

Global Action in Healthcare Network— Healthcare-Associated Infections Module (GAIHN-HAI) Core Principles

This guidance is intended for global healthcare settings participating in GAIHN-HAI.



Version 1, 2024

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Acronyms

Acronym	Definition
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U.S. CDC:	U.S. Centers for Disease Control and Prevention
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GAIHN:	Global Action in Healthcare Network
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GAIHN-HAI:	Global Action in Healthcare Network–Healthcare-associated Infections Module
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HAI:	Healthcare-associated infection
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IPC:	Infection prevention and control
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PPS:	Point prevalence survey
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SSI:	Surgical site infection
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WHO:	World Health Organization
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Foreword

Recent public health emergencies such as monkeypox, Zika virus, H1N1 Influenza (2010), and COVID-19 have underscored the global imperative for core competencies in surveillance and infection prevention and control (IPC) at all levels of healthcare systems. These crises serve as reminders of the interconnectedness of global health and the critical importance of proactive measures ensuring the detection and mitigation of the spread of novel infectious diseases globally.

The Global Action in Healthcare Network (GAIHN) was established to address emerging infectious disease threats through rapid detection and response in healthcare settings. The GAIHN–Healthcare-associated Infections Module (GAIHN-HAI) is a critical and dynamic component of GAIHN, composed of countries, institutions, and partners globally working to build fundamental capacity for enhanced surveillance to support IPC improvement and health system situational awareness.

GAIHN-HAI offers a platform for building competencies in surveillance and IPC while directly and feasibly addressing healthcare-associated infections (HAIs) within existing facilities and systems. Network partners gain the experience, skills, and expertise needed to identify gaps in IPC and to implement evidence-based interventions effectively. Ultimately, GAIHN-HAI participation will help foster a culture of continuous learning and innovation, empowering healthcare workers and public health leaders to drive sustainable improvement in patient care and outcomes. GAIHN-HAI strategies and methods hinge upon the development and promotion of feasible and practical methods tailored to the unique needs and resources of individual healthcare facilities, helping ensure interventions can be effectively integrated into existing workflows, better prioritizing limited resources and facilitating buy-in and engagement of frontline healthcare workers in the development and implementation process.

IPC efforts in hospitals serve as a cornerstone for safeguarding patient safety and bolstering broader public health preparedness and response efforts. Supporting the implementation of feasible and sustainable methods tailored to the unique needs of lower-resource non-US settings to effectively mitigate HAIs while simultaneously fortifying the global resilience of healthcare systems and the ability to prepare and respond to emerging infectious threats. The lessons learned from GAIHN-HAI participation, including the importance of rigorous surveillance, evidence-based interventions, and staff engagement, provide insights that directly translate to enhancing pandemic preparedness strategies. By prioritizing IPC within the network, we protect vulnerable patients within healthcare settings and contribute to our healthcare systems' resilience and readiness to confront future pandemics with agility and effectiveness.

Surveillance is a cornerstone of infection prevention and a World Health Organization (WHO) core component of IPC programs. Evidence shows that efforts are particularly needed to improve HAI surveillance in low-resource settings. GAIHN-HAI can fill critical gaps in standardized methodologies and provide tools designed to implement pragmatic and sustainable HAI surveillance for a broad range of facility capacities.

1. GAIHN-HAI Mission

The Global Action in Healthcare Network—Healthcare-associated Infections Module (GAIHN-HAI) is a global collaborative of healthcare facility networks with the mission to support infection prevention and control (IPC) for the protection of patients and healthcare workers through the development and implementation of validated approaches for the systematic collection, analysis, interpretation, and use of health-related data that are feasible across a broad range of healthcare facility capacities.

2. Background

Healthcare-associated infections (HAIs) are infections people get while receiving health care for another condition. Impacts of HAIs include prolonged hospital stay, long-term disability, increased resistance of microorganisms to antimicrobial medication, financial burden for healthcare systems, high costs for patients and their families, and excess deaths. Most HAIs are preventable. As providers of services that improve and sustain health, healthcare facilities should understand the burden of preventable conditions that can adversely impact the health of their patients and staff and conduct activities that help prevent these conditions. Although global HAI surveillance and burden estimates are limited, the World Health Organization (WHO) cites clear evidence that hundreds of millions of patients develop an infection while receiving care every year worldwide, with the burden of disease much higher in low- and middle-income countries where reliable surveillance is most often lacking.¹ There is an urgent need to develop feasible, pragmatic, reliable, and generalizable methods for HAI surveillance in resource-limited settings, facilitate the direct translation of surveillance findings to implementation of IPC measures, and build critical skillsets that can be used to support public health emergency preparedness and response.

3. GAIHN-HAI Goals

- **Develop**, validate, and ensure equitable access to HAI surveillance methods and tools that are feasible in resource-limited settings and applicable to different patient populations.
- **Build** sustainable frameworks for detecting and characterizing emerging pathogens and infections among inpatient and healthcare worker populations.
- **Inform** implementation of targeted evidence-based HAI prevention strategies.
- **Enhance** capacity for collecting and using actionable HAI surveillance data in healthcare facilities globally.
- **Reduce** prevalence and incidence of HAIs in participating healthcare facilities.

4. Core Principles

The purpose of this document is to present the mission and goals of GAIHN-HAI, describe the structure of the network, and provide the framework for HAI surveillance activities to inform HAI response and prevention. A central principle of the network is the enhancement of healthcare-based surveillance and HAI response and prevention, which are critical components of effective pandemic preparedness strategies. The target audiences of this document are hospital IPC teams, including IPC focal points/leads, hospital directors, and public health officials with the mandate of or interest in strengthening IPC capacity and HAI prevention at the national, sub-national, and acute care hospital levels.

