundles. The expansion to HOB aims to move healthcare organizations from a narrowly focused surveillance approach to a broader, more-inclusive tracking and management approach. This *Playbook* is organized into 13 action areas spanning the following four phases that address HOB prevention, identification, and treatment:

Phase 1, Create a Shared Vision: Strategies to help leaders and the HOB team work collaboratively to develop buy-in, review data infrastructure, assess organizational culture, and build awareness.

Phase 2, Identify Priority Actions: Strategies to assist the HOB Team with defining the current state, identifying improvement opportunities, and setting organizational goals and priorities.

Phase 3, Implement Change: Strategies to prevent, identify, and treat HOB through engaging patients and families, addressing risk, managing symptoms, and providing appropriate care.

Phase 4, Continuous Improvement: Strategies for monitoring progress and promoting sustainability.

APPLICATIONS

The *Hospital-Onset Bacteremia and Fungemia Playbook* is for organizational leaders and clinical care teams in acute care settings who wish to implement or improve HOB prevention and treatment initiatives and effectively report on HOB. The *Playbook* helps organizations unify existing quality and patient safety initiatives to address a broader range of infections in HOB programs. It presents considerations and best practices so that organizations have options that can be tailored to the specific needs of their patients and families, clinical care teams, and acute care settings.

Background

THE NEED FOR EXPANDED HEALTHCARE-ASSOCIATED INFECTIONS SURVEILLANCE

Hospital-onset bacteremia and fungemia (HOB) is any bloodstream infection where bacterial or fungal pathogens are detected from a blood culture specimen collected on day four or later of hospital admission.[1] HOB includes bloodstream infections from all sources, regardless of procedure or device. Thus, it covers a wider range of infections than the traditional targets of infection prevention and control (IPC) and quality measurement efforts over the past two decades (e.g., central line-associated bloodstream infections [CLABSIs], catheter-associated urinary tract infections [CAUTIs], and surgical-site infections [SSIs]). In a study comparing CLABSI and electronic health record (EHR)-determined HOB cases, data showed four non-CLABSI HOB cases for every National Healthcare Safety Network (NHSN)-reportable CLABSI case, a notable finding since both CLABSI and non-CLABSI HOB events are associated with longer hospital stays, higher costs, elevated readmissions, and increased mortality.[6]

HOB is a healthcare-associated infection (HAI) – an infection that patients acquire while being treated in an acute care setting. HAIs lead to over 70,000 deaths and $28 billion in direct medical costs every year, even though many are preventable.[2,3] They also incur an average of $10.5 million in litigation-related costs per hospital per year, and can severely damage patients' trust and exacerbate clinician burnout.[4,5] HAIs often disproportionately affect those with greater and more complex needs (e.g., older adults, pediatric and neonatal patients, patients with underlying comorbidities).[7,8] For instance, one study found that the odds of acquiring an HAI are 2.9 times greater for patients over the age of 50, compared to younger patients.[9]

Existing HAI improvement efforts have contributed to an overall decline in HAIs by incentivizing better prevention, identification, and treatment of specific procedure- and device-related infections, but healthcare organizations have not sustained these gains during times of stress (e.g., staffing shortages, high turnover rates, high patient volume).[10,11] The COVID-19 pandemic exacerbated these stressors, with HAI rates increasing particularly among Black and non-English speaking patients.[12,13] HAI surveillance efforts also challenge healthcare organizations' resources, given the time-consuming and subjective nature of existing HAI measures.[14] These measures require trained personnel to manually review medical records and apply complex definitions. The complexity of these measures also contributes to variability in reporting and classifying HAIs in acute care settings and across healthcare organizations.

Opportunities exist to adjust the scope of HAI monitoring, relieve surveillance burden, and drive improvements for more sources of HAIs.

HOB: NOT NEW, JUST MORE INCLUSIVE

To address existing patient safety risks, growing costs, and reporting challenges, the Centers for Disease Control and Prevention (CDC) is actively refining a new quality measure addressing HOB. The HOB measure is currently defined as a first positive blood culture with the growth of a recognized bacterial or fungal pathogen on admission day four or later,[1] indicating the infection is likely an HAI (i.e., it was acquired within the healthcare system). This surveillance does not include positive blood cultures collected before day four because this earlier timeframe indicates the infection likely occurred before the patient entered the acute care setting (community-onset bacteremia and fungemia). The CDC intends for the HOB measure to be objective, compatible with existing workflows, time-efficient to monitor, and structured similarly to the NHSN's **Laboratory-Identified (LabID) Event reporting method**, which is used for methicillin-resistant *Staphylococcus aureus* (MRSA) bacteremia and *Clostridioides difficile* (*C. diff*) infection reporting.

The HOB measure broadly encompasses multiple causes and is associated with many medical devices, procedures, and anatomical sites; therefore, it does not have the same limitations of current procedure- and device-related measures.[15] HOB sources may include CLABSIs, CAUTIs and other urinary tract infections (UTIs), wounds, skin and soft tissue infections, gastrointestinal or intra-abdominal infections, SSIs and post-invasive procedure complications, mechanical ventilation complications, respiratory infections and pneumonia, and peripheral intravenous device-related infections.[16]

While some of these sources are captured in current reporting and value-based payment programs, the expansion to HOB aims to move healthcare organizations from a narrowly focused surveillance approach to a broader, more-inclusive tracking and management approach.

Many hospital leaders consider leading HOB sources to be at least partially preventable, particularly with better surveillance methods, implementation of prevention bundles, and identification and treatment guidance (Table 1).[15]

Table 1. Perceived Preventability of Leading HOB Sources by Hospital Leaders

SOURCE	% VIEWED PREVENTABLE (MEAN)
Central-line catheters	74%
Peripheral IVs	74%
Surgical sites/post-invasive procedure complications	67%
Urinary sources (with or without catheter)	67%
Skin and soft tissues	66%
Wounds	58%
Respiratory/pneumonia	54%

Healthcare organizations do not need to start anew to address HOB: they can and should draw from decades of IPC research, best practice guidelines, and existing policies or prevention bundles. Organizations have an excellent foundation for building comprehensive HOB programs by supplementing and unifying existing quality and patient safety initiatives. For example, responsible use of antimicrobials to avoid contributing to antimicrobial resistance is an important component when considering the definitive therapy of an HOB event, and antimicrobial stewardship is already part of accreditation, licensing, and regulatory standards (e.g., The Joint Commission [TJC], Centers for Medicare & Medicaid Services [CMS]). Some organizations may already track HOB data, while others have plans to or are awaiting further measure specifications and participation requirements.[16] Either way, organizations can begin with existing data and develop over time as the HOB program matures (e.g., incorporating HAI, microbiology, and antimicrobial stewardship data).

THE HOSPITAL-ONSET BACTEREMIA AND FUNGEMIA PLAYBOOK

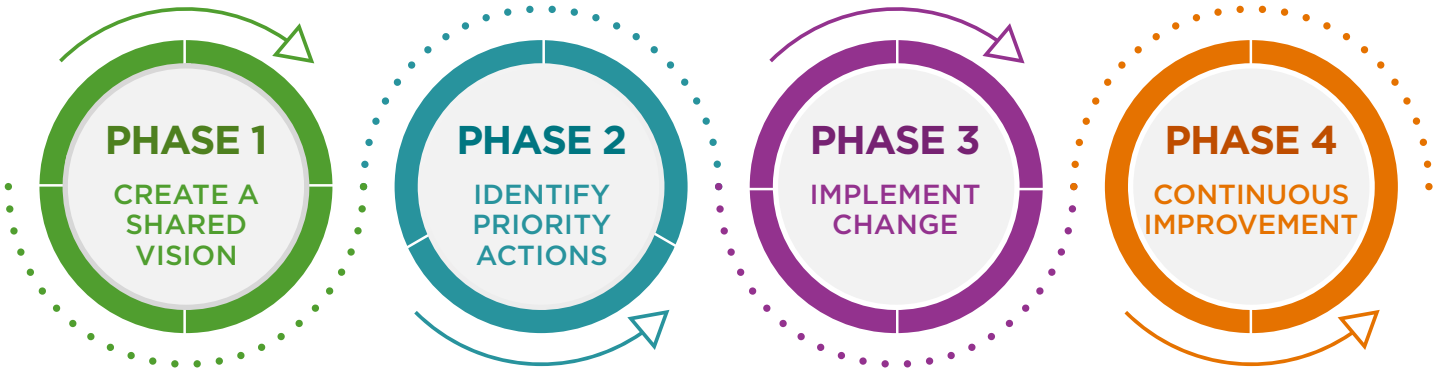
To aid healthcare organizations in developing sustainable HOB programs, the National Quality Forum (NQF) developed the Hospital-Onset Bacteremia and Fungemia Playbook (henceforth referred to as the Playbook). The Playbook centers on the CBE #3686 CDC, National Healthcare Safety Network (NHSN) Hospital-Onset Bacteremia & Fungemia Outcome Measure and provides strategies for preventing HOB, identifying and treating HOB in a timely manner when it does occur, and supporting system changes to enable broader tracking of HOB events and outcomes.

This Playbook serves as a starting point for augmenting IPC practices to address a broader range of infections in HOB programs. It comprises a thoughtful set of considerations and best practices recommended by experts. The Playbook gives organizations options to tailor to the specific needs of their patients and families, clinical care teams, and acute care settings. It is not a rigid set of "must-dos."

The Playbook is organized into 13 action areas spanning four phases (Figure 1) for organizations to plan, implement, and sustain an HOB program that addresses HOB prevention, identification, and treatment (referred to hereafter as "HOB management"). Each phase includes:

- An aim statement with key actions, expected outputs, and team members
- Action area descriptions and targeted strategies
- A list of helpful resources (see Appendix B for a full list of resources)

Figure 1. HOB Program Phases and Action Areas



ACTION AREA 1: Develop Buy-In and Ownership

ACTION AREA 2: Review Data Infrastructure

ACTION AREA 3: Assess Organizational Culture

ACTION AREA 4: Build Awareness

ACTION AREA 5: Define the Current State

ACTION AREA 6: Identify Opportunities for Improvement

ACTION AREA 7: Set Organizational Goals

ACTION AREA 8: Engage Patients and Families in HOB Management

ACTION AREA 9: Prevent HOB—Recognize and Mitigate Risk

ACTION AREA 10: Identify HOB—Assess and Recognize Symptoms

ACTION AREA 11: Treat HOB—Guide Timely and Accurate Care

ACTION AREA 12: Monitor Progress

ACTION AREA 13: Promote Sustainability

The final sections of the Playbook provide insights into opportunities to leverage drivers of healthcare quality and safety to further advance implementation and sustainment of HOB management. The key drivers include accreditation, certification, and credentialing; payment, reimbursement, and public reporting; education and training; research; and policy. The Playbook concludes with a reminder to healthcare organizations on how to advance HOB management going forward.

The Playbook is designed for organizational leaders and clinical care teams in acute care settings. Its content may also be valuable in other settings (e.g., long-term care, ambulatory and outpatient care, and hospital at home), both because bacteremia and fungemia can occur in other settings and because the general process of building buy-in, prioritizing areas for improvement, enacting changes, and monitoring changes over time is applicable. The Playbook is also relevant to other stakeholders, including those directly affected by HOB programming (e.g., patients and families) as well as those involved in research, policy, education, and other programmatic efforts that will help shape future HOB initiatives. The strategies and resources in this Playbook encourage increased adoption of HOB programs and collaboration among entities working to prevent and properly manage HOB or other related manifestations of systemic bloodstream infections such as sepsis. This Playbook is informed by the diverse perspectives of key contributors, including patients, frontline clinicians, healthcare administrators, and representatives from federal agencies, payers, professional societies, and quality improvement organizations (see Appendix A for a full list of contributors).

The Playbook does not replace existing guidance from professional societies, associations, and/or other agencies. It provides practical considerations and action-oriented strategies that augment existing subject matter expertise in HOB management. As knowledge and science around HOB evolve, it is important for leaders and clinical care teams to monitor for updates in research and guidelines to align with the most up-to-date guidance available.

Terms to Know

The Playbook references several terms, stakeholders, and entities defined below:

Acute Care Settings: Individual units in a healthcare organization that provide inpatient care (e.g., intensive care unit [ICU], surgery, pediatrics)

Clinical Care Team(s): Broader term indicating both direct and indirect care teams

- **Direct Care Team:** Staff who provide direct patient care (e.g., nurses, physicians, therapists, phlebotomists, patient care technicians, pharmacists)
- **Indirect Care Team:** Staff who provide key support services, but do not provide direct patient care (e.g., supply technicians, laboratory professionals, environmental services, administrators)

Community-Onset Bacteremia and Fungemia (COB): Detection of a positive blood culture with the growth of a bacterial or fungal pathogen before day four of a patient's admission to the hospital

Families: Individual or group whom the patient identifies to aid in their care. These individuals provide unpaid or paid assistance to a person dealing with short- or long-term limitations due to illness, injury, or disability. Families may include direct family, friends, caregivers, and advocates who form a broader support system for the patient.[17,18]

Healthcare Organization: Individual physician practices, hospitals, skilled nursing facilities, outpatient care settings, etc. (The Playbook focuses on individual hospitals, composed of acute care settings, which provide medical treatment to patients.)

Healthcare System: Group of healthcare organizations that are jointly owned or managed[19]

Hospital-Onset Bacteremia and Fungemia (HOB): Detection of a positive blood culture with the growth of a bacterial or fungal pathogen on day four or later of a patient's admission to the hospital

HOB Management: Broader term indicating the prevention, identification, and treatment of HOB

HOB Team: Multidisciplinary team that oversees HOB program implementation, performance, and continuous improvement

Metric(s): Healthcare quality measures examined over time to assess progress, goals, and benchmarks. Metrics include endorsed healthcare quality measures.

Patient(s): The individual(s) receiving care, treatment, or services in the acute care setting

PHASE 1: CREATE A SHARED VISION

AIM	This phase presents strategies to help establish an HOB program. It discusses how to create a shared understanding of HOB and vision for HOB management, including ways to introduce HOB to the organization and gauge cultural readiness for HOB management.
KEY ACTIONS	▮ Develop Buy-In and Ownership ▮ Review Data Infrastructure ▮ Assess Organizational Culture ▮ Build Awareness
KEY OUTPUTS	An understanding of the organization's readiness for change and key considerations to build a shared vision and ownership for HOB management
KEY TEAM MEMBERS	Chief executive officer (CEO), chief quality officer (CQO), chief medical officer (CMO), chief medical information officer (CMIO), chief nursing officer (CNO), vice presidents or directors of each hospital department or unit, clinical care team members (see examples in Table 3), performance improvement, IPC leadership, antimicrobial stewardship program (ASP) leadership, epidemiology, and information technology (IT)

Action Area 1: Develop Buy-In and Ownership

Leadership buy-in is integral to planning and implementing any new initiative. This first action area provides organizations with considerations for identifying HOB as an organizational priority and leaders who are critical to aligning HOB management with existing and sometimes competing priorities. Once leadership buy-in is secured, organizations can identify the roles and responsibilities of the HOB Team, the multidisciplinary team that oversees HOB program implementation, performance, and continuous improvement. Leaders and the HOB Team need to work collaboratively to guide the early phases of the HOB program, foster accountability and ownership of tasks, and provide needed resources.

