Guideline for Surveillance of Healthcare associated Infections in Healthcare Facilities

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1. List of Abbreviations

- **CAUTI:** Catheter associated Urinary Tract Infections
- **CDC:** Centers for Disease Control and Prevention
- **CLABSI:** Central line-associated Bloodstream infections
- **DUR:** Device Utilization Ratio
- **ESBL:** Extended Spectrum beta-lactamase Producing Enterobacteriaceae
- **HAIs:** Healthcare Associated Infections
- **ICP**: Infection Control Professionals
- **NICU:** Neonatal Intensive Care Unit
- **IPC:** Infection Prevention and Control
- **MDROs:** Multidrug-Resistant Organisms
- **MRSA:** Methicillin-resistant *Staphylococcus aureus*
- **MSSA:** Methicillin-Sensitive *Staphylococcus aureus*
- **NHSN:** National Healthcare Safety Network
- **RSV:** Respiratory Syncytial Virus
- **SSI:** Surgical Site Infection
- **VAP:** Ventilator associated Pneumonia
- **VISA:** Vancomycin Intermediate *Staphylococcus aureus*
- **VRE:** Vancomycin Resistant *Enterococci*.
- **VRSA:** Vancomycin Resistant *Staphylococcus aureus*

2. Glossary

- **Active Surveillance for Health Care-associated Infections:** The direct and vigorous search for information on the occurrence of health care-associated infections in order to detect a change or trend in incidence rate. This is in contrast to passive surveillance, where data are not actively solicited.
- **Device Utilization Ratio (DUR):** The device utilization ratio is the number of device-days per number of patient-days in a given period. This is a measure of the total patient-days in which a high-risk device was used and can be used as a marker for risk of infection.
- **Epidemiologically important pathogens:** Infectious agents that have one or more of the following characteristics:

    - A propensity for transmission within healthcare facilities based on published reports and the occurrence of temporal or geographic clusters of ≥2 patients, *(e.g., VRE, MRSA and MSSA, Clostridium difficile, norovirus, RSV, influenza, Rotavirus, Enterobacter spp; Serratia spp., group A Streptococcus*). However, for group A streptococcus, most experts consider a single case of healthcare-associated disease a trigger for investigation and enhanced control measures because of the devastating outcomes associated with HAI group A *streptococcus* infections. For susceptible bacteria that are known to be associated with asymptomatic colonization, isolation from normally sterile body fluids

in patients with significant clinical disease would be the trigger to consider the organism as epidemiologically important.

- Antimicrobial resistance implications:
    - Resistance to first-line therapies (e.g., MRSA, VRE, VISA, VRSA, ESBL-producing organisms).
    - Unusual or usual agents with unusual patterns of resistance within a facility, (e.g., the first isolate of *Burkholderia cepacia* complex or *Ralstonia* spp. in non-cystic fibrosis patients or a quinolone-resistant strain of *Pseudomonas* in a facility.
    - Difficult to treat because of innate or acquired resistance to multiple classes of antimicrobial agents (e.g., *Stenotrophomonas maltophilia*, *Acinetobacter* spp.).
- Associated with serious clinical disease, increased morbidity and mortality (e.g., MRSA and MSSA, group A streptococcus); or
- A newly discovered or reemerging pathogen. The strategies described for MDROs may be applied for control of epidemiologically important organisms other than MDROs.

- **Hand hygiene:** A general term that applies to any one of the following:
    - Handwashing with plain (non-antimicrobial) soap and water);
    - Antiseptic hand rub (waterless antiseptic product, most often alcohol-based, rubbed on all surfaces of hands); or
    - Surgical hand antisepsis (antiseptic hand wash or antiseptic hand rub performed preoperatively by surgical personnel to eliminate transient hand flora and reduce resident hand flora).