4.1 Foundational steps for HAI surveillance

GAIHN-HAI recognizes **six foundational steps for HAI Surveillance** (adapted from Noah [2006])² and is designed to provide resources and support at each of these steps: planning, data collection, data management, data analysis, interpretation/visualization, and action/response.

STEP 1

Planning: Planning an effective surveillance system requires careful consideration of objectives, resources, methods, necessary approvals, and stakeholder engagement. To support surveillance system planning, GAIHN-HAI provides guidance on prioritization, roadmaps for implementation and validation, evidence-based factors associated with successful and sustainable implementation, and standardized training materials.

STEP 2

Data Collection: Surveillance data collection must be feasible, systematic, of high quality, and based on clear guidelines and standardized case definitions. To support effective data collection, GAIHN-HAI provides participants with validated and field-tested protocols, data collection forms linked to digital resources and experience-based considerations for success. For example, GAIHN-HAI developed and made available an electronic data collection software to facilitate HAI point prevalence survey (PPS) implementation.³

STEP 3

Data Management: Surveillance data management links data collection to data storage and processing to ensure data accuracy, security, privacy, and accessibility. GAIHN-HAI provides guidance and considerations for good data management supported, when possible, by secure digital tools and resources.

STEP 4

Data Analysis: Data analysis is the process of examining collected data to identify patterns, trends, relationships, and insights to inform action. Standardized collection methods and data structures allow enhanced support utilizing task- and context-specific digital tools, analysis code, and support.

STEP 5

Interpretation/Visualization: Closely linked to analysis, data interpretation involves communicating significant patterns, trends, and conclusions to facilitate prioritization and assessment of public health actions. GAIHN-HAI analytic tools strive to support interpretation through automated standardized data visualization and report generation.

STEP 6

Action/Response: All effective HAI surveillance systems culminate in response actions as measures to mitigate the spread of infectious disease threats within healthcare facilities to protect patients, healthcare workers, and ultimately the public/communities surrounding and served by the facility. Participating in GAIHN-HAI helps increase likelihood of well-planned and effectively implemented HAI surveillance systems, helping boost the impact of results by ensuring valid data are available and presented in a relatable comparative context essential to healthcare facilities and ministries of health for comprehensive understanding and effective communication.

4.2 Benefits to network facilities

Network facilities can leverage GAIHN-HAI developed frameworks for implementation of surveillance activities and network relationships to:

■ **Improve acceptability of HAI surveillance**

- Standardized case definitions, methods, and data collection tools have been tested in and validated for resource-limited healthcare settings.
- Data analysis, interpretation, and visualization tools and templates are adaptable to the needs and contexts of network facilities.
- Inter-network collaborations promote a community for shared experiences, addressing challenges, and decision-making support. GAIHN-HAI participants serve as de facto “communities of practice” comprised of public health and clinical professionals experienced at translating GAIHN-HAI surveillance data into actionable insights and supported by network-wide forums, meetings, and collaborative opportunities.

■ **Respond to HAI surveillance findings**

- The GAIHN-HAI framework emphasizes rapid HAI detection, analysis, and output for timely implementation of response activities.
- Cross-network data analyses can provide benchmarks and thresholds that can be used as triggers for HAI response.

■ **Build skillsets for surveillance data use**

- GAIHN-HAI promotes key principles of surveillance data use, which align with WHO guidance.⁴ Participating network facilities have opportunities to gain experience in quality data collection, assessment, validation, analysis, and communication with support from the U.S. CDC and other network participants.
- Inter-network collaborations provide mentorship opportunities.

■ **Engage with the broader scientific community**

- The network promotes and supports collaborations between network facilities, ministries of health, professional societies, and national and international public health organizations.
- Standardized network methods and multi-partner collaboration support opportunities to author manuscripts, multi-site data analyses, and presentation of findings at national and international conferences.
- The network encourages feedback from facilities to iterate upon and expand existing protocols and systems.

4.3 Network structure

GAIHN-HAI is envisioned as a global collaborative framework of healthcare-focused organizations across multiple countries working towards the common goal of detecting and preventing HAIs using tools that are relevant and feasible for low-resource settings. Network facilities are the focal points around which the network is organized and the primary implementors of network activities. In some situations, U.S. CDC teams work with implementing partners to provide direct support to network facilities for activity implementation. In others, U.S. CDC may work through public health authorities. In all situations, information sharing between U.S. CDC and network facilities is an essential component of network participation. This information sharing may occur directly between U.S. CDC and network facilities or through intermediaries such as implementing partners or ministries of health.

4.3.1 Network facility definitions

GAIHN-HAI facilities are defined as healthcare facilities that utilize GAIHN-HAI tools and materials for the purpose of enhancing HAI surveillance and IPC capacity and engage in multidirectional information sharing with other GAIHN-HAI participating organizations and U.S. CDC. Network facilities will differ in baseline capacity for conducting HAI surveillance, response, and prevention activities and the degree to which they collaborate with U.S. CDC and U.S. CDC implementing partners. Facility designations, differing in the degree of direct support received and the nature of data sharing, are described below.

GAIHN-HAI partners: Receive direct support either through U.S. CDC-funded implementing partners or existing ministry of health collaborations with U.S. CDC. Formal agreements are in place for data sharing as appropriate and feedback to improve GAIHN-HAI tools.

GAIHN-HAI collaborators: Receive U.S. CDC technical support for implementation of network activities through a non-formalized relationship with U.S. CDC or U.S. CDC-funded implementing partners. There is an expectation for data sharing and feedback on tools and experiences.