DEFINE HOB AS A PRIORITY

With HOB, organizations expand beyond current surveillance of specific HAIs to a broader identification of bacteremia and fungemia events. This first step provides leaders with strategies for discussing the impact of HOB and why this expansion is needed.

Why is HOB a top priority for the organization?

- Share current evidence that CLABSI is only a subset of all HOB events.[6,14,20,21]
- Discuss other causes of HOB that are not included in current HAI measures (e.g., peripheral vascular access devices, urinary tract infections without an indwelling urinary catheter).[20]
- Discuss MRSA LabID bacteremia data, a subset of HOB, that the organization is already collecting and exporting to NHSN.
- Quantify the impact of HOB on related outcomes (e.g., mortality, morbidity, readmissions).
- Review evidence of emerging inequities across HOB events (e.g., race, gender, other vulnerable patient demographics pertinent to the organization).
- Emphasize the opportunity to improve holistic, person-centered, preventive care.
- Discuss the financial impact of HOB management in terms of cost savings.
- Identify ways HOB management intersects with other health system priorities (e.g., digital measurement, quality and patient safety initiatives).
- Review the clinical care team workflow and patient care benefits of tracking and trending HOB as part of HAI reporting (Table 2).

MYTH: Monitoring HOB will be a challenge that requires organizations to collect and report on a huge amount of new data.

RESPONSE: Successful HOB monitoring builds on existing IPC practices and facilitates the process of identifying qualifying events. High level visibility to HOB trends can uncover other sources of bloodstream infections that current metrics do not capture.

Table 2. Traditional HAIs Tracking and HOB Tracking

HAI EVENTS	HOB EVENTS
Device- and procedure-related event monitoring and interventions	**Expands tracking and trending beyond device- and procedure-related events to all HOB events**
Manual surveillance	**Allows extraction of all HOB data directly from EHRs without detailed manual medical record reviews**

How can leaders make HOB a top priority for their organizations?

- Identify organizational leaders (e.g., C-suite, clinical department leaders, ASP leadership) who are already vested in the reporting and quality care improvement of known sources of HOB (e.g., currently reportable HAIs, hospital-acquired pressure injuries, wounds) and may assist with delineating needs and procuring resources.[21]
- Build a business case for reducing HOB by examining HOB-associated case costs compared to control cases.
- Contextualize HOB as a broader HAI reduction effort, because HOB is a broader indicator of total HAI burden compared to current NHSN monitoring.
- Align the HOB program with existing quality and safety initiatives in the organization.
- Consider previous quality improvement initiatives that broadened surveillance of in-hospital conditions, and identify organizational approaches that resulted in effective change management. For example:
  - » CLABSI rates in the ICU expanded to organization-wide surveillance[22]
  - » In-hospital fall with hip fracture measure changed to in-hospital fall-associated fracture[23]
  - » Diagnosis-related readmissions changed to all-cause readmissions
  - » Ventilator-associated pneumonia changed to ventilator-associated events[22]

FAST FACTS: Why Measure HOB?

- In one study of HOB events across 41 acute-care hospitals, patients with HOB experienced significantly longer stays (12.1–17.4 more days), morbidity, mortality (>3.5-fold increased risk), readmissions (relative risk, 1.28–1.41), and hospital costs ($25,207–$55,001 more per admission) compared to patients without a bloodstream infection.[6]
- Only 20% of HOB events across three academic hospitals were reported to NHSN as CLABSI. This finding suggests that the current CLABSI classification captures only a small portion of HOB events.[6,15]
- Compared to the CLABSI measure, the HOB measure allows for more meaningful comparison between organizations, because HOB and CLABSI rates are strongly associated but HOB occurs more frequently than CLABSIs. Low CLABSI rates present challenges such as the ceiling effect (high performance among a large proportion of organizations), which makes it difficult to detect differences in performance and can lead to the assumption that quality of care is already at its best or highest.[14]

ASSEMBLE THE HOB TEAM

Once the organization designates HOB as a priority, creating an HOB program requires multiple departments, specialties, and subject matter experts. Leaders will convene and introduce clinical care team members to this new organizational priority. This step provides considerations for leaders when launching a diverse multidisciplinary HOB Team.

What perspectives are needed on the HOB Team?

- Discuss the stakeholder perspectives critical for developing an interprofessional HOB Team (see Table 3 for examples).[24]
- Leverage experts on existing committees and workgroups in your organization (e.g., ASP committees, sepsis committees, quality committees, performance improvement councils, infection control committees).
- Identify subject matter experts in your organization (e.g., change management experts, epidemiologists, infection preventionists, vascular access specialists, pharmacists, researchers) and assess them for leadership attributes.[25]
- Involve individuals who can contribute to improvement and will also benefit from the opportunity to develop personally and professionally.[25]
- Include a variety of clinical care team members with IPC experience (e.g., ICU, hospital, emergency department staff).
- Include patients and/or families and non-clinical team members (e.g., patient advocacy team) to incorporate diverse perspectives.
- Assess the team structure periodically to evaluate the balance of perspectives.

What are the roles and responsibilities for HOB Team members?

- Engage the team in identifying responsibilities and expectations.[25]
- Identify an executive champion(s) responsible for supporting the team and providing executive leadership and guidance.[26]
- Assign a team lead to facilitate discussions and track team progress (e.g., facilitator, project manager).[27]
- Establish succession planning and leadership transition plans to avoid interruptions to HOB Team activities over time.
- Identify team members who can mentor and coach others as the initiative is developed and implemented.[25]
- Identify HOB Team member functions and discuss how they may change or evolve with HOB management (Table 3).

Table 3. Examples of HOB Team Members and Corresponding Functions

This list is neither prescriptive nor all-inclusive; team composition depends on your organizational structure and needs, and each team member may fulfill multiple roles based on their experience.

HOB TEAM MEMBER	RECOMMENDED FUNCTIONS WITHIN HOB TEAM
Ancillary Staff (e.g., radiology, physical therapy, occupational therapy, speech-language therapy)	Performs care based on specific discipline, while staying aware of infection risks and actively escalating any concerns
Environmental Services (EVS)	Educates EVS staff on infection prevention (especially in high-risk specialty units); conducts routine environmental surveillance and cleaning
Infection Prevention and Control (IPC)	Conducts surveillance and trending of specific HAIs, including HOB events; helps identify and/or develop educational materials for staff, patients, and families
Information Technology (IT)/ Data Analytics	Contributes to current dashboards and EHR support, including HAI metric report production, as well as developing and maintaining novel reports and EHR alerts to support HOB management
Lab/Microbiology	Tracks and trends blood culture data (e.g., utilization, contamination); identifies high volume blood pathogens via antibiograms, etc.; tracks positive blood cultures drawn on day 4 or later
Nursing	Advocates for and follows evidence-based practice standards and guidelines; proactively identifies and mitigates HOB risks; helps educate how currently reportable HAIs can evolve into HOB events
Organizational Leadership (e.g., executive and department leaders)	Oversees organizational priorities and resource allocation
Patients and Families	Reviews educational materials and engages in conversations on how to minimize risks; participates in hospital committees and workgroups
Pharmacy	Monitors and assists with antimicrobial stewardship practices, including best treatment choices for HOB
Physicians	Provides care based on evidence-based practice standards and bloodstream infection guidelines; discusses HOB risk with IPC, while educating laboratory, ASP, and other clinicians on the importance of shortening time to definitive antimicrobial therapy for HOB events when they occur; helps educate how currently reportable HAIs can evolve into HOB events
Quality, Regulatory, and Risk Management	Promotes a culture of safety that supports reporting, reviewing, and learning around HOB and other HAI events
Vascular Access Team	Provides assessment and insertion of designated vascular access devices; tracks and trends vascular access device-related infections in collaboration with IPC

Staff joining the HOB team will need to balance new HOB-related priorities with existing responsibilities. As leaders assemble the HOB team, they need to be sensitive to the increasing workload that staff may perceive or experience. Awareness and responsiveness can help avoid burnout, low productivity, poor quality care, and possible turnover, and are especially important given the strained healthcare workforce post-COVID-19. Leaders might consider streamlining organizational priorities and investing in training, education, and other development activities for staff so that they feel supported, prepared, and engaged in their work (described in more detail in Action Area 13).

Action Area 2: Review Data Infrastructure

After establishing HOB as an organizational priority and assembling an appropriate team, the next step is to understand the IT requirements, data sources, and organizational readiness for electronic data submission. Digital quality measures (dQMs) are an important element of a modernized healthcare system with interoperable healthcare data.[28] Given the strategic importance of digital measurement and the potential costs associated with the initial transition to dQMs, many organizations may need to carefully review their existing IT and data infrastructure in the early stages of HOB program implementation.[29] This action area discusses how the organization can evaluate their systems' preparedness and anticipated needs for digital data collection and quality measurement.

PLAN DATA MANAGEMENT

Organizations need to prepare for data requirement changes, which may require expanding existing processes (e.g., LabID event reporting). During this step, a healthcare organization needs to consider and assess its current data systems as well as its ability to comply with reporting requirements and anticipate potential pitfalls.

Is the organization's IT infrastructure ready?

- Assess IT system specifications and crosswalk requirements for HOB dQM data submission via NHSNLink.[30]
- Review existing capabilities for HOB data collection, management, and reporting (e.g., EHR reports, lab reports, dashboards).

How will the organization manage HOB data?

- Identify key data elements required for measurement in accordance with NHSN guidelines.
- Identify internal reporting metrics that are helpful to track HOB data, which may include the following:
  - » Pathogens
  - » Source of HOB event (e.g., urinary, respiratory, procedural, vascular access devices)
  - » Patient demographics (disaggregated to identify disparities)[31]
  - » Department or unit
  - » Clinical characteristics
    - – Disease states (e.g., diabetes, oncologic diseases)
    - – Medications (e.g., immunomodulators, immunosuppressants)
- Identify and train a data coordinator to collect and analyze HOB data,[32] ideally an infection preventionist, microbiology lab technician, pharmacist, or other staff member who performs daily reviews of patients with bloodstream infections.

Action Area 3: Assess Organizational Culture

When implementing new HOB initiatives, organizations will benefit from understanding their current state of readiness for change. When involved in and committed to improving organizational culture, leadership and clinical care teams can create an environment that fosters trust, transparency, and teamwork across all levels, regardless of role or rank.[25] This action area focuses on leveraging existing staff surveys and assessments to understand the culture in which an HOB program will be implemented.

PROMOTE A CULTURE OF SAFETY

Organizations can more effectively address HOB and synchronize efforts across all team members if they build a culture committed to HOB management. This step provides considerations for assessing and/or developing a supportive ecosystem of effective leadership, collaboration, and continuous learning.

How can the organization prepare for change?

- Assess staff and unit readiness for change by reviewing recent cultural assessment results (e.g., employee engagement surveys, safety culture surveys) or conduct a pulse survey to garner real-time employee feedback.[33]
- Embrace change management models to guide implementation tactics (e.g., Kotter's, McKinsey 7-S, AKDAR®).[34-36]
- Promote a culture of high reliability that values consistent mindfulness and resilience by supporting these five characteristics:[37]
  - » Preoccupation with Failure: Clinical care teams are aware of and think about the potential for failure.
  - » Reluctance to Simplify: Clinical care teams resist oversimplifying how and why processes succeed or fail.
  - » Sensitivity to Operations: Clinical care teams cultivate an understanding of the context of the current state of their work in relation to the setting or organizational state—i.e., what is going on around them—and how the current state might support or threaten safety.
  - » Deference to Expertise: Clinical care teams defer to local and situational expertise.
  - » Commitment to Resilience: Clinical care teams identify potential safety threats quickly.
- Support a "Just Culture" that balances accountability for both individuals and organizations with a quality learning environment and culture.[38]
- Create an environment of psychological safety, where clinical care teams feel comfortable and have opportunities to raise concerns or ask questions (e.g., individual one-on-one meetings, team huddles, online feedback forms, integrity hotline).[39]
- Create a culture that does not address HOB in a silo (e.g., infection preventionists) and frames HOB as part of a wider organizational priority where all members of the clinical care team have clear roles and are directly involved in creating processes and sharing information.
- Advance the organization's culture of safety through the following domains:[33]
  - » Establish a compelling vision for safety
  - » Educate patients and families on HOB prevention
  - » Build trust, respect, and inclusion
  - » Select, develop, and engage the organization's Board of Directors
  - » Prioritize safety in selecting and developing leaders
  - » Lead and reward a just culture
  - » Establish organizational behavior expectations

COMPARE AND CONTRAST: Safety Culture vs. Blame Culture

A strong culture of safety—rather than blame—is vital to the success of an HOB program.

- In organizations with a strong culture of **safety**, every team member has a role in providing safe care, and accountability does not lie solely with one person or department. Teams also share a learning mindset, focusing on opportunities for improvement and celebrating quality improvement wins. Team members feel trusted, motivated, and empowered to do their part; speak up when something goes awry; and participate in collective decision-making that allows for meaningful progress and action. This, in turn, can contribute to better patient care and outcomes.
- In contrast, organizations with a strong culture of individual **blame** may lead team members to hide or ignore errors out of fear. Team members might also be hesitant to raise questions or concerns, even when they feel that something is wrong. Psychological and emotional stress from blame culture may also contribute to distraction or burnout. An environment of blame can lead to lower quality of care and poor patient outcomes.

Action Area 4: Build Awareness

Many clinical care team members are familiar with common IPC practices, protocols, and initiatives for currently measured HAIs. When beginning to implement an HOB program, organizations will gain from understanding what HOB is and why it is important to patients, communities, and the organization. Organizations may need to prioritize educating and training clinical care teams on HOB management, as well as providing access to informational and instructional resources. Building awareness requires communicating the strategic importance of HOB management, including tailored messaging for the intended audience (e.g., leadership, frontline clinical staff, patients, and families). Specifically, organizations will want to consider efforts to raise HOB awareness among patients and the broader community, especially for those most vulnerable yet least likely to have in-depth knowledge about HOB. This action area identifies strategies for communicating the prioritization of HOB management and identifying opportunities to increase HOB awareness.

COMMUNICATE STRATEGIC IMPORTANCE

Leaders need to share their vision for HOB management across the organization. This step provides guidance on building consensus around a communications plan.

How will the organization communicate this new initiative?

- Identify current messaging strategies and tools available for use.[40]
- Develop a communications plan with clear expectations of the leadership team.[40]
- Cascade information strategically and over time.[40]
- Define the audience for messaging and consider the need for both internal and external communications.[40]
- Gain genuine understanding of matters of importance to team members, patients, and families.[39]

ELEVATE HOB KNOWLEDGE

Despite long-standing IPC standards, patients are still at risk of acquiring infections during their hospital stay. This step identifies strategies to amplify the vision to do more, be proactive, and prioritize HOB management.

How can organizations increase awareness about HOB?