- **Healthcare-associated infection (HAI):** An infection that develops in a patient who is cared for in any setting where healthcare is delivered (e.g., acute care hospital, chronic care facility, ambulatory clinic, dialysis center, surgy center, long term home care) and is related to receiving health care (i.e., was not incubating or present at the time healthcare was provided). In ambulatory and home settings, HAI would apply to any infection that is associated with a medical or surgical intervention performed in those settings.
- **Incidence:** The frequency with which an event occurs in a population over a defined time period.
- **Infection Risk:** The probability that a patient/resident will acquire an infection based on the characteristics of the individual, the inherent risks associated with a procedure, or other factors that might put the individual at risk for a health care-associated infection.
- **Multidrug-resistant organisms (MDROs):** In general, bacteria (excluding M. tuberculosis) that are resistant to one or more classes of antimicrobial agents and usually are resistant to all but one or two commercially available antimicrobial agents (e.g., MRSA, VRE, extended spectrum beta-lactamase [ESBL]-producing or intrinsically resistant gram-negative bacilli).

- **Periodic Surveillance for Health Care-associated Infections:** Surveillance undertaken over a specified time interval (e.g., one month each quarter) in a health care setting. Some infection prevention and control programs will conduct surveillance on one or more units for a period of time and then shift to another unit or group of units. This rotation provides a less costly method to collect information on all high-risk patient care areas.
- **Rate:** It is the occurrence of an event in a specific population during a defined time period. Calculation of rates requires that the event (the numerator, e.g., a specific HAI) can be identified, and that the population at risk of acquiring or developing the HAI (the denominator) can similarly be enumerated.
- **Ratio**: It is a fraction, obtained by dividing one quantity (the numerator) by a second quantity (the denominator); the numerator may or may not be included in the denominator.
- **Risk Stratification:** A process to control for differences in the underlying risk factors for infection. Risk stratification involves calculating separate rates for patients/residents with similar susceptibilities to health care-associated infections, or those in the same category of risk (e.g., surgeon-specific infection rates).
- **Surveillance:** The systematic, ongoing collection, collation and analysis of data with timely dissemination of information to those who require it in order to take action

3. Executive Summary

Healthcare-associated infection (HAI) surveillance programs play a crucial role in enabling healthcare organizations to assess the effectiveness of current practices, provide timely feedback to clinicians, and promote practice improvement to enhance patient outcomes. Surveillance is a fundamental component of any infection prevention and control program, as well as a key element in patient safety initiatives. It involves the systematic process of collecting, organizing, analyzing, interpreting, and disseminating data to support the planning, implementation, and evaluation of healthcare delivery, alongside ensuring the quality and safety of patient care. The primary goal of surveillance in infection prevention and control is to identify sentinel events, monitor HAIs, and report findings to relevant stakeholders, including the Infection Prevention and Control (IPC) Service.

It is not feasible to conduct facility-wide surveillance for all events; therefore, surveillance is often targeted with a focus on specific events, processes, organisms, medical devices or high-risk patient populations. Healthcare associated infections surveillance programs may focus on:

- specific sites of infection (e.g. bloodstream, surgical sites)
- specific populations (e.g. neonates, healthcare worker occupational exposure to blood and body substances)
- specific organisms or types of organisms (e.g. MDRO, *Clostridium difficile*, *RSV*, *Rotavirus*)
- in specific locations in the healthcare facility or community (e.g. intensive care unit, neonatal intensive care unit, long-term care facility).

Recommendations
Monitor the incidence of epidemiologically-important organisms and targeted HAIs that have substantial impact on outcome and for which effective preventive interventions are available; use information collected through surveillance of high-risk populations, procedures, devices and highly transmissible infectious agents to detect transmission of infectious agents in the healthcare facility **(Strong Recommendation)**
Apply the following epidemiologic principles of infection surveillance: Use standardized definitions of infection - Use laboratory-based data - Collect epidemiologically-important variables (e.g., patient locations and/or clinical service in hospitals, population-specific risk factors [e.g., low birth-weight neonates], underlying conditions that predispose to serious adverse outcomes)