Although the degree of data sharing as determined in formal agreements may differ between GAIHN-HAI partners and collaborators, all network facilities, regardless of designation, are required to provide information on network activities sufficient to inform a standardized annual network facility report.

4.3.2 Use of GAIHN-HAI materials outside of the network

GAIHN-HAI materials, such as protocols and software, may be available for use by facilities outside of the network without direct U.S. CDC support. Healthcare facilities that utilize GAIHN-HAI materials would be expected to adhere to ethical use of these tools without significant modification. Bidirectional information sharing and/or feedback on tools would be encouraged but not expected.

4.4 Minimum requirements

GAIHN-HAI is intended to include healthcare facilities with a diversity of capacities for HAI surveillance, prevention, and response. However, network facilities must meet defined minimum requirements to engage in network activities or have plans to satisfy minimum requirements prior to implementing GAIHN-HAI activities and tools. The following describes minimum requirements for general network participation ([Table 1](#)). Additional minimum requirements for implementation of specific network activities are described in their respective sections.

Table 1: Minimum requirements for GAIHN-HAI facilities

The Requirement	GAIHN Partners	GAIHN Collaborators
Have staff and/or are willing to hire additional staff to support network HAI surveillance activities	Required	Required
Have established IPC program with dedicated IPC staff or other dedicated staff with the ability and authority to implement IPC interventions based on surveillance findings	Required	Required
Adhere to ethical use of tools	Required	Required
Attribute use of tools and protocols to GAIHN-HAI	Required	Required
Be willing to collaborate with external partners and/or U.S. CDC to share experiences and provide feedback on tools	Required	Required
Be willing to collaborate with U.S. CDC-funded partners and/or U.S. CDC in the sharing of HAI surveillance data	Required	Required
Have formal agreements in place with U.S. CDC-affiliated external partners and/or U.S. CDC for data sharing	Required	Not Required

4.5 Network surveillance activities

GAIHN-HAI activities are designed as pilot initiatives addressing identified healthcare facility-based public health priorities. Implementation of activities within GAIHN provides the opportunity for field testing and iterative improvement of network protocols, tools, training materials, and other resources.

GAIHN-HAI aims to initially address three surveillance priorities:

1. Establishing pragmatic, acceptable, and valid point estimates of HAI burden in low-resource settings, considering a variety of existing capacities for systematic data collection and diagnostics.
2. Establishing feasible and pragmatic longitudinal HAI surveillance systems that are relevant to lower resource settings.
3. Establishing surveillance tools that increase capacity for healthcare facility IPC targeted prevention activities and response.

Examples of three activities that address each of these three priorities are further described in Appendices [A.1](#), [A.2](#), and [A.3](#). Additionally, new priorities and associated activities may be identified as the network matures. This approach ensures that as the network expands, new facilities will benefit from a body of established materials addressing common priorities, ready for implementation along with the opportunities to engage with new network activities.

Additionally, established protocols will benefit from each implementation in new facilities and contexts. This iterative process allows the network to gradually learn, gain experience, and improve over time to meet the diverse needs and capacities of facilities across the network while fostering the development of skillsets for surveillance data collection, analysis, interpretation, and use.

4.5.1 Data ownership and ethical considerations

All data collected as part of GAIHN-HAI activities are the property of the respective facility or responsible public health authority where applicable and as determined by local laws. Data access will be aligned with local laws and standards.

Although GAIHN-HAI activities are designed to be defined as a public health practice, network facilities should follow local laws and regulations for the submission of network protocols to local ethical committees.

4.6 Data for action: Prevention and response

Data are essential for improving health systems. Even though some low- and middle-income countries have introduced electronic health data systems to improve data quality and availability while reducing costs, many low- and middle-income countries still struggle with inefficient data collection and management systems.⁵ Beyond collecting and managing data, HAI surveillance must also ensure that information is useful, usable, and accessible to people who need it.

The planning and implementation of response activities that translate surveillance information to actions and IPC improvement are the purview of the health facilities and public health authorities that make up the network. To support facility translation of network-supported data and information, GAIHN-HAI methods and tools are developed to reference and directly support select evidence-based strategies and recommendations from recognized regional and international public health authorities such as, but not limited to, WHO and regional and national centers for disease control and prevention.

Through general strengthening of the foundational steps of HAI surveillance and by referencing evidence-based and well-established WHO guidelines for the core components of IPC programs,⁶ GAIHN-HAI participants and partners are better able to identify targets for HAI prevention with the implementation of IPC evidence-based strategies directed to each healthcare facility's main HAI problems. HAI surveillance data also allow IPC teams to monitor the effectiveness of IPC interventions over time and to identify tailored interventions to address gaps informed by surveillance data.