- Assess baseline understanding of HOB management in the organization to establish knowledge gaps.
- Leverage existing communications experience on similar disease states that require multidisciplinary action (e.g., sepsis).
- Develop an educational plan for all staff that explains HOB, the measure, and why it is a priority for the organization.
- Provide easy access to HOB facts and answers to commonly asked questions.
- Educate staff how to access appropriate resources for HOB education and management.
- Create opportunities with patients and clinicians to share HOB experiences.
- Provide educational resources to patients, families, and communities served.
- Collaborate across the care continuum (including community-based organizations) to educate patients and community partners on reducing hospital-based infection risks.
- Develop high-quality online health information following five fundamentals: credible, obtainable, authentic, relatable, and actionable.[41]

Phase 1 Resources

Assemble the Team

- Executive Engagement – The Role of the Sponsor – Project Management Institute
- Key Driver 2 - Implement a Data-driven Quality Improvement Process to Integrate Evidence into Practice Procedures – Agency for Healthcare Research and Quality (AHRQ)
- Effective Leadership for Quality Improvement in Health Care: A Practical Guide – United States Agency for International Development Project
- Toolkit for Reducing Catheter-Associated Urinary Tract Infections in Hospital Units: Implementation Guide - Appendix A. Checklist for Assessing Executive and Physician Champion Potential – AHRQ

Plan Data Management

- dQMs – Digital Quality Measures – eCQI Resource Center
- Digital Quality Measurement Strategic Roadmap – CMS
- eCQM Implementation Checklist – eCQI Resource Center
- Key Driver 3: Optimize Health Information Systems to Extract Data and Support Use of Evidence in Practice – AHRQ

Promote a Culture of Safety

- Leading a Culture of Safety: A Blueprint for Success – Institute for Healthcare Improvement (IHI)
- The 8 Steps for Leading Change – Kotter
- Enduring Ideas: The 7-S Framework – McKinsey & Company
- Prosci ADKAR Model – Prosci
- High Reliability – AHRQ
- A Framework for Safe, Reliable, and Effective Care – IHI
- Improving the Accessibility of High Quality Online Health Information – NQF
- Core Comprehensive Unit-based Safety Program (CUSP) Toolkit – AHRQ

Communicate Strategic Importance

- A Tool Kit for Improving Communication in Your Healthcare Organization – American College of Healthcare Executives

PHASE 2: IDENTIFY PRIORITY ACTIONS

AIM	This phase presents strategies to help the HOB Team gauge existing processes and practices, identify risks and opportunities for improvement, and establish the highest priority actions for HOB management. Specifically, Phase 2 provides guidance on how the HOB Team can assess where they are now, where they want to be, and where they will focus their HOB management efforts.
KEY ACTIONS	▮ Define the Current State ▮ Identify Opportunities for Improvement ▮ Set Organizational Goals
KEY OUTPUTS	An understanding of the most pressing HOB-related issues that need to be addressed within an acute care setting to effectively mitigate and manage HOB
KEY TEAM MEMBERS	HOB Team (see Table 3) and additional subject matter experts (e.g., data management and IT specialists)

Action Area 5: Define The Current State

Once the organization cohesively understands that HOB management is a priority, the HOB Team can begin to assess the current state of HOB management across acute care settings. Reviewing the current state provides the HOB Team with baseline information to set realistic performance targets and to use for comparison in later phases. Action Area 5 provides strategies for assessing existing HOB-related data, protocols, and procedures. HOB management may differ across acute care settings. Therefore, the HOB Team can perform early analysis to better understand these differences and prioritize the team's efforts.

REVIEW AND ANALYZE CURRENT DATA

HOB-related data exist in many organizations today. This step requires acute care settings and the HOB Team to cross-reference existing data from various settings with a new target: reducing HOB.

What HOB-related data are currently available to the HOB Team?

- Collaborate with other departments early in the process to better understand existing HOB-related data collection and reporting. For example:
  - » ASPs may have data readily available on key pathogens and time to therapy benchmarks for bloodstream infections, UTIs, respiratory infections, wounds, and other potential sources of HOB.
  - » Microbiology labs may have data readily available on the types of organisms most frequently detected in positive blood cultures.
- Review established IPC reports and consider review of not only reportable cases, but also cases excluded based on surveillance specifications.
- Assess well-established infection-related metrics such as CLABSI, CAUTI, MRSA LabID events, and *C. diff* LabID events.
- Examine data on additional sources of HOB infection such as urinary, respiratory, wounds, surgical site, mechanical ventilation, skin and soft tissue, and peripheral vascular access devices.[16]
- Extract additional supporting and influential data to further inform decision-making. This includes any NHSN-required elements, and may also include information such as the following:[42-44]
  - » Date of blood culture
  - » Causative organism
  - » Location or unit where the culture was collected
  - » Blood culture testing intensity (i.e., the total number of blood cultures collected within hospital-onset period among admissions with any blood culture) and contamination rate
  - » Average length of stay for acute care patients
  - » Patient demographics
  - » Device days (e.g., vascular, urinary, respiratory, etc.) and types
  - » Surgical site infection data
  - » Sepsis data
  - » Lab data
  - » Diagnostic and ASP data
  - » Coding and claims data
- Engage clinical care teams in processes to vet the accuracy of data collected, in accordance with institutional policies for data validation.

What trends exist in the data?

- Identify data analysis options in the organization to assist with abstracting trends (e.g., built-in EHR reports or third-party add-ons).
- Leverage charts and diagrams to visualize, assess, and act on the data. Relevant formats include the following:
  - » Control charts
  - » Pareto charts
  - » Histograms
  - » Box and whisker plot
  - » Scatter diagram
- Evaluate data for variances:
  - » Observe patterns across different time intervals (e.g., weekly, monthly, yearly).
  - » Compare values across acute care settings and/or benchmark against similar organizations or national targets.
  - » Monitor for outbreaks or clusters of infection and seasonal occurrences.
- Disaggregate the data to reveal trends that may not be known:
  - » By race, ethnicity, language, and interpreter use (mandatory fields in NHSN in 2025[45])
  - » By age, sex, insurance type, and other relevant patient-level characteristics
  - » By hospital units
  - » By diagnoses
  - » By comorbidities

REMINDER: When presenting data and information, the HOB Team should present at a scale that is relevant and actionable to their target audience (e.g., sharing "the entire hospital had X number of infections" is less tangible than "our unit had an infection rate of Y%, which made up Z% of the infections in the hospital").

IDENTIFY ASSOCIATED PROCESSES AND PRACTICES

Upon reviewing current data and trends in HOB-related cases, the HOB Team will need to identify associated policies and protocols so it can compare these against actual performance. This review may be targeted to the specific data points discovered in the previous step or can remain broad, focusing on common IPC trends.

What official HOB-related policies, protocols, and procedures exist in the organization?

- Inventory existing resources for HOB prevention, identification, and treatment in all acute care settings, such as the following resources:[46]
  - » Written policies, protocols, and procedures
  - » Review application and adherence to the existing policies, protocols, and procedures
  - » Frequency of audits and feedback
  - » Existence and awareness of alternative procedures and/or products
  - » Patient and caregiver education and engagement procedures and protocols
  - » Methodology and processes for entering and recording information
  - » Established communication feedback loops between departments
  - » Staff training and competency
- Consider additional formats for collecting information on existing processes, flow of materials, duration and timing of tasks, and other key performance indicators such as staff surveys, interviews, and observational reports.[47]
- Review and document existing countermeasures, support mechanisms, and trainings to reduce scenarios where HOB is likely to occur, such as the following:[42]
  - » Indwelling device insertion, maintenance, and removal practices
  - » Documentation in medical record of the presence and necessity of each invasive device
  - » Hand hygiene compliance
  - » Enhanced patient environment cleaning
  - » Contact precaution protocols
  - » Staff-to-patient ratios and staffing mixes
  - » Department specific performance improvement projects
  - » Pre-surgical checklists
  - » Ventilator maintenance and protocols
  - » Clinical decision support system
  - » Ongoing staff trainings, competencies, or certifications
  - » Ongoing education and engagement opportunities for patients and families related to HOB prevention and identification

REMINDER: When inventorying existing policies, protocols, and procedures, remember that many currently reported HAIs are subsets of HOB (e.g., CLABSI, MRSA bacteremia) or sources of HOB (e.g., CAUTI, ventilator-associated pneumonia, SSIs). Existing policies and procedures around these HAIs, along with existing protocols for laboratory testing and appropriate treatment, can serve as a strong starting point when building a unified HOB program.

How do existing policies, protocols, and procedures compare to clinical practice?

- Gather information on gaps in practice using multi-modal methods (e.g., direct observations, audits and feedback, staff interviews, surveys).
- Identify clinical care team members involved in direct patient care to identify potential gaps and opportunities for HOB management.
- Solicit feedback from direct and indirect care team members frequently to gauge everyday factors that influence HOB management (e.g., skill mix, acuity, patient factors).
- Use quality improvement strategies, methodologies, and tools to pinpoint contributing factors of HOB. These may include the following: [48-50]
  - » Root cause analysis
  - » Variance analysis in processes
  - » Point-prevalence surveys
  - » Lean Six Sigma
  - » Failure mode and effects analysis
  - » Value stream mapping
  - » Human factors analysis
  - » Proactive risk assessment
  - » Fishbone diagram

Action Area 6: Identify Opportunities For Improvement

Once the HOB Team understands the current state of HOB performance, it can evaluate this against the desired state. This action area provides strategies for aligning with evidence-based practices and understanding existing barriers. Benchmarking current practice against evidence-based literature, emerging science, and clinical best practice guidelines can provide the HOB Team with a starting place for improvement. Once the HOB Team completes this review, they can conduct a gap analysis and develop a tailored action plan and set well-informed and realistic targets.

IDENTIFY DESIRED PERFORMANCE

Science is continuously evolving, so organizations should continuously evolve their policies, protocols, and procedures to align with the latest evidence. This step encourages the HOB Team to review current guidance and identify potential gaps and improvement opportunities.

Are organizational policies, protocols, and procedures aligned with best practice guidance?

- Conduct a focused literature review for identified gaps and priorities from the previous action areas (e.g., review of peer-reviewed journal articles, clinical practice guidelines, and other credible sources).[52]
- Assess how the inventory of existing processes for HOB management aligns with pathogenesis- and pathophysiologic-based protocols and guidelines (e.g., existing guidelines for prevention, identification, and treatment of CLABSI,[52,53] CAUTI,[54] ventilator-associated and hospital-acquired pneumonia,[55-57] skin and soft tissue,[58] and sepsis[59,60]). Document where misalignment exists.
- Identify gaps between current organizational policy and/or process, evidence-based practices, and emerging science.
- Review current performance against established state and national benchmarks, if available, to gauge potential areas of improvement.
- Engage in shared learnings across various healthcare organizations (e.g., specialty societies, hospital and healthcare associations, local and national learning collaboratives, accreditation organizations).

REVIEW IMPLEMENTATION CHALLENGES

Once the HOB Team understands the gaps in desired HOB-related performance, it can then consider why these gaps exist. This step empowers the HOB Team to survey and identify the barriers behind differences in evidence-based guidance and current practice.

Does the organization have any barriers to implementation?

- Identify existing technical and adaptive barriers (Table 4 presents a side-by-side comparison).[61]
  - » Technical barriers can be surmounted by applying existing know-how and the organization's current problem-solving processes, and can include the following:
    - Data and information that are not easily found
    - Unclear process for identifying and inputting data
    - Databases lacking relevant or useful information
    - Lack of tools for analyzing, risk adjusting, or aggregating data
    - Unclear roles and responsibilities
    - Deadline constraints for documenting events in EHR or lab work
  - » Adaptive barriers require individuals and organizations to alter their behaviors and attitudes, and can include the following:
    - Lack of trust in the data and its interpretation
    - Lack of staff buy-in and engagement
    - Lack of accountability
- Assess if and how HOB management efforts may compete or align with existing organizational priorities and brainstorm potential ways to create alignment.
- Assess current workload of clinical care teams, and identify opportunities for innovative task design (e.g., high volume or high acuity case mix may decrease attention to new implementation).
- Identify needed resources when prioritizing next steps.
- Leverage existing toolkits and frameworks for promoting a safe culture (e.g., comprehensive unit-based safety plan [CUSP],[62] Speaking Up and Speaking Out).

Table 4. Understanding Differences Between Technical and Adaptive Challenges[63]

	TECHNICAL CHALLENGES	ADAPTIVE CHALLENGES
Problem	**Known or easy to identify**	**Unknown or hard to identify**
Solution	**Known based on experience**	**Unknown and requires learning**
Locus of Responsibilities	**Experts and authorities**	**Stakeholders and authorities**
Obstacles	**Resource-limited (e.g., time and money)**	**Less tangible (e.g., values, loyalties, relationships)**

Action Area 7: Set Organizational Goals

After defining the opportunities for improvement in HOB-related care, the HOB Team will need to discuss and set organizational goals. Goals will vary from institution to institution. For example, at one hospital, peripheral IV-related bloodstream infections[64] may be problematic whereas at another institution, problem areas may be non-ventilator-associated pneumonia.[65] This action area provides suggestions for identifying strategic goals that can guide acute care settings towards better HOB management. When organizations set realistic and well-informed goals with buy-in from clinical care teams, executing change becomes easier. Once organizational goals are established, the HOB Team can begin to effectively communicate specific HOB improvement strategies to leadership, clinical care teams, and even patients.

IDENTIFY SPECIFIC OUTCOMES

Creating a path forward in an HOB program is most effective when driven by consensus and informed by data. This step guides the HOB Team in compiling the findings obtained throughout Phase 2 and identifying key priorities and actions.

Does the organization have a clear end goal?

- Develop team consensus on key priorities for HOB management.
- Identify short- and long-term goals that are S.M.A.R.T. (specific, measurable, achievable, relevant, and time-bound).
- Create feedback mechanisms that elicit clinical care team input on desired performance targets.
- Consider the following:
  - » What is the current HOB rate, and what is a realistic target?
  - » Which infections does the team consider preventable, largely preventable, or not preventable?[15]

REMINDER: The HOB Team must be cognizant that data collection and synthesis needs to be accurate and transparent and needs to support decisions and outcomes around key priorities. HOB leaders can hinder buy-in if they are not transparent about how the data are obtained, dissected, interpreted, and shared.[32]

REMINDER: In many cases, actions in Phase 1 can be supported and continually strengthened with the strategies in Phase 2. For example, a root-cause analysis may show that minor changes to processes may improve performance in HOB prevention, identification, and treatment.

Phase 2 Resources

Evaluate Barriers and Solutions

- Reducing Infections "Together": A Review of Socioadaptive Approaches – Sreeramoju
- Examples of Technical and Adaptive Solutions for Change - Agency for Healthcare Research and Quality (AHRQ)

Evaluate Compliance

- Instruments for evaluating compliance with infection control practices and factors that affect it: an integrative review – Duarte Valim et al.
- Development of a Tool to Measure Compliance with Infection Prevention Activities Against Emerging Respiratory Infectious Diseases among Nurses Working in Acute Care and Geriatric Hospitals – Jeong et al.