- Analyze data to identify trends that may indicate increased rates of transmission - Provide feedback information on trends in the incidence and prevalence of HAIs, probable risk factors, and prevention strategies and their impact to the appropriate healthcare providers, organization administrators, and as required by local and state health authorities **(Strong Recommendation)**
Steps should be taken in hospitals to ensure that case definitions are consistently and accurately applied. **(Strong Recommendation)**
Active surveillance should be used for surveillance programs in hospitals because of the higher sensitivity associated with this approach to case finding. **(Strong Recommendation)**
Use standardized methodology for performing device associated infections surveillance; the number of infections per 1,000 device days or device utilization ratio **(Strong Recommendation)**
Rates of device-associated infection that are adjusted for duration of exposure to the device should be calculated. **(Strong Recommendation)**
Perform surveillance for SSI. (**Strong Recommendation)**
Develop and implement strategies to reduce risks for transmission and evaluate effectiveness. **(Strong Recommendation)**
When transmission of epidemiologically-important organisms continues despite implementation of infection prevention and control strategies, obtain consultation from persons with infection prevention and control, infectious disease, healthcare epidemiology knowledge to review the situation and recommend additional measures for control. **(Strong Recommendation)**
The surveillance process implemented in a facility (e.g., application of case definitions, case finding and communication methods) should be regularly reviewed and modifications made as needed. At least annually, the outcomes of surveillance systems (i.e., reductions to the risk of infection) should be reviewed and system objectives re-aligned as required. **(Strong Recommendation)**
Review periodically information on community or regional trends in the incidence and prevalence of epidemiologically-important organisms as per Egyptian Law and Regulation of Preventive Sector of Ministry of Health (including in other healthcare facilities) that may impact transmission of organisms within your facility. **(Good Practice Statement)**
Calculate and analyze prevalence and incidence rates of targeted MDRO infection in populations at risk **(Strong Recommendation)**
Include only one isolate per patient, not multiple isolates from the same patient, when calculating rates **(Good Practice Statement)**

Increase the frequency of compiling and monitoring antimicrobial susceptibility summary reports for a targeted MDRO as indicated by an increase in incidence of infection or colonization with that MDRO. **(Good Practice Statement)**
Monitor trends in the incidence of target MDROs in the facility over time using appropriate statistical methods to determine whether MDRO rates are decreasing and whether additional interventions are needed. **(Strong Recommendation)**
In all healthcare organizations, establish systems to ensure that clinical microbiology laboratories (in-house and out-sourced) promptly notify infection control staff when a novel resistance pattern for that facility is detected. **(Strong Recommendation)**

4. Introduction

Surveillance in healthcare facilities is the systematic and ongoing collection, analysis, interpretation, and dissemination of data regarding health-related events for use in public health action to reduce morbidity and mortality and to improve health. In the context of a healthcare facility, surveillance focuses on identifying and monitoring specific health-related events within the patient population, staff, and the environment to prevent and control healthcare-associated infections (HAIs), detect outbreaks early, evaluate the effectiveness of interventions, and improve the overall quality and safety of care.

This guideline provides an introduction to the principles and practices of surveillance within a healthcare setting. It aims to outline the importance of surveillance, the key components involved, and the steps necessary to establish and maintain an effective surveillance program.

Key Components of a Healthcare Surveillance Program:

A comprehensive surveillance program typically includes the following key components:

1. **Defining Objectives and Scope:** Clearly define the goals of the surveillance program (e.g., reducing specific HAIs, detecting outbreaks) and the scope of activities (e.g., which patient populations, units, or types of infections will be monitored).
2. **Selecting Surveillance Targets:** Identify the specific health-related events or conditions that will be monitored. These may include specific HAIs (e.g., central line-associated bloodstream infections, catheter-associated urinary tract infections, surgical site infections), antimicrobial resistance patterns, or other adverse events.
3. **Establishing Case Definitions:** Develop clear and standardized criteria for identifying and classifying cases of the targeted events. Consistent case definitions are essential for accurate data collection and comparison over time and across different settings.
4. **Developing Data Collection Methods:** Determine the methods for collecting relevant data. This may involve reviewing patient charts, laboratory reports, microbiology results, medication records, and conducting direct observation.
5. **Implementing a Data Management System:** Establish a system for organizing, storing, and managing the collected data. This may involve manual spreadsheets, electronic databases, or specialized surveillance software.
6. **Analyzing and Interpreting Data:** Regularly analyze the collected data to identify trends, patterns, and potential outbreaks. Statistical methods may be used to calculate rates, identify significant changes, and compare data over time.