4.6.1 Translating surveillance data for IPC improvement

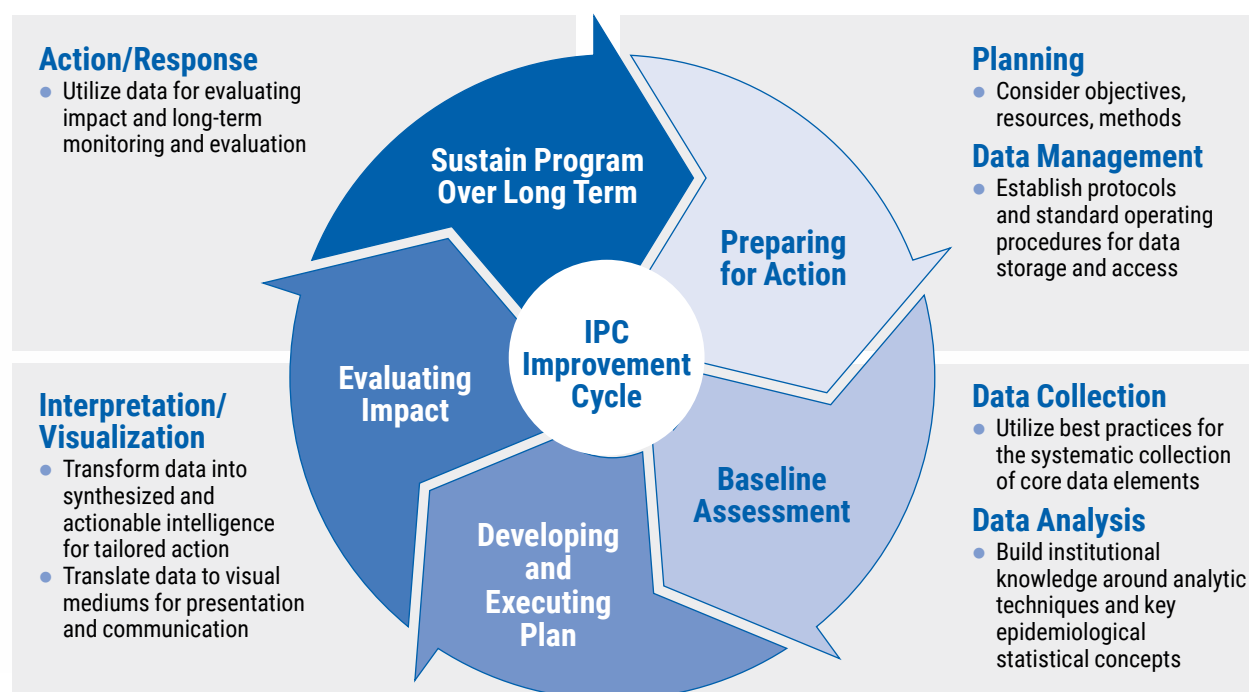
WHO recommends utilizing a five-step cycle to support any IPC program improvement or intervention:⁷

1. Preparing for action
2. Baseline assessment
3. Developing and executing the plan
4. Evaluating impact
5. Sustaining the program over the long term

These five steps provide a framework for implementation that acknowledges the importance of using standardized tools to identify gaps and iterating upon findings of those assessments in a facility-specific and iterative manner. GAIHN-HAI activities and tools aligned with the foundational steps of HAI surveillance ([Section 4.1](#)) provide a framework by which data can be used to help support the WHO IPC quality improvement cycle ([Figure 1](#)).

Figure 1: WHO five step cycle for IPC improvement supported by HAI surveillance foundational steps.

For accessible explanation go to [Appendix B](#).

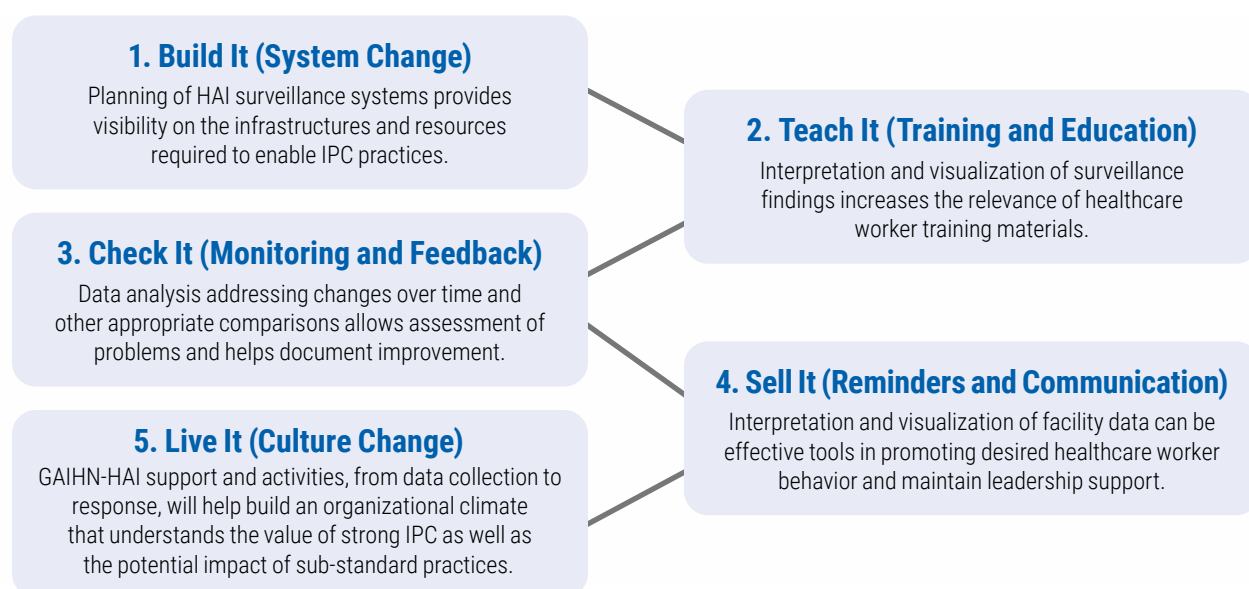


4.6.2 Translating surveillance data for multimodal IPC implementation

Implementation of multimodal strategies is a core component of effective IPC programs according to the WHO Guidelines on Core Components of IPC programs.^{8,9} The guideline recommends five elements to focus on while implementing IPC improvement: system change, training and education, monitoring and feedback, reminders and communications, and culture change. GAIHN-HAI activities and tools help fulfill the information requirements associated with each of these elements in alignment with the foundational principles of surveillance (Figure 2).

Figure 2: WHO multimodal improvement strategy elements supported by foundational HAI surveillance steps. Adapted from WHO multimodal improvement strategy elements

For accessible explanation go to [Appendix B](#).