Benchmarking and Data Generation

- Benchmarking for prevention: the Centers for Disease Control and Prevention's National Nosocomial Infections Surveillance (NNIS) system experience – Jarvis
- SSI Benchmark Report Graph for Example Hospitals – Duke Infection Control Outreach Network
- National HAI Targets & Metrics – U.S. Department of Health and Human Services (HHS)
- HAIs: Reports and Data – CDC
- Current HAI Progress Report – CDC
- Reference Antimicrobial Susceptibility Testing (AST) Data – CDC
- Healthcare Associated Infections – National – CMS
- Healthcare Associated Infections – Hospitals – CMS
- Healthcare Associated Infections – State – CMS

PHASE 3: IMPLEMENT CHANGE

AIM	This phase presents strategies to prevent, identify, and treat HOB and empowers acute care settings to recognize and address high priority risks. Phase 3 outlines basic and advanced strategies for each action area specific to patients, families, and clinical care teams.
KEY ACTIONS	▮ Engage Patients and Families in HOB Management ▮ Prevent HOB—Recognize and Mitigate Risk ▮ Identify HOB—Assess and Recognize Symptoms ▮ Treat HOB—Guide Timely and Accurate Care
KEY OUTPUTS	A better understanding of how to identify and implement basic and advanced prevention, identification, and treatment strategies that align with and meet HOB program goals
KEY TEAM MEMBERS	HOB Team (see Table 3), additional clinical care team members, patients, and families

Overview

Phases 1 and 2 in this Playbook discuss broader, organization-wide actions that set the appropriate groundwork for HOB-related quality improvement. Once organizations have created a shared vision and prioritized areas for action, acute care settings can implement change at the level in which care is provided. Phase 3 builds on the prior phases by laying out concrete strategies and resources that clinical care teams may use to achieve the program goals identified by the HOB Team.

Many of the strategies in Phase 3 are not new: basic IPC precautions, programs, and bundles are the foundational starting points for addressing HOB. Phase 3 builds on this foundation by highlighting special considerations (e.g., differences in patients, medical characteristics, care settings) and education and training opportunities across all facets of HOB management. Action Area 8 outlines strategies for engaging patients and families in various aspects of HOB management. Action Areas 9, 10, and 11 provide strategies for prevention, identification, and treatment of HOB, respectively.

The strategies are further broken down into two tiers based on complexity: **basic strategies** reflect general skills and considerations while **advanced strategies** build upon (but do not replace) the basic strategies to reflect more robust efforts for HOB management. The two tiers aim to reflect the varying levels of expertise and skills that acute care settings may have, with some acute care settings already implementing more advanced strategies while others are still getting comfortable with basic strategies. Acute care settings can leverage action area strategies that align with priority actions identified in Phase 2 and tailor these strategies to person-centered organizational efforts for implementing change.

Special Considerations

Care is unique to each patient, so acute care settings need to balance standardization in prevention, identification, and treatment with awareness of individualized factors that affect HOB risk and planning. Table 5 highlights categories of special considerations that may increase HOB risk for certain individuals and affect decisions related to HOB management. This table offers examples of special considerations that are a starting point for acute settings as they evaluate their patient population and acute care setting trends.

Table 5. Special Considerations for Increased HOB Risk

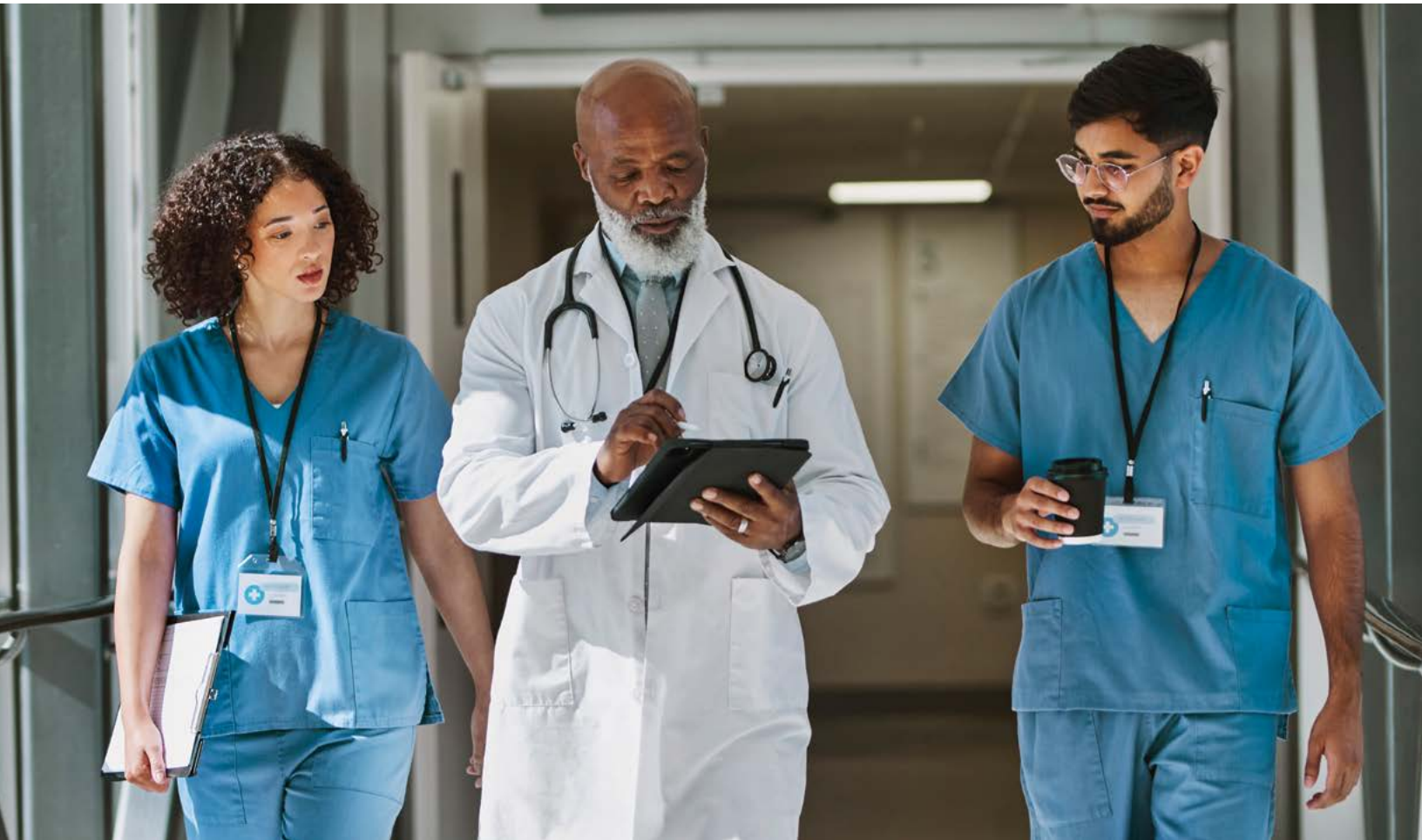
CATEGORY	SPECIAL CONSIDERATIONS
Age	• Neonatal and Pediatric[66] » Types, sizes, and location of devices based on weight and age » Presence of genetic syndromes » Separate monitoring and/or exclusion from reporting metrics » Diagnostic challenges (e.g., late-onset sepsis in neonates, occult bacteremia) • Older adults » Presence of multiple comorbidities that pose a higher risk for HAIs (e.g., pulmonary disease, diabetes) » Increased risk of UTIs due to predisposing factors such as neurogenic bladder, lack of estrogen, post-void residual urine, and incontinence[67] • Senescence
Clinical Characteristics	• Primary and secondary immunodeficiencies (e.g., cancer, human immunodeficiency virus, organ transplant, autoimmune conditions)[68] • Procedures that involve manipulating the skin or mucosa (e.g., surgeries, invasive procedures, indwelling catheters, ports)[69] • Disruption of skin and/or mucosal surfaces (e.g., trauma, ulcers, burns) or at risk for skin integrity issues[69] • Comorbidities and chronic conditions (e.g., obesity, chronic lung disease, diabetes, high blood pressure, kidney disease)[70] • Difficult intravenous access (DIVA) patients,[71] poor venous access, history of or current intravenous (IV) drug use • Recent hospitalization, long-term care, transfer from another facility • Prolonged and combined antibiotic therapy[67] • Long-term device use (e.g., chemotherapy, total parenteral nutrition) • Limited mobility (e.g., paralysis, generally debility) • Cognitive impairment or delirium
Healthcare Setting	• Risk of higher morbidity and mortality among critical care patients • Increased risk with longer length of stay • Limitations in resources that may include: » Lack of or limited specialty care or consult (e.g., infectious disease, vascular access team) » Limited bed availability causing boarding of patients in atypical units (e.g., adult patient admitted to a pediatric unit, holding in emergency departments) » Staffing shortages » Innovations in technology (e.g., telemedicine, electronic ICU, artificial intelligence)
Social Conditions	• Health-Related Social Needs (HRSN): Individual-level, adverse social conditions that may negatively affect a person's health or healthcare, such as food insecurity, housing instability, and lack of access to transportation[72] • Social Drivers of Health (SDOH): Conditions in the environments where people are born, live, learn, work, play, worship, and age that affect a wide range of health, functioning, and quality of life outcomes and risks. (Also referred to as social determinants of health.)[73] SDOH may include safe housing, racism and discrimination, education level, income, access to food and nutrition, air and water quality, language, and literacy skills.[73]

Education and Training

The strategies and considerations in Phase 3 require targeted education and training efforts for patients, families, and clinical care teams. By focusing on continuous educational advancement, acute care settings can increase comprehension of HOB risks and establish improved competency in HOB management. Education and training are critical to change strategy and address gaps in knowledge. To optimize education and training, acute care settings need to consider frequent repetition, individual focus, and implementation of higher-value improvement interventions and system-based changes (e.g., automation, standardization, checklists).[74] Acute care settings can also use education and training to share successful processes and relative expertise that have been effective in other units, organizations, or care settings.

The HOB Team preparing to implement change may leverage the following strategies for developing and implementing education:

- Incorporate HOB concepts into existing IPC trainings and protocols.
- Share facility-specific data (where available) as part of educational programming to help audiences meaningfully contextualize the content.
- Identify a front-line champion(s) with expertise in clinical tasks to develop or identify third-party educational materials and lead peer trainings.
- Conduct focus groups (e.g., patients, caregivers, direct and indirect care teams) to assess educational needs and barriers.
- Provide simulation-based education to practice clinical skills, assess competency, and advance knowledge in a safe and controlled environment.[75]



Action Area 8: Engage Patients and Families In HOB Management

Patients and their families have a right to be involved in their own care and care decisions.[76] Clinical care teams are responsible for minimizing HOB risks and guiding care decisions for safe, quality care. However, patients and families are often poised to see opportunities that clinical care teams may not, making them valuable partners to clinical care teams. Even when patients cannot speak for themselves, families can be pivotal partners in HOB management throughout intake, admission, and hospitalization. For example, families spend much of their time at the bedside, attuned to the patient's condition, so they are well-positioned to quickly alert clinical care teams to risks and/or early symptoms of HOB such as a rash, fatigue, or confusion. Clinical care teams can foster strong partnerships with patients and families by identifying and creating increased engagement opportunities that meet patients and families where they are (described in further detail below). When clinical care teams foster consistent, effective communication throughout the care journey, patients and their families become more involved in HOB management, shared decision making, and healthcare quality improvement.

ENGAGE PATIENTS AND FAMILIES IN HOB PREVENTION

The strategies in this step create opportunities for clinical care teams to improve collaboration with patients and families to reduce HOB risks. Clinical care teams are not shifting responsibility for HOB prevention, rather, they are empowering patients and families to be part of the care journey. Clinical care teams can leverage both basic and advanced strategies for patient and family engagement to benefit both patient safety and clinical care quality.

How can acute care settings involve patients and families in HOB prevention?

- Provide device-specific infection risk information to foster dialogue around protocols for removal, culture, and rationale for decision making (e.g., indwelling urinary catheter urine culture practices, vascular access device insertion or removal).
- Inform patients about what to expect from their clinical care team (e.g., hand hygiene, personal protective equipment, site inspection, environmental cleaning and disinfection).
- Communicate the role of patients and families in your organization and support their engagement during the hospital journey.
- Discuss how to recognize common signs and symptoms of infection and provide options for reporting or escalating concerns.
- Empower patients and families to speak up for safety, report concerns, and partner with the clinical care team.
- Leverage existing patient advisory councils or conduct a patient focus group with equitable inclusion of diverse patient populations to help inform care team policy and education.

Table 6. Basic and Advanced Patient and Family Engagement Strategies

BASIC PATIENT AND FAMILY ENGAGEMENT STRATEGIES	ADVANCED PATIENT AND FAMILY ENGAGEMENT STRATEGIES
Educate about the importance of hand hygiene	Educate about what patients and families can expect regarding clinical care team hand hygiene. Give them a script how to ask anyone entering the room (e.g., clinical care teams, visitors) to stop and perform hand hygiene if not done.
Educate about expectations for routine care practices (e.g., vascular access and indwelling device assessment, dressing change protocol, device-related pain or discomfort)	Engage in discussion about routine care practices and how to report changes or concerns (e.g., presence of a loose dressing)
Educate about common infection risks	Provide optional tasks patients and families can do to help mitigate risks (e.g., wipe down handrails between staff cleanings)
Provide equitable education opportunities that consider person-specific needs (e.g., language, literacy, culture)	Conduct focus group(s) to assess population-specific trends that will inform person-centered education plans
Supply informational pamphlets and reading materials	Provide electronic versions of materials (e.g., videos, accessible online information using quick response [QR] codes)
Inform about clinical care team rounds	Include patients and families in clinical care team rounds to create opportunities for person- and family-centered care (e.g., shared decision-making)[77]
Increase awareness of how to access and use EHR Information	Leverage EHR patient portals to communicate with patients and families in real-time
Ask to assist with daily care practices (e.g., bathing, repositioning, oral care)	Increase awareness of the need for daily care practices and provide guidance so families can actively and safely participate
Inform about common medical treatments and equipment	Inform how to identify clean medical equipment when brought in for use (e.g., script how to ask about cleanliness)
Educate about current device protocols (e.g., vascular access device, urinary catheter)	Post device information in a clear and accessible manner in patient rooms, using visual management strategies (e.g., expected device removal date, total device days)[78] Use conversations, reminders, and checklists to transparently set expectations about why devices remain in use and when they will be removed

ENGAGE PATIENTS AND FAMILIES IN HOB IDENTIFICATION AND TREATMENT

This step provides strategies for clinical care teams to engage patients and families in identifying and treating HOB in a timely way. By involving patients and families in HOB identification and treatment pathways, clinical care teams can help them have a greater sense of control over their care, leading to higher treatment success, and overall better HOB-related health outcomes.

How can acute care settings involve patients and families in HOB identification?