7. **Disseminating Findings:** Communicate surveillance findings to relevant stakeholders, including healthcare professionals, administrators, and infection prevention and control committees. Reports should be clear, concise, and actionable.
8. **Implementing and Evaluating Interventions:** Based on the surveillance data and analysis, implement targeted interventions to address identified risks or problems. Continuously evaluate the effectiveness of these interventions through ongoing surveillance.
9. **Providing Feedback and Education:** Regularly provide feedback to healthcare staff on surveillance findings and the impact of interventions. Education and training are crucial for promoting adherence to infection prevention practices.
10. **Ensuring Confidentiality and Data Security:** Maintain the confidentiality of patient and staff information in accordance with ethical and legal guidelines. Implement appropriate measures to ensure data security.

Steps to Establish and Maintain a Surveillance Program:

1. **Form a Multidisciplinary Team:** Establish a team that includes representatives from infection prevention and control, microbiology, pharmacy, nursing, medicine, information technology, and administration.
2. **Conduct a Baseline Assessment:** Evaluate the current infection prevention and control practices and identify areas where surveillance is needed.
3. **Develop a Surveillance Plan:** Outline the objectives, scope, targets, case definitions, data collection methods, data management system, analysis plan, and dissemination strategies.
4. **Train Personnel:** Provide adequate training to all personnel involved in data collection, analysis, and reporting.
5. **Pilot Test the System:** Implement the surveillance plan on a small scale to identify any challenges or areas for improvement.
6. **Implement the Program:** Roll out the surveillance program across the designated areas of the healthcare facility.
7. **Regularly Review and Revise the Plan:** Periodically review the surveillance plan and make necessary adjustments based on the data, changes in the healthcare environment, and emerging threats.
8. **Ensure Sustainability:** Allocate adequate resources (personnel, technology, funding) to support the ongoing operation of the surveillance program.

5. Scope and Purpose

The **scope** of surveillance in a healthcare facility encompasses the systematic and ongoing monitoring of various health-related events and conditions within the facility's environment, among its patients, and its staff. This includes:

- **Healthcare-associated infections (HAIs):** Tracking the incidence and prevalence of infections acquired during healthcare delivery, such as central line-associated bloodstream infections (CLABSI), catheter-associated urinary tract infections (CAUTI), surgical site infections (SSI), and ventilator-associated pneumonia (VAP).
- **Outbreaks:** Detecting and investigating clusters or unusual increases in the occurrence of infections or other adverse health events.
- **Antimicrobial resistance:** Monitoring patterns of resistance to antibiotics and other antimicrobial agents.
- **Occupational health events:** Monitoring illnesses or injuries among healthcare workers that may be related to their work environment or practices.
- **Environmental factors:** Assessing and monitoring environmental conditions that may contribute to infection transmission or other health risks.
- **Compliance with infection prevention practices:** Observing and documenting adherence to hand hygiene, isolation precautions, bundle compliance and other recommended practices.

The **purpose** of surveillance in a healthcare facility is multifaceted and aims to:

- **Prevent and control HAIs:** By identifying risks, monitoring trends, and evaluating the effectiveness of prevention strategies.
- **Detecting outbreaks early:** Enabling timely intervention to limit the spread of infections and protect patients and staff.
- **Evaluate the effectiveness of interventions:** Assessing the impact of implemented prevention and control measures to guide future actions.
- **Improve patient safety and quality of care:** By identifying areas for improvement and monitoring outcomes related to infection and other adverse events.
- **Meet regulatory and accreditation requirements:** Many external bodies mandate surveillance activities as part of quality and safety standards.
- **Provide data for benchmarking:** Allowing facilities to compare their infection rates and outcomes with those of similar institutions.
- **Guide resource allocation:** Informing decisions about staffing, supplies, and other resources needed for effective infection prevention and control.