Appendix A. Surveillance Activities

A.1 HAI surveillance using point prevalence surveys

Background

The GAIHN-HAI Point Prevalence Survey (PPS) provides an estimate of HAI burden at a distinct, pre-determined point in time in a standardized, feasible, and pragmatic fashion. To the extent possible, survey methods rely on objective criteria available in medical records for case determination and are less dependent on clinical diagnosis of infection, therefore allowing for better comparability.

The algorithm behind GAIHN-HAI PPS methodology is embodied into the GAIHN-HAI PPS electronic data collection software¹⁰ which enables limiting data collection to the minimum data elements needed to make an HAI determination and minimizes difficult and time-consuming medical record review. The GAIHN-HAI approach to HAI PPS is designed to meet a broader range of facility capacities than currently available HAI PPS methodologies.

Objectives

1. Estimate the burden (prevalence) of HAIs in selected units/wards of network facilities.
2. Describe the prevalence of survey patients on antimicrobials, classes of antimicrobials used, the prevalence of invasive devices, and the microbiology of infections for eligible patients in targeted populations.
3. Describe key structures and processes for the prevention of HAIs at the health facility and ward levels.
4. Strengthen network facility capacity for the systematic collection, analysis, interpretation, and use of actionable HAI surveillance data.

Minimum Requirements

The following indicates what should be considered minimum requirements for conducting the GAIHN-HAI PPS. These requirements are in addition to general requirements described in [Section 4.4](#) (Table A.1.1).

Table A.1.1: Minimum requirements for GAIHN-HAI facilities implementing HAI PPS activity

The Requirement	GAIHN Partners	GAIHN Collaborators
Have existing infrastructure that can be utilized for HAI surveillance including: <ul style="list-style-type: none">■ A microbiology laboratory with capacity for species level identification of blood, urine, and respiratory culture results■ A paper or electronic medical record system by which patient records are maintained and which can be accessed for prospective chart review■ Ability to access GAIHN-HAI PPS materials with an internet connection	Required	Required
Have established evidence-based processes for utilization of diagnostic testing for infections and antimicrobial prescription	Required	Required

Design/Methods

The GAIHN-HAI PPS protocol is designed for use in one or multiple wards within healthcare facilities and currently only includes adult patients (age ≥ 18 years), although there are plans to expand to pediatric/neonatal populations in the future.

The HAI-PPS studies the prevalence of HAIs in selected units/wards of GAIHN-HAI facilities. HAIs of interest include 3 commonly reported HAIs in hospital acute care areas:

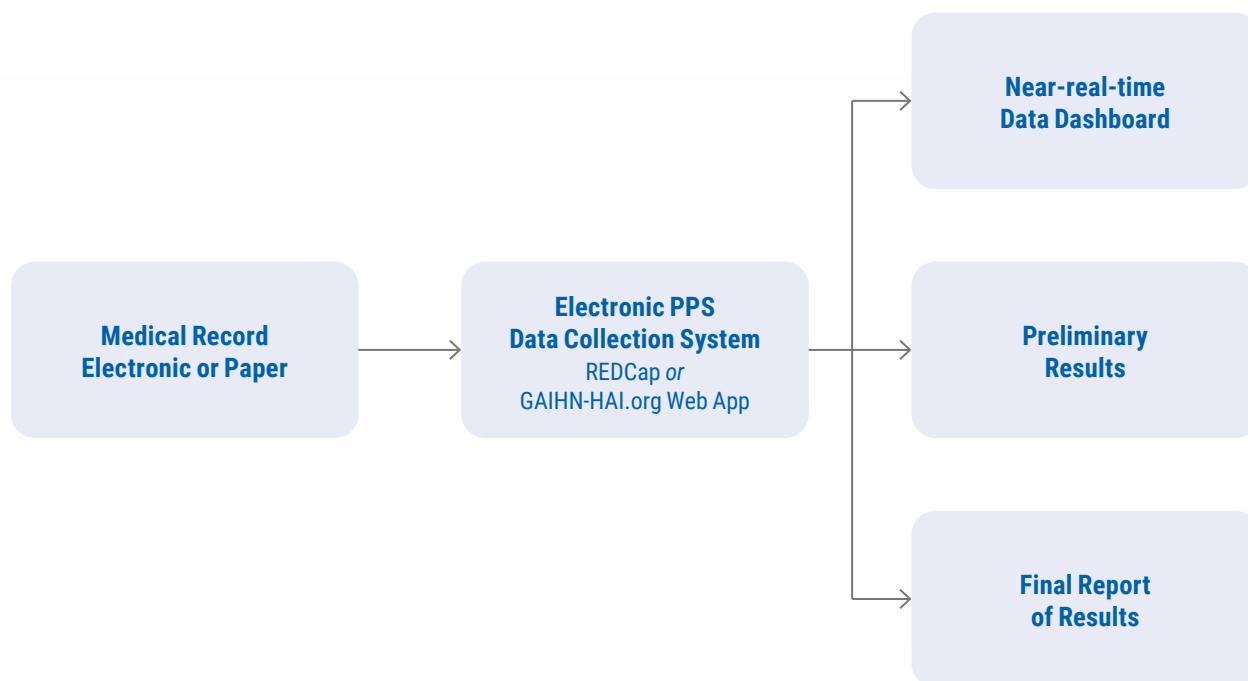
- Urinary tract infection
- Pneumonia
- Bloodstream infection

The PPS is designed to survey a **single day** in the surveyed ward or facility. Each facility and/or ward will choose its own survey date within a pre-defined timeframe. Data will be collected from information present on the survey date, including diagnostic testing (chest imaging, microbiology, etc.) available on that date or within 14 days prior to the survey date (also called the data review period).