- Educate about causes of infectious disease (e.g., bacteria, viruses, fungi) through oral, visual (e.g., posters, hospital TV), written (e.g., pamphlets), and digital (e.g., hospital education portal, text messaging) instruction.
- Discuss general signs and symptoms of HOB (e.g., fever, chills, fatigue, mental status change, abnormal vital signs, and pain, tenderness, and swelling at device access site) and common diagnostic tests used to isolate the cause (e.g., blood test, sputum test, urine test, wound culture, X-rays, ultrasound, computed tomography [CT] scan).[79]
- Talk with patients and families about the reason for diagnostic testing and, conversely, when testing is not indicated.
- Use plain language and teach-back methodology when educating patients and families to reinforce understanding and improve shared decision-making.[80]
- Support patient- and family-activated rapid response programs to alert direct-care teams about concerns or changes in patient status.[76]

How can acute care settings involve patients and families in HOB treatment?

- Emphasize the importance of prevention and identification even when undergoing treatment, as the patient can still be susceptible to other infection sources.
- Educate about antimicrobial use, misuse, and efficacy to improve understanding of treatment decisions (e.g., antimicrobial stewardship).[81]
- Assess patients' cultural backgrounds and other special considerations (see Table 5) so that the clinical care team is aware of varying beliefs and perceptions of medical treatment(s).
- Give patients access to information and involve them in treatment decisions.[82]

Action Area 9: Prevent HOB—Recognize and Mitigate Risk

Preventing HOB in acute care settings begins with identifying risk and continues with monitoring and mitigating those risks. To diminish the prevalence of HOB, clinical care teams must identify and act on preventable pitfalls that place patients at risk. This action area presents both basic and advanced HOB prevention strategies that build on the foundation of existing and ongoing IPC efforts. Clinical care teams can leverage these strategies to develop comprehensive HOB prevention efforts that align with HOB-related priority actions identified in Phase 2 and foster multi-disciplinary collaboration and person-centered care.

ADVANCE HOB PREVENTION

Each person who encounters a patient in an acute care setting can affect the prevention and mitigation of risks. This step helps clinical care teams consider ways to improve existing strategies or implement new strategies to support HOB prevention. These basic and advanced strategies can augment daily patient care practices (e.g., assessment, personal hygiene, turning and repositioning, skin care, mobility) to identify and mitigate HOB risk.

Table 7. Basic and Advanced Prevention Strategies for Clinical Care Teams

BASIC PREVENTION STRATEGIES	ADVANCED PREVENTION STRATEGIES
Engage care teams in hand hygiene practices	Engage patients, families, and care teams in robust hand hygiene practices that include peer-to-peer accountability and support[83]
Follow policy for device checks and documentation	Expand inspection of devices and reporting of issues to all appropriate clinical care team members (e.g., vascular access team) while engaging all team members in identifying and reporting potential issues and risks
Review policies and protocols for alignment with evidence-based practice for device management	Develop organizational protocols for proactively removing devices and mitigating risks Identify accountable clinical care team members for this decision (e.g., surgeon who placed the device, intensivist overseeing care of the patient in the intensive care unit [ICU], vascular access team)
Develop communication pathways when a supply or product changes (e.g., disinfectant wipes, alternatives to indwelling urinary catheters)	Engage in gap and risk analyses when a supply or product changes Provide just-in-time training when products are implemented
Encourage proactive notification to clinicians about risks of devices	Initiate device rounds that discuss plan for keeping versus discontinuing a device
Flag high-risk patients in the EHR (including, but not limited to, groups listed in Table 5)	Build electronic notification of high-risk factors and individualize care plans to mitigate risks these factors present (e.g., increase device checks for a patient who is cognitively impaired)
Educate patients and families	Actively listen to and partner with patients and families (see Action Area 8)
Engage patients and families in infection prevention tasks (e.g., hand hygiene, oral care)	Identify patients who may be unable or unwilling to actively participate in prevention tasks, and assign additional care team support for patients with a lower capacity for partnership or self-activation (e.g., patient advocates, in-home caregiver, social worker)
Select devices and device placement based on therapy needs	Consider high-risk factors (e.g., long term use of an antecubital IV in a DIVA patient) when deciding on devices and device placement (e.g., inserting a peripherally inserted central catheter) Place devices based on patient needs; follow best practice guidelines for the appropriateness of device utilization (e.g., Michigan Appropriateness Guide for Intravenous Catheters) and, if available, consult subject matter experts (e.g., vascular access team)
Review patients' right to refuse treatment (e.g., refusal of bathing, ambulation, or a dressing change)	Partner with patients and families to identify reasons for refusal, gauge understanding of potential health consequences related to refusal, and develop a plan to lower their risk for infection
Conduct multidisciplinary rounds	Involve patients and families in bedside multidisciplinary rounds that include risk identification and mitigation discussions using plain language for better understanding Provide time for patient and family questions or escalation of concerns

Action Area 10: Identify HOB—Assess and Recognize Symptoms

Clinical care teams manage various medical conditions with varying degrees of complexity requiring time-sensitive, accurate, and efficient detection. Identifying HOB can involve a degree of ambiguity especially when considering multiple sources of infection and mimickers of infection (e.g., deep vein thrombosis, inflammatory arthropathies, tumors)[84] which can lead to delayed or misdiagnosis. This action area guides care teams in clinical workflows to establish the presence of bacteria and fungi in the bloodstream and builds on existing practices (e.g., diagnostic stewardship, blood culture collection) to create systems where appropriate testing leads to timely diagnosis.[85] The presence of HOB can significantly affect patient outcomes and progress into life-threatening emergent situations (e.g., sepsis). In addition to establishing the presence of HOB, clinical care teams need to recognize the symptoms of sepsis, severe sepsis, and septic shock, as these lead to higher incidence of organ damage and death. Early detection and treatment of HOB and sepsis are essential for survival and for limiting disabling effects of this profound response to an infection.[86]

ADVANCE HOB IDENTIFICATION

To advance HOB identification, clinical care teams may explore effective and timely care processes to isolate the type of infection present and, thus, the treatment needed. In partnership with existing experts (e.g., IPC, ASP, laboratory leads), clinical care teams may leverage the basic and advanced strategies in this step to improve protocols (e.g., lab workflows, equipment use, communication, staff) and reduce time between testing and diagnosis.

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 lab
Report positive blood cultures	Include notes in the report that may include the following: • Reminder about common commensals and likely contaminants • Flag for infectious disease consult, if needed[85] • Consider inclusion of differential time to positivity to identify CLABSI[91]
Implement sepsis protocols	Implement sepsis protocols across all acute care settings, and establish 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 consequences of inappropriate testing with the urgency of timely and appropriate identification Practice diagnostic stewardship to strike a balance between timely identification and appropriate testing

Action Area 11: Treat HOB—Guide Timely and Accurate Care

Infectious disease science and treatment protocols are rapidly evolving fields in healthcare. When identifying the appropriate treatment course, clinical care teams may reference evidence-based clinical and pharmacological standards, guidelines, and best practices. In addition, ASPs optimize medication prescribing and use to effectively treat infections, protect patients from adverse events associated with antimicrobials, and combat antimicrobial resistance.[92,93] Direct care teams may familiarize themselves with infection sources and organisms or consult subject matter experts (e.g., indirect care team members such as infectious disease specialists and epidemiologists) when considering a course of treatment. When direct care teams are well equipped and supported in identifying and prescribing accurate and timely infection treatment(s), acute care settings can prevent complications, reduce transmission, and optimize HOB-related patient outcomes.

ADVANCE HOB TREATMENT

Clinical care teams rely on timely and accurate notification of testing results and other clinical findings to optimize daily patient management. This step helps clinical care teams consider basic and advanced strategies to address factors that can delay HOB treatment decisions.

Table 9. Basic and Advanced Treatment Strategies for Clinical Care Teams

BASIC TREATMENT STRATEGIES	ADVANCED TREATMENT STRATEGIES
Review lab results	Review culture results for common commensals and likely contaminants; implement processes to improve diagnostic accuracy (e.g., minimize false positives)
Develop workflows for timely notification of positive diagnostic results (e.g., positive blood cultures)	Investigate processes that reduce time to action (e.g., EHR notifications), identify the clinical care team member(s) who will be notified, and set expectations for action once notification is received
Provide evidence-based guidelines for care teams	Build decision support in the EHR to guide practice and trend practice patterns (e.g., empiric antimicrobial therapy guidance)
Engage pharmacist(s) to review appropriate antimicrobial use, therapeutic drug monitoring, and medication adjustment recommendations	Develop a robust multidisciplinary ASP that is available every day Use antibiotic time-outs to assess any required changes to drug, dose, duration, and/or route[94,95]
Identify processes for infectious disease consult, especially when not available on site	Engage infectious disease experts to develop protocols so all clinical care team members have access to expert guidance for common infection sources, leaving consult use for special cause or complex cases Develop consult guidelines for infectious disease when resources are limited
Treat active infection, and use caution regarding colonization	Caution to not treat for colonization in the absence of clinical disease or when asymptomatic Prescribe the appropriate treatment based on infection source and organism
Review regional syndromic surveillance	Discuss and monitor for emerging disease trends by tracking publicly available surveillance data from local, state, and national public health departments or agencies (e.g., National Notifiable Diseases Surveillance System); review disease trends in HOB Team meetings[96]
Develop guidance for timely and appropriate testing	Acknowledge the challenge of balancing unintended consequences of inappropriate testing with the urgency of timely and appropriate identification Practice diagnostic stewardship to strike a balance between timely identification and appropriate testing

Phase 3 Resources

Evaluate Barriers and Solutions

- Epidemiology and Prevention of Healthcare-Associated Infections in Geriatric Patients: A Narrative Review – Cristina et al.
- A Review of Pediatric Central Line-Associated Bloodstream Infections Reported to the National Healthcare Safety Network: United States, 2016-2022. – Prestel et al.
- A Guide to Using the Accountable Health Communities Health Related Social Needs Screening Tool: Promising Practices and Key Insights – CMS

Patient, Family, and Caregiver Engagement

- Patient and Family-Centered I-PASS SCORE Program: Resident and Advanced Care Provider Training Materials – Lewis et al.
- Hospital Care Checklists – Care Partner Project
  - » Checklist: Prevent Bloodstream Infection
  - » Checklist: Prevent Urinary Tract Infections
  - » Checklist: Prevent Ventilator Pneumonia
  - » Checklist: Prevent "Superbug" Infections
  - » Checklist: Help Prevent C. diff Infection

Prevention

- Diagnostic stewardship to improve patient outcomes and healthcare-associated infection (HAI) metrics – Singh et al.
- Prevention of Vascular Access Device-Associated Hospital Onset Bacteremia and Fungemia: A Review of Emerging Perspectives and Synthesis of Technical Aspects – Garcia et al.
- Guidelines for the prevention of bloodstream infections and other infections associated with the use of intravascular catheters. Part I: peripheral catheters. – World Health Organization
- Infusion Therapy Standards of Practice – Infusion Nurses Society
- Compendium of Strategies to Prevent Healthcare-Associated Infections in Acute Care Hospitals – The Society for Healthcare Epidemiology of America (SHEA)
- Implementation of a vascular access team and an intravenous therapy programme: A first-year activity analysis – Rosich-Soteras et al.

Identification

- Diagnostic stewardship to improve patient outcomes and healthcare-associated infection (HAI) metrics – Singh et al.
- Preventing Adult Blood Culture Contamination: A Quality Tool for Clinical Laboratory Professionals – CDC
- 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) – Miller et al.

Treatment

- IDSA 2024 Guidance on the Treatment of Antimicrobial Resistant Gram-Negative Infections – Tamma et al.
- Core Elements of Antibiotic Stewardship – CDC
- National Quality Partners Playbook: Antibiotic Stewardship in Acute Care – NQF
- SHEA/IDSA Clinical Practice Guidelines for Implementing an Antibiotic Stewardship Program – Barlam et.

PHASE 4: CONTINUOUS IMPROVEMENT

AIM	This phase presents strategies to help track HOB-related progress within acute care settings. Specifically, Phase 4 highlights additional metrics beyond the HOB measure that can be used to monitor and assess continuous improvement efforts. This phase also highlights suggested actions for sustaining quality improvements related to HOB.
KEY ACTIONS	▮ Monitor Progress ▮ Promote Sustainability
KEY OUTPUTS	An understanding of key metrics that can reflect performance in HOB management and inform continuous improvement plans
KEY TEAM MEMBERS	HOB Team (see Table 3)

Action Area 12: Monitor Progress

Monitoring is integral to ensuring the continuity and sustainability of an HOB program. In addition to tracking and trending performance on the HOB measure, organizations will want to monitor metrics that correspond to action areas and opportunities for improvement identified in previous phases. From these metrics, the HOB Team can build a base of evidence to understand whether processes and procedures are being successfully implemented, the extent to which process changes contribute to improved outcomes, and whether improvements are sustained over time and consistent across patient populations. Organizations can also share data in thoughtful formats that will help clinical care teams identify successes, promising practices, and opportunities for additional training or structural improvements. In the long term, organizations can leverage monitoring data to plan future cycles of improvement (i.e., understanding priority areas for quality improvement and targeting additional resources).[97,98] This action area presents potential supporting metrics for tracking progress and suggested strategies for continuous process improvement.

IDENTIFY SUPPORTING METRICS

After implementing actions to address priority improvement opportunities, organizations will benefit from tracking the impact of these actions. This step outlines considerations for monitoring the effectiveness of HOB management strategies.

What can help organizations choose supporting metrics?

- Follow existing best practices and guidance for selecting metrics, monitoring, and reporting on performance improvement progress, such as the **elements highlighted in the Agency for Healthcare Research and Quality's (AHRQ) Toolkit for Using the AHRQ Quality Indicators**:
  - » Choose a limited set of effective measures.
  - » Establish a schedule for regular reporting (frequency depends on anticipated rate of change; for example, slowly changing, organization-wide metrics might be tracked annually, while faster-changing, unit-specific metrics might be tracked weekly or monthly).
  - » Develop report formats to communicate clearly.
  - » Establish procedures for acting on identified problems.
  - » Assess sustainability periodically.
- Select individual metrics beyond the HOB dQM that are relevant to HOB, feasible to collect, clearly interpretable, and actionable (Table 10).
- Consider the combination of supporting metrics when building the overall set. The set of supporting metrics should include a mix of processes and outcomes, capture the highest priority milestones or specific interventions being targeted for improvement, and include measures that balance each other to avoid unintended consequences.
  - » Example: Consider pairing a metric tracking the total number of positive blood cultures with a metric tracking the overall number of blood cultures collected (e.g., if percentage of positive blood cultures trends upward, the HOB Team may want to review both metrics for indicators of blood culture avoidance).
- Track additional metrics (e.g., HOB rates, length of stay for HOB patients, and associated financial impact before and after interventions) to support a clear business case for future interventions.