- **Inform public health efforts:** Providing data on reportable diseases and emerging threats to local and national health authorities.
- **Educate and provide feedback to staff:** Raising awareness about infection risks and the impact of their practices on patient safety.

6. Target Audience

- Infection Prevention and Control Team and HAIs Surveillance Officers
- Healthcare Workers: Including Clinicians, Nurses, Head Nurses
- Healthcare Facilities and Department Managers
- Microbiology Laboratory Manager
- Clinical Pharmacists

7. Methodology

A comprehensive search for guidelines was undertaken to identify the most relevant guidelines to consider for adaptation.

Inclusion/ exclusion criteria followed in the search and retrieval of guidelines to be adapted:

- Selecting only evidence-based guidelines (guideline must include a report on systematic literature searches and explicit links between individual recommendations and their supporting evidence)
- Selecting only national and/or international guidelines
- Specific range of dates for publication (using Guidelines published or updated in 2014 and later)
- Selecting peer reviewed publications only
- Selecting guidelines written in English language
- Excluding guidelines written by a single author, not on behalf of an organization to be valid and comprehensive, a guideline ideally requires multidisciplinary input.
- Excluding guidelines published without references as the panel needs to know whether a thorough literature review was conducted and whether current evidence was used in the preparation of the recommendations.

The following characteristics of the retrieved guidelines were summarized in:

- Developing organization/authors

- Date of publication, posting, and release
- Country/language of publication
- Date of posting and/or release
- Dates of the search used by the source guideline developers.

All retrieved Guidelines were screened and appraised using AGREE II instrument (www.agreetrust.org) by at least three members. The panel decided on a cut-off point or ranked the guidelines (any guideline scoring above 50% on the rigor dimension was retained). The committee decided to adapt from:

1. Centers for Disease Control and Prevention (CDC). Management of Multidrug-Resistant Organisms in Healthcare Settings. 2006; update March 18, 2024.
2. Centers for Disease Control and Prevention (CDC). Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings. 2007; last update 2023.
3. Ontario Agency for Health Protection and Promotion (Public Health Ontario), Provincial Infectious Diseases Advisory Committee. Best practices for surveillance of healthcare-associated infections in patient and resident populations. 3rd ed. Toronto, ON: Queen's Printer for Ontario; 2014.

Evidence assessment

According to the World Health Organization (WHO) Handbook for Guidelines, we used the GRADE (Grading of Recommendations, Assessment, Development and Evaluation) approach to assess the quality of a body of evidence, develop and report recommendations. GRADE methods are used by WHO because these represent internationally agreed standards for making transparent recommendations. Detailed GRADE information is available on the following sites:

- GRADE working group: http://www.gradeworkinggroup.org
- GRADE online training modules: http://cebgrade.mcmaster.ca/
- GRADE profile software: http://ims.cochrane.org/revman/gradepro

Table (1) Quality and Significance of the four levels of evidence in GRADE

Quality	Definition	Implications
High	The guideline development group is very confident that the true effect lies close to that of the estimate of the effect	Further research is very unlikely to change confidence in the estimate effect
Moderate	The guideline development group is moderately confident in the effect estimate: the true effect is likely to be close to the estimate of the effect, but there is a possibly that it is substantially different	Further research is likely to have an important impact on confidence in the estimate of the effect and may change the estimate
Low	Confidence in the effect estimate is limited: the true effect may be substantially different from the estimate of the true effect	Further research is very likely to have an important on confidence in the estimate of effect and is unlikely to change the estimate
Very low	The group has very little confidence in the effect estimate: the true effect is likely to be substantially different from the estimate of the effect	Any estimate of the effect is very uncertain

Table (2) Factors that determine How to upgrade or downgrade the quality of evidence.

Downgrade in presence of	Upgrade in presence of
Study limitations. **1-** Serious limitations **2-** Very serious limitations	Dose- response gradient. +1 Evidence of a dose-response gradient
Consistency **1-** Important inconsistency	Direction of plausible bias + All plausible confounders would have reduced the effect
Directness **1-** Some uncertainty **2-** Major uncertainty	Magnitude of the effect +1 Strong, no plausible Confounder, consistent and direct evidence
Precision **1-** Imprecise data	+2 very strong, no major threats to validity and direct evidence
Reporting bias **1.** High probability of reporting bias	

The strength of the recommendations

The strength of a recommendation communicates the importance of adherence to the recommendation.