The HAI-PPS relies only on existing data sources (e.g., medical records, nursing records, and laboratory reports) and uses triggers and algorithmic methodology to limit data collection to only clinical data that is needed for case determination. There is no direct interaction with patients. A schematic of the data collection and output process is shown below (Figure A.1.1).

Figure A.1.1: Schematic of GAIHN-HAI PPS data collection and output process. (GAIHN-HAI, 2024)

For accessible explanation go to [Appendix B](#).



Data collection tools

Data collected for the PPS include patients' signs and symptoms, antimicrobial use, invasive devices, radiology exams and results, and laboratory tests and results. Collected data will be entered into either a REDCap tool (Research Electronic Data Capture, Vanderbilt University, Nashville, TN) hosted on a secure server at the Vanderbilt University Medical Center Data Coordinating Center or into the GAIHN-HAI web application. Access to the GAIHN-HAI web application, PPS training materials, and FAQs are available at <https://gaihn-hai.org>.

Data privacy, storage, and ownership

Patient records are completely anonymized in the GAIHN-HAI PPS electronic data collection system. Each record is associated with only one patient using a unique identifier known only to the network facility conducting the PPS.

Outcomes

1. Estimation of HAI prevalence rate during the surveillance period
2. Visualization of the prevalence of HAIs and care delivery metrics such as antimicrobial use, invasive devices, and microbiology results for detected HAIs in selected units/wards of each surveyed facility
3. Strengthened communication and coordination between persons in charge of surveillance and IPC at network facilities
4. Strengthened network facility capacity for the systematic collection, analysis, interpretation, and use of actionable HAI surveillance data

A.2 SSI surveillance

Background

The purpose of the surgical site infection (SSI) surveillance protocol is to propose standardized approaches to SSI surveillance with the goal of providing actionable information for SSI prevention at the lowest cost in resources and staff effort by:

- Targeting surveillance efforts.
- Using revised and simplified SSI surveillance definitions.
- More directly connecting SSI surveillance to SSI prevention activities.

Quality SSI surveillance has been shown to be an effective intervention for reducing the risk of SSI and establishing safer surgical practice.¹¹ While building and maintaining any surveillance system is not easy, with targeted system goals/objectives and an honest appreciation of available resources, quality SSI surveillance can be realized.

U.S. CDC has developed tools for SSI surveillance which include an implementation protocol and a structured assessment of SSI surveillance capacity: the Structural Surgical Surveillance Assessment is a U.S. CDC-developed tool that can act as an initial step in establishing the data collection and surveillance methods forming the foundation of a successful SSI surveillance program. In facilities with limited experience in surveillance of HAIs, the activities described in the assessment will guide early surveillance planning, assessment of data availability, and implementation of methods needed to define and capture the base population (denominator) required for surgical surveillance.

Objectives

The objectives of the SSI surveillance protocol are to:

- Provide a cost-saving methodology for the systematic collection, analysis, and presentation of actionable information on the occurrence of SSI.
- Guide targeted IPC activities and monitor/measure the results of SSI prevention efforts.
- Protect patients from acquiring an SSI by informing prevention actions.

Minimum Requirements

The following indicates what should be considered minimum requirements for using the SSI surveillance protocol. These requirements are in addition to general requirements described in [Section 4.4](#) (Table A.2.1).

Table A.2.1: Minimum requirements for GAIHN-HAI facilities implementing surgical site infection (SSI) surveillance activity

The Requirement	GAIHN Partners	GAIHN Collaborators
Assessment of the resources required for the proposed SSI surveillance activities with ensured availability of estimated requirements for at least 1-year (See: Structural Surgical Surveillance Assessment)	Required	Required
Review of current surgical practices to ensure that relevant strongly recommended practices for SSI prevention with an evidence grade score of moderate – high are being followed. If not, priority should be given to correcting deficient practices before the utilization of resources for surveillance ¹²	Required	Required

Design/Methods

Starting surveillance in a carefully chosen surgical procedure and patient population can greatly reduce resource requirements and help set up a surveillance program for success by controlling both patient-level and procedure-related infection risk. To maximize any observable change following IPC improvement, an ideal surgical population for surveillance will have a low baseline risk of infection. Surgeries in which patient-level risk is independent of the need for the procedure and wound classification is typically clean are most likely to be low-risk and should be prioritized. Post-cesarean sections (C-section) are one of the most common surgical procedures performed in many resource-limited settings.¹³ Starting SSI surveillance in women undergoing C-section presents multiple benefits:

- Increased comparability: Patients have similar risk of infection.
- Improved targeting of recommendations: If problems are found, finding solutions is easier.
- Decreased system complexity: Surveillance is easier in smaller groups of patients and staff.

Because most SSI will occur after discharge, **post-discharge case finding is essential to measure SSI rates in a meaningful way**.¹⁴ Post-discharge case finding involves staff contacting patients at specified time points after their procedure to ask about wound healing. Procedures for post-discharge follow-up and case finding include deciding when patients will be contacted. For surveillance, a single contact at the end of the follow-up period (approximately 14 or 30 days after procedure) may be sufficient and can help reduce the reporting of minor symptoms consistent with normal healing common earlier. For certain procedures (such as those involving the placement of an implant), a longer follow-up period may be needed.

The **total number of target procedures** performed is the denominator used to determine the SSI incidence.

Data collection

Data to be collected relate to the type of surgical procedure, patient signs and symptoms, patient treatment with antimicrobials and/or interventions, and the total number of procedures of interest performed during the surveillance period.