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

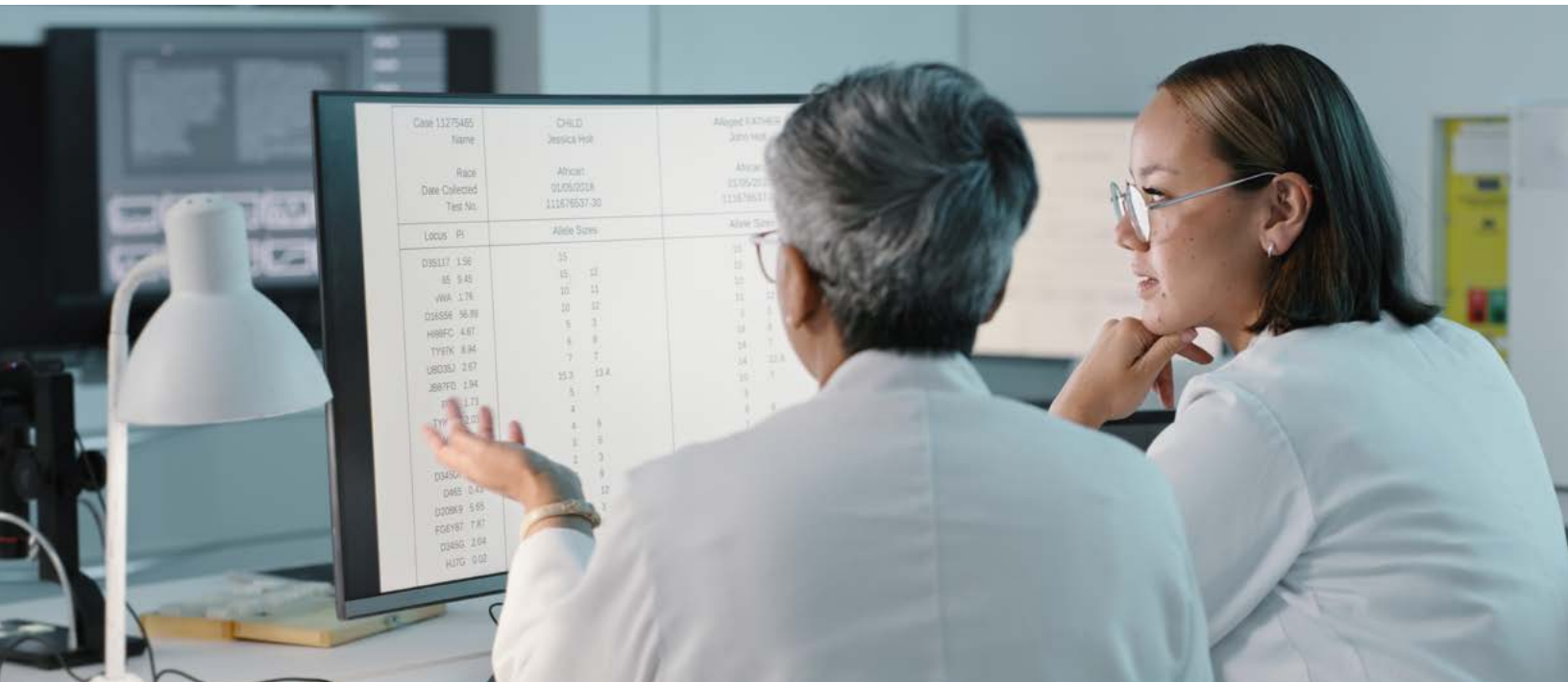


Table 10. Examples of Relevant Supporting Metrics for HOB Management

FACTORS	RATIONALE	EXAMPLES
Staffing	Understand attitudes, culture, and capacity of staff to participate in HOB interventions	• Percentage of staff who agree that they always speak up when they see something that may negatively affect patient care (e.g., Culture of Safety survey) • Employee engagement rates • Clinical care team turnover and vacancy rates • Direct care team/patient ratios
Population Health	Improve awareness of HOB risk factors among patients and communities	• Prevalence of primary and secondary immunodeficiencies in the patient population • Community Health Needs Assessment population data (e.g., obesity, demographics) • CMIT 1662: Proportion of patients who screened positive for social risk factors (food insecurity, housing instability, transportation problems, utility help needs, or interpersonal safety)
Patient and Environmental Hygiene	Identify possible sources of contamination related to insufficient patient and /or environmental hygiene	• Patient experience data on facility cleanliness (e.g., hospital environment of care questions in HCAHPS) • Patient hygiene (e.g., completion rates for bathing, oral care) • Level of contamination detected on high-touch surfaces (e.g., via swab)[99] • Tracking and trending of reusable equipment cleaning practices
Device-Related Metrics	Understand current patterns of device use	• Percentage of patients with different devices, such as the following: » Vascular access devices (including peripheral vascular access devices, midlines) » Surgical drainage tubes » Chest tubes » Indwelling urinary catheters » Ventilators • Number and types of inserted devices, standardized over length of stay • Percentage of patients with an idle catheter (i.e., catheter in place but not in use)[100] • Unit-specific vascular access device insertion patterns (e.g., number, location, appropriateness) and maintenance practices (e.g., compliance with protocols on changing non-intact dressings and site assessment) • Complication and device failure rates requiring early removal or additional treatment

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) • CBE #3658: Adult Blood Culture Contamination Rate • Blood culture positivity rates by unit, organism, and/or infection source • Use of blood culture diversion device or waste tubes to reduce contamination, unless drawing through device to identify suspected source of infection • Blood cultures per antibiotic start
Antimicrobial Treatment	Assess appropriate, timely treatment and antimicrobial stewardship	• Days of therapy (DOT) • Antimicrobial use (AU): DOT per 1,000 patient days • Time to appropriate therapy • 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 • Hospital-onset sepsis rates • Mortality rates • Device-related complication rates • Procedures for surgical site incision and drainage or device removal/replacement • Readmissions attributed to bloodstream infection

How can organizations optimize the data collection and analysis processes for selected metrics?[32]

- Consistently monitor and evaluate the data that were agreed upon for review to verify that the right information is being abstracted.
- Check data accuracy regularly and create mechanisms for staff to raise any concerns about data results (e.g., discussion opportunities, escalating intentional misreporting to an ethics hotline, speaking up for safety when there are concerns for missed diagnosis or deviation from the standards of care).
- Partner with clinical care teams to obtain feedback on currently available data and the feasibility of collecting other metrics.
- Identify existing systems that already collect pertinent information (e.g., EHR, registries, laboratory systems, billing and coding systems) and leverage data from these sources.
- Designate at least one point person with sufficient training; if possible, schedule protected time to assist others throughout the organization with data management and troubleshooting (e.g., auditing, setting up reports).
- Over time, share data analytics processes and methodologies that have been successful at your organization, and consider best practices shared by other organizations (e.g., safe and effective ways to leverage artificial intelligence).

MYTH: Tracking the HOB measure and other metrics is not useful, because staff will try to "game" the measure.

RESPONSE: When selecting and tracking metrics for performance management, unintended consequences such as tunnel vision (i.e., focusing on aspects that are measured while ignoring other important aspects) or gaming (i.e., manipulating behavior to artificially inflate measure performance) can occur.[101] However, organizations can discourage these behaviors by incorporating some of the suggestions already presented in the Playbook:

- Avoid tying rewards or penalties to a single metric.
- Choose multiple complementary metrics that balance each other and identify gaming behavior early.
- Reinforce a culture where staff understand that quality improvement metrics are for continuous improvement, not for blame.
- Emphasize the broader importance of addressing patient safety and reducing the high morbidity and mortality from HOB, rather than centering discussion entirely on the HOB measure.

DISCUSS REPORTING PATHWAYS

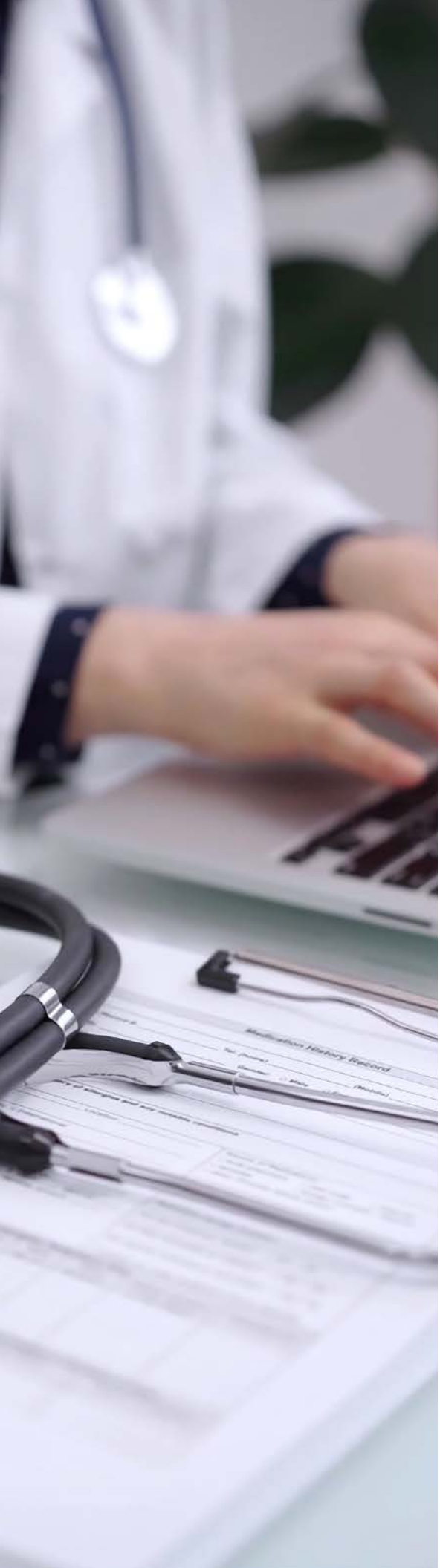
After identifying metrics and collecting relevant data, the next step to understand progress is to synthesize information and share the results with stakeholders through appropriate reporting pathways. In this step, organizations can build consensus for monitoring data, including choosing the method and format of reports.

Does the HOB Team have a reporting plan?

- Identify data analysis support and define the methodology, so that all team members are in alignment and have clarity on the process.
- Promote transparency and trust by informing clinical care teams about the chosen analysis methodology.
  - » Inform clinical care teams about HOB data submission, where to view it, and how it will be used by federal programs.
  - » Monitor and trend selected supporting metrics to report on HOB Team improvement efforts.
- Identify and act on opportunities to share HOB-related data analysis results with clinical care teams (e.g., rounds, reports, presentations, dashboards).

What are the most effective methods for reporting?

- Make internal reports actionable and useful to different stakeholders by including additional contextual information, such as the following:
  - » Trends in HOB-related blood culture results
  - » Stratification by patient population (race, gender, age, medical conditions), hospital unit (ICU vs non-ICU), co-morbidities
  - » Infection source and organism
- Tailor reports to the recipients by including specific information such as the methods used, visual displays, interpretation of results, recommendations and actions, and the specific stakeholders positioned to act on those recommendations.[49]
  - » Consider the needs of specific audiences to ease the burden of accessing and understanding the most relevant information for their roles and responsibilities.
- Garner feedback from clinical care teams on ways to improve reports and dashboards to increase the effectiveness of the reports over time.



CONTINUOUS PROCESS IMPROVEMENT

As organizations begin to better understand their HOB rates, supporting metrics, and related processes and outcomes, they have a valuable opportunity to engage in the cycle of continuous process improvement. In this step, organizations use the data from their supporting metrics to inform incremental process improvements that contribute to rapid cycle improvements in HOB management.

What tools can teams use to drive continuing improvement?

- Leverage tools and recommended practices from existing quality improvement models: many organizations already use one or more of these models, and examples from three of the most common models (Model for Improvement, Lean, Six Sigma)[102] are briefly described below. Each model has a slightly different structure, but all include activities such as defining goals, identifying underlying causes of problems, planning improvements to address these causes, and using measurement to drive rapid cycles of improvement and adjust interventions over time.
  - » IHI's **Model for Improvement**: Set aims and establish appropriate measures before selecting, testing, implementing, and spreading changes following the Plan-Do-Study-Act (PDSA) cycle.[103]
  - » Lean: Identify and minimize waste, not only overuse of physical resources (e.g., unnecessary tests) but other inefficiencies (e.g., wait times, errors that delay care, underuse of staff input and skill sets). Multiple tools for Lean are available, such as the **A3 report**.[104]
  - » Six Sigma: Continuously improve processes by following the **Define-Measure-Analyze-Improve-Control (DMAIC) framework**. Define goals, measure performance, analyze processes to identify root causes of problems, improve processes accordingly, and control changes (e.g., monitor changed processes and adjust over time).[105]
- Investigate causative factors (e.g., root cause analysis, human factors analysis) of HOB events to understand the underlying causes of infections in your organization.
  - » If the volume of cases is large, teams may not have the resources to analyze every HOB case in detail. Teams may also find it challenging to identify a primary cause or contributing factor. However, conducting root cause analyses on a subset of HOB cases can identify patterns associated with HOB. Include randomly selected cases as well as those associated with significant harm.

  - » Use structured frameworks or algorithms to guide investigation, and consider both common and lesser-known sources of infection. Figure 3 shares a sample diagram used for HOB evaluation at a NHSN CoLab pilot site and Figure 4 illustrates a potential framework by **Schrank et. al. (2003)**.
  - » Foster a culture of continuous improvement by focusing on systems and processes that guide and support clinical care teams.
  - » Avoid oversimplifying events, which can lead to blame or unnecessary punitive actions[106] and are detrimental to psychological safety and overall culture of safety.
  - » Look for trends (e.g., recurring sources of infection) within units and across time.
  - » Structure the outcome of investigation to include concrete, actionable next steps.
  - » Engage patients and families in the investigation when possible.[107] While the HOB Team should interview patients and families to gather information about each HOB case, they may want to include a different patient advocate/representative in the subsequent review process (to represent the patient voice without hindering open discussion due to fear of distressing the affected patient or family).
- Analyze HOB data for continuous learning about implicit biases and health inequities.
  - » Opportunities exist for education and awareness on the impact of SDOH within all disease states. Acute care settings can begin by prioritizing quality improvement interventions that foster high-quality equity and implicit bias training for clinical care teams and goals enacted to improve equity.[31]

Figure 3. Sample Diagram for HOB Case Evaluation Process at a NHSN CoLab Pilot Site
Courtesy of Mark Shelly, MD, Geisinger.