- **Strong recommendations**

With strong recommendations, the guideline communicates the message that the desirable effects of adherence to the recommendation outweigh the undesirable effects. This means that in most situations the recommendation can be adopted as policy.

- **Conditional recommendations**

These are made when there is greater uncertainty about the four factors above or if local adaptation has to account for a greater variety in values and preferences, or when resource use makes the intervention suitable for some, but not for other locations. This means that there is a need for substantial debate and involvement of stakeholders before this recommendation can be adopted as policy.

When not to make recommendations?

When there is lack of evidence on the effectiveness of an intervention, it may be appropriate not to make a recommendation.

8. Recommendations

Recommendations
Monitor the incidence of epidemiologically-important organisms and targeted HAIs that have substantial impact on outcome and for which effective preventive interventions are available; use information collected through surveillance of high-risk populations, procedures, devices and highly transmissible infectious agents to detect transmission of infectious agents in the healthcare facility. **(Strong Recommendation, High Grade Evidence)**
Apply the following epidemiologic principles of infection surveillance: Use standardized definitions of infection - Use laboratory-based data - Collect epidemiologically-important variables (e.g., patient locations and/or clinical service in hospitals, population-specific risk factors [e.g., low birth-weight neonates], underlying conditions that predispose to serious adverse outcomes) - Analyze data to identify trends that may indicate increased rates of transmission

- Provide feedback information on trends in the incidence and prevalence of HAIs, probable risk factors, and prevention strategies and their impact to the appropriate healthcare providers, organization administrators, and as required by local and state health authorities **(Strong Recommendation, Moderate Grade Evidence)**
Steps should be taken in hospitals to ensure that case definitions are consistently and accurately applied. : **(Strong Recommendation, Moderate Grade Evidence)**
Active surveillance should be used for surveillance programs in hospitals because of the higher sensitivity associated with this approach to case finding. : **(Strong Recommendation, Moderate Grade Evidence)**
Use standardized methodology for performing device associated infections surveillance; the number of infections per 1,000 device days or device utilization ratio **(Strong Recommendation, Moderate Grade Evidence)**
Rates of device-associated infection that are adjusted for duration of exposure to the device should be calculated. **(Strong Recommendation, Moderate Grade Evidence)**
Perform surveillance for SSI. (**Strong Recommendation, Moderate Grade Evidence)**
Develop and implement strategies to reduce risks for transmission and evaluate effectiveness. **(Strong Recommendation, Moderate Grade Evidence)**
When transmission of epidemiologically-important organisms continues despite implementation of infection prevention and control strategies, obtain consultation from persons with infection prevention and control, infectious disease, healthcare epidemiology knowledge to review the situation and recommend additional measures for control **(Strong Recommendation, Moderate Grade Evidence)**
The surveillance process implemented in a facility (e.g., application of case definitions, case finding and communication methods) should be regularly reviewed and modifications made as needed. At least annually, the outcomes of surveillance systems (i.e., reductions to the risk of infection) should be reviewed and system objectives re-aligned as required. **(Strong Recommendation, Moderate Grade Evidence)**
Review periodically information on community or regional trends in the incidence and prevalence of epidemiologically-important organisms as per Egyptian Law and Regulation of Preventive Sector of Ministry of Health (including in other healthcare facilities) that may impact transmission of organisms within your facility **(Good Practice Statement)**
Calculate and analyze prevalence and incidence rates of targeted MDRO infection in populations at risk **(Strong Recommendation, Moderate Grade Evidence)**