Outcomes

Expected outcomes from the SSI surveillance activity include:

1. Estimation of SSI incidence for the surgery(ies) of interest during the surveillance period.
2. Strengthened network facility capacity for the systematic collection, analysis, interpretation, and use of actionable SSI surveillance data.

A.3 Viral genomic surveillance in healthcare populations

Background

The COVID-19 pandemic has demonstrated that genomic data for viral pathogens (including SARS-CoV-2) with pandemic and epidemic potential are acceptable and valuable for informing facility-level and national-level policy and development of vaccines, therapeutics, and diagnostic testing.^{15,16} Specifically, genomic sequencing can be used at the healthcare facility level for:

- Identifying reservoir/transmission pathways.
- Confirming common source/transmission events.
- Disproving that transmission occurred, sparing unnecessary investigation.
- Guiding the implementation of facility-level response measures.

The SARS-CoV-2 genomic surveillance protocol under GAIHN-HAI defines a process for the collection of viral genomic sequencing samples and epidemiologic data associated with healthcare workers and hospitalized patients. Although the protocol utilizes SARS-CoV-2 as an example pathogen for surveillance, the protocol can be adapted for other viral pathogens, including those with epidemic and pandemic potential.

Objectives

- Facilitate and encourage SARS-CoV-2 and other viral respiratory disease case identification, epidemiologic data collection, and specimen testing for variant characterization.
- Describe SARS-CoV-2 variant distribution over time and by sub-populations of interest (e.g., vaccinated vs. not vaccinated healthcare workers).
- Identify lineages and/or mutations that require further monitoring and/or additional laboratory or epidemiologic investigation.

Minimum Requirements

The following indicates what should be considered minimum requirements for conducting the GAIHN-HAI viral genomic surveillance activity. These requirements are in addition to general requirements described in [Section 4.4](#) (Table A.3.1).

Table A.3.1: Minimum requirements for GAIHN-HAI facilities implementing viral genomic surveillance activity

The Requirement	GAIHN Partners	GAIHN Collaborators
Have access to populations of healthcare workers and/or patients who routinely undergo diagnostic workups that include testing for SARS-CoV-2 viral RNA	Required	Required
Have existing infrastructure that can be utilized for long or short-read SARS-CoV-2 whole genome sequencing activities, including: <ul style="list-style-type: none">■ A laboratory with capacity for validated long or short-read SARS-CoV-2 whole genome sequencing■ Ability to assign lineages and identify mutations using a bioinformatics pipeline with documented validation	Required	Required
Have existing infrastructure that can be utilized for collection of metadata: <ul style="list-style-type: none">■ A paper or electronic medical record system by which patient records are maintained and which can be accessed for prospective chart review	Required	Required
Be willing to share anonymized sequencing results via public-facing whole genome sequencing databases such as GISAID ¹⁷ or NCBI GenBank ¹⁸	Required	Required

Design/Methods

This project will include four essential surveillance activities:

- Case Finding
- Metadata* Collection
- Specimen Sequencing and Analysis
- Assessment, Reporting, and Response

* Anonymized epidemiological and clinical data linked to submitted sequences

Case Finding

SARS-CoV-2 case finding involves the identification of individuals with laboratory-confirmed SARS-CoV-2 infection within the project surveillance population:

Healthcare Workers

Healthcare workers are critical for a resilient health system and are considered a high-priority population for COVID-19 surveillance due to their potential occupational exposures and COVID-19 vaccine prioritization. Additionally, because of their medical training, healthcare workers may have improved recognition and reporting of symptoms with better access to testing results. Because disease severity and vaccine escape (infections in those fully vaccinated) are important epidemiologic characteristics to target for variant characterization, healthcare workers are the recommended initial surveillance population to target.

Hospitalized Patients

Expected to predominantly represent unvaccinated case patients, the inclusion of hospitalized patients will increase the number of samples available for sequencing. If resources and/or laboratory capacity are limited, healthcare workers should be considered the initial surveillance population of interest.

Metadata collection

To meet project objectives, a limited set of specimen-linked information (**metadata**) based on [WHO's Genomic sequencing of SARS-CoV-2: a guide to implementation for maximum impact on public health](#)¹⁹ will be collected. The amount and specific metadata elements collected will be based on availability of data, resources, and relevant approvals.

Analysis and Genetic Characterizations of SARS-CoV-2 Specimens

Viral RNA from specimens found SARS-CoV-2 positive by PCR testing will be isolated using column-based commercially available kits according to current laboratory practice. Variant/genetic characterization will utilize a combination of RT-PCR and whole genome sequencing methods. Validation of laboratory methods must be documented in accordance with local regulations and guidance.

Data collection tools

Collected data (including metadata and lineage classification) will be entered into either a REDCap tool (Research Electronic Data Capture, Vanderbilt University, Nashville, TN) hosted on a secure server at the Vanderbilt University Medical Center Data Coordinating Center or into an alternative facility-maintained secured database. Facilities should ensure data sharing meets all local regulations and guidance.

Outcomes

Expected outcomes from the viral genomic surveillance activity include:

1. Understanding the epidemiology of COVID-19 or other viral respiratory diseases among unique healthcare facility populations and analyses of association between epidemiologic characteristics.
2. Assessment of changes in lineage prevalence over time.
3. Visualization of maximum-likelihood phylogenetic trees.
4. Strengthened network facility capacity for the genomic characterization of COVID-19 or other viral respiratory disease clusters.
5. Strengthened network facility capacity for the systematic collection, analysis, interpretation, and use of actionable healthcare facility-level surveillance data.