Positve Blood Culture on Day 4 or later not POA

Not a contaminant by NHSN LCBI logic

HOB

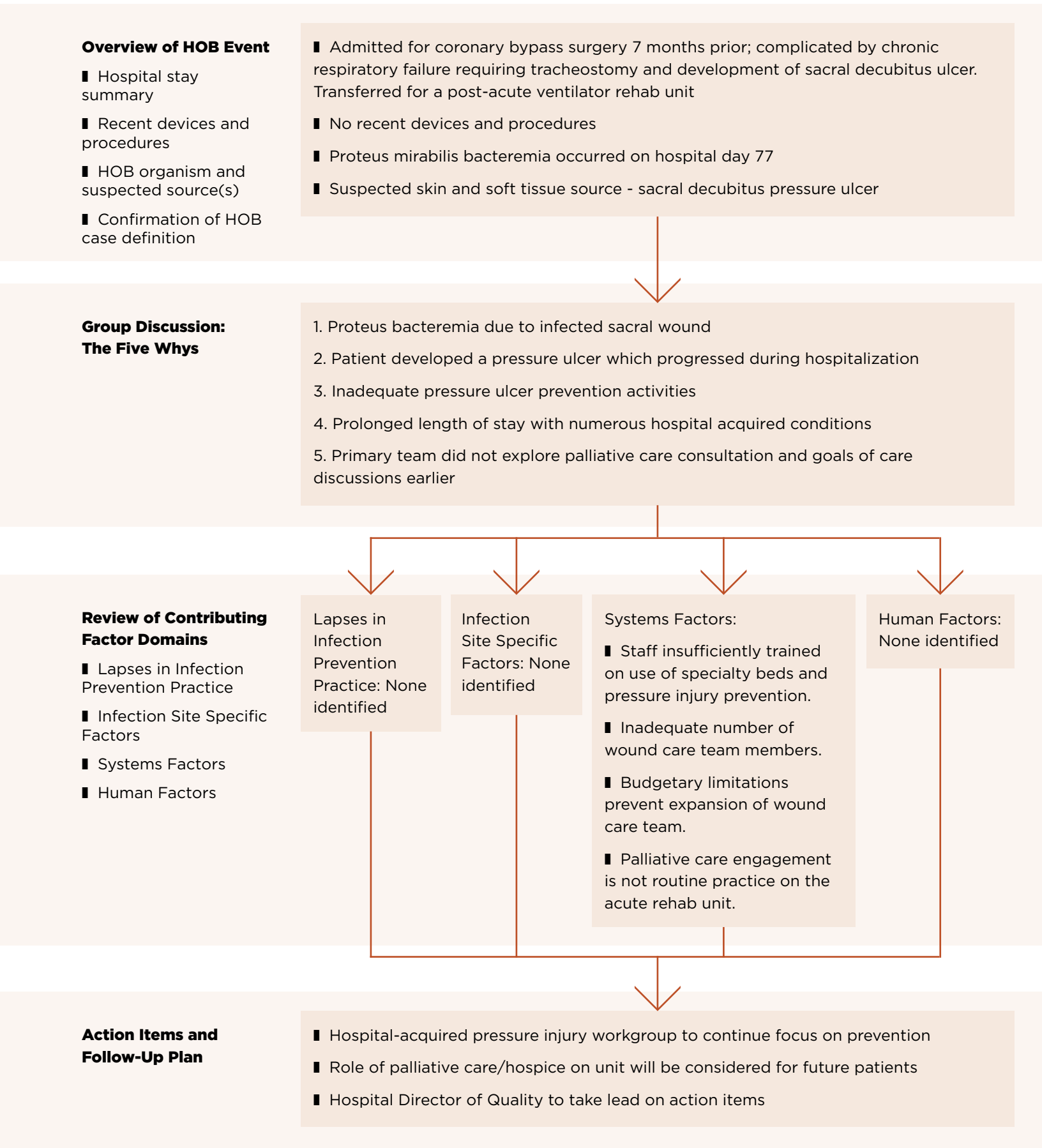
Gather data on:

- Clinical symptoms & diagnostic suspicion
- Lines, drains and airways
- Procedures including surgery and endoscopy
- Neutropenia, colitis or mucositis
- Organism

What is the most likely source?

- Central Line
- Other vascular access, peripheral IV to ECMO
- Pneumonia (+/- ventilator)
- Urinary tract (with or without catheter)
- Gastrointerstinal or intraabdominal
- Wounds, skin and soft tissue
- Mucosal Barrier Injury
- Other

Figure 4. Sample Framework for HOB Root Cause Analysis
Reproduced from Schrank et al. (2023).[1]



Action Area 13: Promote Sustainability

After organizations implement quality improvements, it is common for gains to be temporary. Clinical care teams may return to old habits and processes without continued reinforcement and training, abandon improvements given new and competing demands, or lose emphasis on best practices or protocols with staff turnover. As defined by AHRQ, sustainability occurs "when processes or improved outcomes last within an organization… become part of the organizational culture… and [are] maintained regardless of workforce turnover."[110] Sustainable quality improvements related to HOB require organization-wide culture change and continued education, training, and resources. This section discusses elements important to HOB program sustainability and actions that leaders can take to reinforce HOB quality improvement efforts.

CONSIDERATIONS FOR SUSTAINABILITY

To sustain permanent improvements in HOB outcomes for patients, organizations must continue to reinforce HOB-related priorities and environmental and staff changes over time. This step outlines general considerations and strategies for HOB program sustainability.

What can an organization do to promote sustained quality improvements?

- Track the organization's buy-in, data and data infrastructure, culture of safety, and awareness of HOB-related goals and processes over time. HOB program elements discussed in previous phases can wax and wane over time, and the organization should periodically re-evaluate these. Examples of strategies to maintain these areas include the following:
  - » Resources:
    - Designate adequate personnel and resources to manage HOB. Consider HOB requirements when budget items and staffing plans are updated.
    - Allocate additional resources to manage HOB when the organization introduces new or expanded strategies, either through new or pre-existing programs (e.g., additional funding to existing IPC programs or ASPs).
    - Provide opportunities for personnel to continue learning and growing HOB-related skills (e.g., ongoing skills fairs focusing on aspects of care associated with high risk of HOB).
    - Designate resources for larger strategic projects (e.g., modernizing and maintaining data management infrastructure) that support HOB efforts.
  - » Buy-in and Ownership:
    - Explain the purpose of HOB processes to clinical care teams.
    - Provide evidence to support implementation of best practices.
    - Recognize and leverage hands-on experience of staff; include clinical care teams throughout the process of planning new HOB initiatives to gauge feasibility and build a sense of ownership.
  - » Data and Data Infrastructure:
    - Track data related to new processes (e.g., rounds, documentation).
    - Audit collected data to assess its accuracy.
    - Confirm the supporting metrics that will be considered to track and trend progress.

  - Share data with all stakeholders in a timely manner for transparency (e.g., through a real-time dashboard visible to everyone in the unit to track processes and outcomes).
  - Review electronic submission updates and requirements to ascertain whether infrastructure capabilities are up to date.
- Culture:
  - Monitor the organizational culture, including readiness for change, barriers, and preparedness for more quality improvement activities.
- Awareness:
  - Use visual management (e.g., labeling, posting reminders, color-coding supplies and procedures) to maintain an environment where staff can easily track processes and prevent errors that can lead to increased risk of HOB and preventable harm.
  - Include explanation and training on new HOB-related process improvements as part of onboarding, competencies, and peer-to-peer training for new hires.
  - Incorporate HOB-related goals when defining unit goals.

What can organizational leadership do to help sustain quality improvements?

- Periodically reinforce shared understanding, expectations, and responsibilities for staff related to continuous improvement.[25,39]
  - Describe the benefits of quality improvement for different stakeholders.
  - Aim for a culture where all staff are actively invested in "[doing] their jobs and [improving] upon them."[25]
  - Identify and follow agreed-upon methods to address needs, problems, and conflicts that may arise during the quality improvement process.
- Emphasize the value of evidence-based practice and adaptation of practices as best available evidence changes over time.[111,112]
  - Empower clinical care teams to engage in continuous learning, explore the science behind new evidence, and create mechanisms for sharing information across the organization.
  - Review current performance metrics, impact, and opportunities regularly for further improvement.
  - Equip clinical care team members with appropriate authority, training, knowledge, skills, and best practices.
  - Allocate time and funding as necessary to support continued learning and quality improvement activities.
- Engage staff in quality improvement efforts by participating in activities such as rounding.[26,41]
  - Identify and celebrate successes early and often, and express appreciation for clinical care teams and their efforts as they participate in these activities.
- Support a culture in which all staff are comfortable and can raise questions and concerns about quality improvement or safety.[25,39,112]
  - Examples of actions to support this culture include assigning staff clear roles, sharing information, delivering feedback in a collaborative and constructive way, and recognizing and celebrating achievements.
- Recognize and nurture quality improvement leaders at all levels (e.g., frontline staff, unit managers, department managers or directors), not just at the top of the organization.[25,112,113]
  - Engage staff at all levels in decision making.
  - Recognize and empower natural leaders and champions of learning, evidence-based practice, and quality improvement throughout the organization.
- Assume shared accountability for overall results.

Phase 4 Resources

General

- Quality Measurement and Quality Improvement - CMS
- Sustainability - AHRQ
- A Framework for Safe, Reliable, and Effective Care – Institute for Healthcare Improvement

Data and Data Analysis

- Key Driver 3: Optimize Health Information Systems to Extract Data and Support Use of Evidence in Practice – AHRQ
- Text of Infection Control and Epidemiology – Association for Professionals in Infection Control and Epidemiology (APIC)
  - » Chapter: Surveillance
  - » Chapter: Descriptive Statistics
  - » Chapter: Inferential Statistics

Quality Improvement Models

- Quality Improvement - Johns Hopkins Medicine
- How to Improve: Model for Improvement – Institute for Healthcare Improvement
- A3 Report – Lean Enterprise Institute
- DMAIC: Approach to Continuous Improvement – Six Sigma

HOB Evaluation Tools

- Hospital-onset bacteremia and fungemia: examining healthcare-associated infections through a wider lens – Schrank, Snyder, and Leekha

Leadership

- Effective Leadership for Quality Improvement in Health Care: A Practical Guide – Boguslavsky, Gutierrez, and Holschneider
- A Tool Kit for Improving Communication in Your Healthcare Organization – American College of Healthcare Executives
- Key Driver 4: Create and Support High Functioning Care Teams to Deliver High-Quality Evidence-Based Care – AHRQ
- Key Driver 6: Culture Leadership and Create a Culture of Continuous Learning and Evidence-Based Practice – AHRQ

Drivers of Change

Based on initial lessons from HOB measure implementation, a wide range of stakeholders will continue improving HOB management and refining the HOB measure. Healthcare organizations are responsible for integrating HOB management into current workflows; however, they cannot do this work alone. Organizations need support from the entire healthcare ecosystem. Professional societies, federal agencies, researchers, and other partners in quality improvement can advance HOB prevention through educational, policy, and regulatory efforts.

This section provides an overview of several key areas that can drive advancements in HOB management, including accreditation and certification, payment and reimbursement, education and training, research, and policy.

ACCREDITATION, CERTIFICATION, AND CREDENTIALING

Accreditation, certification, and credentialing organizations can promote the creation and sustainment of HOB programs by developing general standards related to IPC and specific standards that address HOB management. For example, standards that require a hospital-wide IPC surveillance program foster hospital leaders' commitment to an IPC program, while standards specific to HOB management and collection and reporting of HOB data can incentivize these leaders to prioritize funding and resources for HOB programs. Accreditation, certification, and credentialing organizations can align their data-related standards with existing quality measures and avoid introducing additional measurement burden. Accreditation, certification, and credentialing organizations can also foster alignment with evidence-based practices from key specialty organizations (e.g., Infectious Diseases Society of America, The Society for Healthcare Epidemiology of America, Association for Professionals in Infection Control and Epidemiology, Emergency Care Research Institute) which have published clinical practice guidelines and reviews related to HAIs.[114]

PAYMENT, REIMBURSEMENT, AND PUBLIC REPORTING

Federal agencies and health plans can incentivize HOB management by linking performance to payment and reimbursement structures. Tying HOB prevention to payment and reimbursement can motivate acute care settings to start and sustain their HOB programs. This is important because public reporting requirements are expected to follow an initial period of HOB measure implementation and adoption. Federal agencies and health insurers can support the collection and reporting of HOB data, which can lead to national benchmarking and trending improvements in quality and safety. Federal agencies and health plans can foster transparency of HOB rates through public reporting, so patients and families are informed. Public reporting can also support patient education on HOB prevention and can inform patients, helping them avoid care at high-risk facilities. Payment and public reporting requirements related to HOB can help acute care settings actively work toward comprehensive HOB management and be acknowledged for their performance.

EDUCATION AND TRAINING

Although IPC is essential to healthcare, it is often siloed as just one specialty of healthcare professionals. IPC needs to be further integrated into education and training programs in all relevant healthcare fields, including medicine, nursing, and pharmacy. Medical, nursing, and pharmacy schools should bolster HOB management in their curricula and postgraduate training. These training programs must underscore the importance of reducing infection in acute care settings (including the observed disparities) and teach students concrete strategies for recognizing and mitigating infection risks. More funding to increase training program positions in infectious disease would also be helpful.

Leading IPC organizations can improve awareness and knowledge of HOB prevention by disseminating education and training materials for clinical care teams. For example, the CDC has created the Project Firstline initiative, a national training collaborative for IPC. Project Firstline provides interactive educational modules and materials to help healthcare professionals better understand and apply IPC principles and protocols.[115] Continuing education can similarly help clinical care teams and leadership stay abreast of the most up-to-date information on IPC. Increasing the number of staff trained to identify and address HOB in acute care settings can significantly reduce HOB-related mortality, morbidity, and healthcare costs. As organizations across the nation roll out HOB monitoring in the coming years, HOB-related research and best practices will evolve rapidly, heightening the importance of continuing HOB-related education.

In addition to clinician education, patient and community education is equally important for preventing HOB. Educating patients, families, and community members on the importance of HOB prevention will empower them to be effective partners in identifying and mitigating HOB risks. Organizations such as AHRQ and IHI have published guides on better informing and engaging patients, families, and caregivers in hospital quality and safety efforts.[116,117] The active involvement of patients, families, and caregivers drives shared decision-making, person-centered care, and ultimately, better patient outcomes.

RESEARCH

As more acute care settings implement the HOB measure, data will become more widely available. This influx of data will provide an opportunity to track and trend sources of HOB that may not be well-known and can be a catalyst for advancing research. Healthcare organizations can lead the exploration of new strategies and methods to advance HOB management. HOB Teams will need better science around leading contributors as the focus shifts to all HOB causes. With nearly 200 million peripheral intravenous catheters used yearly in the United States, opportunities to highlight needed improvements in prevention science and device management will emerge.[118]

Another growing opportunity is to analyze data for social inequities that can be easily overlooked with aggregate data. However, healthcare organizations without robust data analytics support may have difficulty assessing gaps in equity for the populations within their care. As work progresses in these fields, healthcare organizations will need to capture lessons learned and promising practices to improve patient outcomes.

Research needs funding and support. Healthcare organizations cannot do this alone and need key stakeholders in policy, research, and clinical practice guidance to advocate for improvements.

POLICY

HOB is an ongoing U.S. public health priority and concern. In 2022, the U.S. Department of Health and Human Services' Office of Infectious Disease and HIV/AIDS Policy released an HAI National Action Plan, which is a national roadmap for HOB prevention.[119] Policy at the state level can also drive prevention. As part of the CDC's Epidemiology and Laboratory Capacity for Prevention and Control of Emerging Infectious Diseases cooperative agreement, all states have an HAI/antimicrobial resistance (AR) program that is tasked with developing state-level HAI/AR priorities and plans.[120] Through the HAI/AR program, the CDC provides recipient health departments with funding, expertise, and resources to support their HAI/AR prevention activities.[121] Allocating more funding and support toward these HAI/AR programs will expand HOB prevention efforts. Collaboration among local, state, and federal public health entities is also key to a more coordinated approach to HOB prevention. National- and state-level support for HOB prevention can contribute to more robust implementation and sustainability of HOB programs in acute care settings.