Include only one isolate per patient, not multiple isolates from the same patient, when calculating rates **(Good Practice Statement)**
Increase the frequency of compiling and monitoring antimicrobial susceptibility summary reports for a targeted MDRO as indicated by an increase in incidence of infection or colonization with that MDRO. **(Good Practice Statement)**
Monitor trends in the incidence of target MDROs in the facility over time using appropriate statistical methods to determine whether MDRO rates are decreasing and whether additional interventions are needed. **(Strong Recommendation, High Grade Evidence)**
In all healthcare organizations, establish systems to ensure that clinical microbiology laboratories (in-house and out-sourced) promptly notify infection control staff when a novel resistance pattern for that facility is detected. **(Strong Recommendation, Moderate Grade Evidence)**

Rationale

It is estimated that most HAIs are preventable. Therefore, an infection prevention and control (IPC) program that is effective in preventing HAIs can substantially reduce health care costs and, more importantly, the morbidity and mortality associated with HAIs. An effective surveillance system will reduce the frequency of health care-associated infection. The general steps required in setting up a surveillance program can be followed by any hospital or long-term care home in planning and implementing their surveillance system:

1. **Assess the population to be surveyed:** This evaluation enables priorities for a surveillance system to be established. Resources for surveillance can then be targeted to the populations at risk for the outcomes of greatest importance, defined in these priority areas.
2. **Select the outcome(s) for surveillance:** Facility-wide surveillance, while comprehensive, requires considerable time and personnel resources. There is no value to identifying infections for surveillance purposes unless the results may be used to effect change that will result in lower HAI rates. Facility-wide surveillance will identify many infections that cannot be prevented, wasting valuable resources that may be used for other purposes, such as education. Prioritization of the types of infections to be surveyed will assist the Infection Control Professionals (ICPs) to make the best use of the available resources while having the greatest impact on the populations that they serve.

3. **Use standardized, validated case definitions for infection that is consistent over time:** In any surveillance system, all elements of the data that are being collected need to be clearly defined, including the infection outcome, the '*at risk*' population and other risk factors for infection. The recommendation for hospitals is to use standardized, validated case definitions for surveillance, to allow for comparability. For example, the National Healthcare Safety Network (NHSN) program's case definitions are widely used in hospital surveillance programs worldwide and provide benchmarks for comparison. Infection Control Professionals should receive training in the consistent and correct application of case definitions for surveillance
4. **Collect the surveillance data:** Data collected on a daily basis by ICPs using standardized methodology and case definitions. Health care-associated infections are expressed as a rate, i.e., the number of cases related to the number of persons at risk over a particular period of time. Using standardized forms, the elements required to generate these HAI rates in the specific time period involved.
    - *Numerator*- the number of cases (i.e., persons developing a particular infection)
    - *Denominator*- number of persons at risk (i.e., population at risk for development of that infection)
    - Specific forms for each infection type and locations to calculate the rates of each unit involved in the surveillance
5. **Calculate and analyze surveillance rates:** Calculating incidence rates involves compiling individual level patient/resident data and then aggregating it into a summary of the risk for developing a HAI within a population of patients over a specified time-period. It is better to adjust rates of HAIs for patient/resident length of stay by using the number of patient/resident days as the denominator, rather than number of admissions or number of beds, also for exposure to medical devices and for type of surgical procedure in the hospital setting.
6. **Apply risk stratification methodology where applicable:** Patients served by differing health care settings have differing risk factors related to the treatments and procedures that they undergo. These risk factors may be either extrinsic (e.g., environment-related) and/or intrinsic (patient-related) risk factors for HAI, including underlying disease condition and advanced age. Without adjustment for these factors, comparisons within the same

health care setting or inter-facility comparisons may be invalid or misleading interpret HAI rates. Risk stratification allows for meaningful comparison of rates among patients/residents with similar risks within a health care setting or between health care settings and at different points in time.