Appendix B: Descriptions of figures for accessibility

Figure 1: IPC WHO five step cycle for IPC improvement supported by HAI surveillance foundational steps

A graphic showing WHO five step cycle for IPC improvement supported by HAI surveillance foundational steps. The text shown is described below:

1. Preparing for action
 - Planning
 - Consider objectives, resources, methods
 - Data management
 - Establish protocols and standard operating procedures for data storage and access
2. Baseline assessment
3. Developing and executing the plan
 - Data collection
 - Utilize best practices for the systematic collection of core data elements
 - Data analysis
 - Build institutional knowledge around analytic techniques and key epidemiological statistical concepts
4. Evaluating impact
 - Interpretation/visualization
 - Transform data into synthesized and actionable intelligence for tailored action
 - Translate data to visual mediums for presentation and communication
5. Sustaining the program over the long term
 - Action/response
 - Utilize data for evaluating impact and long-term monitoring and evaluation

Return to [Figure 1](#).

Figure 2: WHO five elements of multi-modal improvement supported by HAI surveillance foundational steps

A graphic showing WHO five elements of multi-modal improvement supported by HAI surveillance foundational steps. The text shown is described below:

1. Build it (System Change)
 - Planning of HAI surveillance systems provides visibility on the infrastructures and resources required to enable IPC practices.
2. Teach it (Training & Education)
 - Interpretation and visualization of surveillance findings increases the relevance of healthcare worker training materials.
3. Check it (Monitoring & Feedback)
 - Data analysis addressing changes over time and other appropriate comparisons allows assessment of problems and helps document improvement.
4. Sell it (reminders and communication)
 - Interpretation and visualization of facility data can be effective tools in promoting desired healthcare worker behavior and maintain leadership support.

5. Live it (Culture change)

- GAIHN-HAI support and activities, from data collection to response, will help build an organizational climate that understands the value of strong IPC as well as the potential impact of sub-standard practices.

Return to [Figure 2](#).

Figure A.1.1: Schematic of GAIHN-HAI PPS data collection and output process.
(GAIHN-HAI, 2024)

A chart shows the flow of data through the PPS data collection system.

Data is collected from the medical record, entered into the electronic PPS data collection system, and then flows into outputs, which include a near-real-time dashboard, preliminary results, and final report of results.

Return to [Figure A.1.1](#).

Endnotes

- 1 *Report on the Burden of Endemic Health Care-Associated Infection Worldwide*. World Health Organization; 2011.
- 2 Noah N. *Controlling Communicable Disease (Understanding Public Health)*. First Edition. Open University Press, 2006.
- 3 HAI PPS materials including electronic data collection software are available at GAIHN-HAI.org.
- 4 *Minimum requirements for infection prevention and control*. Geneva: World Health Organization; 2019. License: CC BY-NC-SA 3.0 IGO.
- 5 O'Neil S, Taylor S, Sivasankaran A. Data equity to advance health and health equity in low- and middle-income countries: a scoping review. *Digit Health* 2021;7. <https://doi.org/10.1177/20552076211061922>
- 6 *Guidelines on core components of infection prevention and control programmes at the national and acute health care facility level*. Geneva: World Health Organization; 2016. License: CC BY-NC-SA 3.0 IGO. *Minimum requirements for infection prevention and control*. Geneva: World Health Organization; 2019. Licence: CC BY-NC-SA 3.0 IGO.
- 7 *Minimum requirements for infection prevention and control*. Geneva: World Health Organization; 2019. Licence: CC BY-NC-SA 3.0 IGO.
- 8 *Guidelines on core components of infection prevention and control programmes at the national and acute health care facility level*. Geneva: World Health Organization; 2016. License: CC BY-NC-SA 3.0 IGO <https://www.who.int/publications/i/item/9789241549929>
- 9 WHO multimodal improvement strategy. Geneva: World Health Organization; 2009. <https://www.who.int/publications/m/item/who-multimodal-improvement-strategy>
- 10 HAI PPS materials including electronic data collection software, training materials, and FAQs are hosted at <https://gaihn-hai.org>
- 11 Haley RW, Culver DH, White JW, Morgan WM, Emori TG, Munn VP, Hooton TM. The efficacy of infection surveillance and control programs in preventing nosocomial infections in US hospitals. *Am J Epidemiol*. 1985 Feb;121(2):182-205. doi: 10.1093/oxfordjournals.aje.a113990. PMID: 4014115.
- 12 *Global guidelines for the prevention of surgical site infection, second edition*. Geneva: World Health Organization; 2018. Licence: CC BY-NC-SA 3.0 IGO.
- 13 Boatin AA, Ngonzi J, Ganyaglo G, Mbaye M, Wylie BJ, Diouf K. Cesarean delivery in low- and middle-income countries: A review of quality of care metrics and targets for improvement. *Semin Fetal Neonatal Med*. 2021 Feb;26(1):101199
- 14 Petherick ES, Dalton JE, Moore PJ, Cullum N. Methods for identifying surgical wound infection after discharge from hospital: a systematic review. *BMC Infectious Diseases*. 2006 Nov 27;6(1).
- 15 Saravanan KA, Panigrahi M, Kumar H, et al. Role of genomics in combating COVID-19 pandemic. *Gene* 2022; 823:146387
- 16 Geller G, Duggal P, Thio CL, et al. Genomics in the era of COVID-19: ethical implications for clinical practice and public health. *Genome Med* 2020; 12:95
- 17 GISAID EpiFlu Database; <https://gisaid.org/>
- 18 Genbank; <https://www.ncbi.nlm.nih.gov/genbank/>
- 19 *Genomic sequencing of SARS-CoV-2: a guide to implementation for maximum impact on public health*. Geneva: World Health Organization; 2021. <https://www.who.int/publications/i/item/9789240018440>