Moving Forward

HOB is a patient safety issue that has long existed and will continue to exist, and further research and quality improvement efforts are needed to significantly reduce HOB. The CDC's HOB measure builds upon decades of IPC knowledge and motivates organizations to assess patient safety and quality of care using a wider lens. However, HOB measure adoption is in its early stages, and acute care settings need more time, data, and experience to fine-tune their efforts in managing HOB. Therefore, the goal of early HOB efforts is progress rather than perfection. Acute care settings and other partners in this work can drive immediate improvements by reinforcing existing best practices, understanding that clinical care teams will refine efforts over time as they build confidence and familiarity with HOB.

This Playbook is the first step in creating a shared vision and preparing the field for HOB program management. As guidance evolves with new information from clinical care teams and researchers, key stakeholders should revisit best practice guidelines and consider innovative new approaches to HOB management. Although this Playbook focuses on acute care, it can also inform HOB prevention efforts and guidelines in other care settings and situations, because HOB is not limited to acute care settings. By implementing, establishing, and consistently managing HOB programs, the healthcare ecosystem has the valuable opportunity to improve the safety and quality of care for patients across the nation.

Appendices

APPENDIX A: KEY CONTRIBUTORS

The National Quality Forum (NQF) thanks and acknowledges the contributors who shared their time and expertise to develop this Playbook. The contributors served in various roles, including Virtual Forum expert panelists, key informants, and content reviewers. The conclusions, findings, and opinions expressed by individuals who contributed to this publication do not necessarily reflect the official position of any contributor's affiliated organization.

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APPENDIX B: URL LINKS TO RESOURCES

Phase 1: Create a Shared Vision

RESOURCE	ADDRESS
Executive Engagement – The Role of the Sponsor – Project Management Institute	https://www.pmi.org/-/media/pmi/documents/public/pdf/business-solutions/executive-engagement.pdf
Key Driver 2 - Implement a Data-driven Quality Improvement Process to Integrate Evidence into Practice Procedures – Agency for Healthcare Research and Quality (AHRQ)	https://www.ahrq.gov/evidencenow/tools/key-drivers/implement-qi.html
Effective Leadership for Quality Improvement in Health Care: A Practical Guide – United States Agency for International Development Project	https://www.urc-chs.com/wp-content/uploads/urc-assist-qi-leadership-guide.pdf
Toolkit for Reducing Catheter-Associated Urinary Tract Infections in Hospital Units: Implementation Guide - Appendix A. Checklist for Assessing Executive and Physician Champion Potential – AHRQ	https://www.ahrq.gov/hai/cauti-tools/impl-guide/implementation-guide-appendix-a.html
dQMs – Digital Quality Measures – eCQI Resource Center	https://ecqi.healthit.gov/dqm
Digital Quality Measurement Strategic Roadmap – CMS	https://ecqi.healthit.gov/sites/default/files/CMSdQMStrategicRoadmap_032822.pdf
eCQM Implementation Checklist – eCQI Resource Center	https://ecqi.healthit.gov/ecqm-implementation-checklist
Key Driver 3: Optimize Health Information Systems to Extract Data and Support Use of Evidence in Practice – AHRQ	https://www.ahrq.gov/evidencenow/tools/key-drivers/optimize-health-it.html
Leading a Culture of Safety: A Blueprint for Success – Institute for Healthcare Improvement (IHI)	https://www.ihi.org/sites/default/files/Leading_a_Culture_of_Safety_Blueprint.pdf
The 8 Steps for Leading Change – Kotter	https://www.kotterinc.com/methodology/8-steps/
Enduring Ideas: The 7-S Framework – McKinsey & Company	https://www.mckinsey.com/capabilities/strategy-and-corporate-finance/our-insights/enduring-ideas-the-7-s-framework

RESOURCE	ADDRESS
Prosci ADKAR Model – Prosci	https://www.prosci.com/methodology/adkar
High Reliability – AHRQ	https://psnet.ahrq.gov/primer/high-reliability
A Framework for Safe, Reliable, and Effective Care – IHI	https://www.ihi.org/resources/white-papers/framework-safe-reliable-and-effective-care
Improving the Accessibility of High Quality Online Health Information – NQF	https://www.qualityforum.org/highquality-healthinfo/
Core Comprehensive Unit-based Safety Program (CUSP) Toolkit – AHRQ	https://www.ahrq.gov/hai/cusp/modules/index.html
A Tool Kit for Improving Communication in Your Healthcare Organization – American College of Healthcare Executives	https://www.ache.org/-/media/ache/about-ache/covid/hap/atoolkitforimprovingcommunicationinyour2.pdf

Phase 2: Identify Priority Actions

RESOURCE	ADDRESS
Reducing Infections "Together": A Review of Socioadaptive Approaches – Sreeramoju	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6359910/
Examples of Technical and Adaptive Solutions for Change - Agency for Healthcare Research and Quality (AHRQ)	https://www.ahrq.gov/hai/quality/tools/cauti-ltc/modules/implementation/long-term-modules/module2/tools.html
Instruments for evaluating compliance with infection control practices and factors that affect it: an integrative review – Duarte Valim et al.	https://onlinelibrary.wiley.com/doi/10.1111/jocn.12316
Development of a Tool to Measure Compliance with Infection Prevention Activities Against Emerging Respiratory Infectious Diseases among Nurses Working in Acute Care and Geriatric Hospitals – Jeong et al.	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10073976/
Benchmarking for prevention: the Centers for Disease Control and Prevention's National Nosocomial Infections Surveillance (NNIS) system experience – Jarvis	https://pubmed.ncbi.nlm.nih.gov/15018472/
SSI Benchmark Report Graph for Example Hospitals – Duke Infection Control Outreach Network	https://dicon.medicine.duke.edu/member-services/benchmarks

RESOURCE	ADDRESS
National HAI Targets & Metrics – U.S. Department of Health and Human Services (HHS)	https://www.hhs.gov/oidp/topics/health-care-associated-infections/targets-metrics/index.html
HAIs: Reports and Data – CDC	https://www.cdc.gov/healthcare-associated-infections/php/data/index.html
Current HAI Progress Report – CDC	https://www.cdc.gov/healthcare-associated-infections/php/data/progress-report.html
Reference Antimicrobial Susceptibility Testing (AST) Data – CDC	https://www.cdc.gov/healthcare-associated-infections/php/lab-resources/reference-ast-data.html
Healthcare Associated Infections – National – CMS	https://data.cms.gov/provider-data/dataset/yd3s-jyhd
Healthcare Associated Infections – Hospitals – CMS	https://data.cms.gov/provider-data/dataset/77hc-ibv8
Healthcare Associated Infections – State – CMS	https://data.cms.gov/provider-data/dataset/k2ze-bqvw

Phase 3: Implement Change

RESOURCE	ADDRESS
Epidemiology and Prevention of Healthcare-Associated Infections in Geriatric Patients: A Narrative Review – Cristina et al.	https://www.mdpi.com/1660-4601/18/10/5333
A Review of Pediatric Central Line-Associated Bloodstream Infections Reported to the National Healthcare Safety Network: United States, 2016-2022. – Prestel et al.	https://academic.oup.com/jpids/article/12/9/519/7265390
A Guide to Using the Accountable Health Communities Health Related Social Needs Screening Tool: Promising Practices and Key Insights – CMS	https://www.cms.gov/priorities/innovation/media/document/ahcm-screeningtool-companion
Patient and Family-Centered I-PASS SCORE Program: Resident and Advanced Care Provider Training Materials – Lewis et al.	https://www.mededportal.org/doi/full/10.15766/mep_2374-8265.11267
Hospital Care Checklists – Care Partner Project	https://thecarepartnerproject.org/hospital-stay-checklists/

RESOURCE	ADDRESS
Diagnostic stewardship to improve patient outcomes and healthcare-associated infection (HAI) metrics – Singh et al.	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC11007360/
Prevention of Vascular Access Device-Associated Hospital Onset Bacteremia and Fungemia: A Review of Emerging Perspectives and Synthesis of Technical Aspects – Garcia et al.	https://academic.oup.com/cid/advance-article/doi/10.1093/cid/ciae245/7665472
Guidelines for the prevention of bloodstream infections and other infections associated with the use of intravascular catheters. Part I: peripheral catheters. – World Health Organization	https://iris.who.int/handle/10665/376722
Infusion Therapy Standards of Practice – Infusion Nurses Society	https://journals.lww.com/journalofinfusionnursing/citation/2024/01001/infusion_therapy_standards_of_practice,_9th.1.aspx
Compendium of Strategies to Prevent Healthcare-Associated Infections in Acute Care Hospitals – The Society for Healthcare Epidemiology of America (SHEA)	https://shea-online.org/compendium-of-strategies-to-prevent-healthcare-associated-infections-in-acute-care-hospitals/
Implementation of a vascular access team and an intravenous therapy programme: A first-year activity analysis – Rosich-Soteras et al.	https://journals.sagepub.com/doi/10.1177/11297298231220537
Diagnostic stewardship to improve patient outcomes and healthcare-associated infection (HAI) metrics – Singh et al.	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC11007360/
Preventing Adult Blood Culture Contamination: A Quality Tool for Clinical Laboratory Professionals – CDC	https://www.cdc.gov/labquality/blood-culture-contamination-prevention.html
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) – Miller et al.	https://academic.oup.com/cid/advance-article/doi/10.1093/cid/ciae104/7619499
IDSA 2024 Guidance on the Treatment of Antimicrobial Resistant Gram-Negative Infections – Tamma et al.	https://www.idsociety.org/practice-guideline/amr-guidance/
Core Elements of Antibiotic Stewardship – CDC	https://www.cdc.gov/antibiotic-use/hcp/core-elements/index.html
National Quality Partners Playbook: Antibiotic Stewardship in Acute Care – NQF	https://www.qualityforum.org/Publications/2016/05/Antibiotic_Stewardship_in_Acute_Care_Playbook.aspx
SHEA/IDSA Clinical Practice Guidelines for Implementing an Antibiotic Stewardship Program – Barlam et al.	https://www.idsociety.org/practice-guideline/implementing-an-ASP/

Phase 4: Continuous Improvement

RESOURCE	ADDRESS
Quality Measurement and Quality Improvement - CMS	https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/MMS/Quality-Measure-and-Quality-Improvement-
Sustainability - AHRQ	https://www.ahrq.gov/hai/quality/tools/cauti-ltc/modules/implementation/long-term-modules/module6/mod6-facguide.html
A Framework for Safe, Reliable, and Effective Care – Institute for Healthcare Improvement	https://www.ihi.org/resources/white-papers/framework-safe-reliable-and-effective-care
Key Driver 3: Optimize Health Information Systems to Extract Data and Support Use of Evidence in Practice – AHRQ	https://www.ahrq.gov/evidencenow/tools/key-drivers/optimize-health-it.html
Text of Infection Control and Epidemiology – Association for Professionals in Infection Control and Epidemiology (APIC)	https://text.apic.org/toc
Quality Improvement - Johns Hopkins Medicine	https://www.hopkinsmedicine.org/nursing/center-nursing-inquiry/nursing-inquiry/quality-improvement
How to Improve: Model for Improvement – Institute for Healthcare Improvement	https://www.ihi.org/resources/how-to-improve
A3 Report – Lean Enterprise Institute	https://www.lean.org/lexicon-terms/a3-report/
DMAIC: Approach to Continuous Improvement – Six Sigma	https://www.6sigma.us/dmaic-process/
Hospital-onset bacteremia and fungemia: examining healthcare-associated infections through a wider lens – Schrank, Snyder, and Leekha	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10654956/
Effective Leadership for Quality Improvement in Health Care: A Practical Guide – Boguslavsky, Gutierrez, and Holschneider	https://www.urc-chs.com/wp-content/uploads/urc-assist-qi-leadership-guide.pdf
A Tool Kit for Improving Communication in Your Healthcare Organization – American College of Healthcare Executives	https://www.ache.org/-/media/ache/about-ache/covid/hap/atoolkitforimprovingcommunicationinyour2.pdf
Key Driver 4: Create and Support High Functioning Care Teams to Deliver High-Quality Evidence-Based Care – AHRQ	https://www.ahrq.gov/evidencenow/tools/key-drivers/create-care-teams.html
Key Driver 6: Culture Leadership and Create a Culture of Continuous Learning and Evidence-Based Practice – AHRQ	https://www.ahrq.gov/evidencenow/tools/key-drivers/nuture-leadership.html

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APPENDIX D: NQF STAFF

Ayesha D'Avena
Chief Operating Officer

Chuck Amos
Managing Director

Kimberly Streett
Senior Director

Carolee Lantigua
Senior Manager

Amy Guo
Senior Manager

Erica Brown
Project Manager

Deidra Smith
Project Manager

Chanel Lee
Analyst

APPENDIX E: CHECKLIST OF GUIDING QUESTIONS FOR HOB PROGRAM PLANNING

PHASE 1: CREATE A SHARED VISION

Action Area 1: Develop Buy-In and Ownership

- ☐ Why is HOB a top priority for the organization?
- ☐ How can leaders make HOB a top priority for their organizations?
- ☐ What perspectives are needed on the HOB Team?
- ☐ What are the roles and responsibilities for HOB Team members?

Action Area 2: Review Data Infrastructure

- ☐ Is the organization's IT infrastructure ready?
- ☐ How will the organization manage HOB data?

Action Area 3: Assess Organizational Culture

- ☐ How can the organization prepare for change?

Action Area 4: Build Awareness

- ☐ How will the organization communicate this new initiative?
- ☐ How can organizations increase awareness about HOB?

PHASE 2: IDENTIFY PRIORITY ACTIONS

Action Area 5: Define the Current State

- ☐ What HOB-related data are currently available to the HOB Team?
- ☐ What trends exist in the data?
- ☐ What official HOB-related policies, protocols, and procedures exist in the organization?
- ☐ How do existing policies, protocols, and procedures compare to clinical practice?

Action Area 6: Identify Opportunities for Improvement

- ☐ Are organizational policies, protocols, and procedures aligned with best practice guidance?
- ☐ Does the organization have any barriers to implementation?

Action Area 7: Set Organizational Goals

- ☐ Does the organization have a clear end goal?

PHASE 3: IMPLEMENT CHANGE

Action Area 8: Engage Patients and Families in HOB Management

- ☐ How can acute care settings involve patients and families in HOB prevention?
- ☐ How can acute care settings involve patients and families in HOB identification?
- ☐ How can acute care settings involve patients and families in HOB treatment?

Action Area 9: Prevent HOB - Recognize and Mitigate Risk

Action Area 10: Identify HOB - Assess and Recognize Symptoms

Action Area 11: Treat HOB - Guide Timely and Accurate Care

- ☐ What basic and advanced strategies align with the organization's HOB program goals?

PHASE 4: CONTINUOUS IMPROVEMENT

Action Area 12: Monitor Progress

- ☐ What can help organizations choose supporting metrics?
- ☐ How can organizations optimize the data collection and analysis processes for selected metrics?
- ☐ Does the HOB Team have a reporting plan?
- ☐ What are the most effective methods for reporting?
- ☐ What tools can teams use to drive continuing improvement?

Action Area 13: Promote Sustainability

- ☐ What can an organization do to promote sustained quality improvements?
- ☐ What can organizational leadership do to help sustain quality improvements?

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