- Common methods used for risk-adjustment in HAI surveillance:
- Stratification by location in surveillance of device associated infections
- Stratification by surgery type in SSI surveillance
- Stratification by risk index category in SSI surveillance
- Stratification by birth weight group in neonatal CLABSI and VAP
- Stratification by type of central line in CLABSI in specialty care areas
- Standardized infection ratio

7. **Interpret Infection Rates:** Infection Control Professionals must be able to interpret HAI rates so that they can identify areas where improvements to infection prevention and control practices are needed to lower the rate of infection, or to evaluate where preventive interventions have been effective in reducing the risk of infection. Interpreting the meaning of a rate of infection requires a close working knowledge of how one's surveillance system operates and noticing if a rate deviates substantially from previous surveillance periods
8. **Communicate and use surveillance information to improve practice:** If surveillance data are not used to effect changes to IPC practices, then the surveillance system is not working. Distribution of surveillance data is both verbal and visual, and their usage as an input to IPC practice constitutes the end goal of an effective surveillance system. A surveillance system that simply collects and houses data without being delivered to stakeholders don't attain the main goal, that of improved IPC practice and decreased rates of HAIs.
9. **Evaluate the surveillance system:** The surveillance process implemented in a facility (e.g., application of case definitions, case finding and communication methods) should be regularly reviewed and modifications made as needed. At least annually, the outcomes of surveillance systems (i.e., reductions to the risk of infection) should be reviewed and system objectives re-aligned as required. Periodic review of surveillance methods should be incorporated as part of regular Infection Control Committee meetings.

Case finding via computer algorithm may result in more time saving for ICPs to be devoted to prevention, for example, using a computer-generated report to limit the number of cases that would be followed by an ICP to those with a high likelihood of infection.

Electronic systems are used to store and analyze data, HAI rates can be calculated with a greater ease and efficiency and are less prone to error, provided that the ICP has received training in the use of such programs. The system is used to define the magnitude and scope of HAIs in the country and to allow HAI rates interhospital comparison.

9. Indicators for Monitoring

To ensure the surveillance of HAIs practices in hospitals and reduce the risk of HAIs, specific indicators should be monitored regularly. These are some indicators which can provide measurable data to assess compliance, identify areas for improvement, and guide interventions. Here are some key indicators that can be included in hospital guidelines for surveillance of HAIs:

a) Calculation of incidence: The incidence of an HAI is a specific rate that represents the occurrence (number) of new cases of a disease (e.g., a specific HAI) occurring in a defined patient population during a defined period. All individuals in the population being surveyed must be at risk of developing the outcome.

$$\textbf{Incidence Rate} = \frac{\text{Number of patients diagnosed with new specific HAI during the surveillance period}}{\text{Number of patients at risk of the specific HAI during the surveillance period}} \times 100$$

b) Infection rates is calculated by (per 1000 patient-days)

$$\textbf{Rate of infection / 1,000 patient-days} = \frac{\text{Number of specific infections cases over specified time period (e.g. surveillance quarter) in a specific location}}{\text{Total number of patients days in a specific location in same time period}} \times 1000$$

In this rate a patient with 2 infections is counted twice

Rate of Patients infected/ 1,000 patient-days =

$$\frac{\text{Number of patient infected over specified time period (e.g. surveillance quarter) in a specific location}}{\text{Total number of patients days in a specific location in same time period}} \times 1000$$

In this rate a patient with 2 infections is counted only once

c) Incidence Density Rates (adjusts for patient/resident length of stay)

If patients are followed for the occurrence of an HAI but the time of follow-up varies for each patient, a more precise measure of incidence called incidence density is used.

Incidence density=

$$\frac{\text{Number of cases over specified time period}}{\text{Total number of days patients in hospital (facility) over time period}} \times 10{,}000$$

d) Device-Associated Infection Rates (Per 1000 device days)

Example infections

- Central line-associated bloodstream infections (CLABSI)
- Ventilator-associated Events (VAE)
- Indwelling catheter-associated urinary tract infections (CAUTI)

Device-Associated Infection Rates (Per 1000 device days) =

$$\frac{\text{Number of cases over the specified time period in a specific location}}{\text{Total number of device days in a specific location}} \times 1000$$

e) Device Utilization Ratio (DUR): The device utilization ratio is the number of device-days per number of patient-days in a given period. This is a measure of the total patient-days in which a high-risk device was used and can be used as a marker for risk of infection.

Device Utilization Ratio=

$$\frac{\text{Number of device days in a specific location}}{\text{Total number of patient days in a specific location}}$$

According to the approved center of disease control (CDC) criteria,

**Device days are the total number of days of exposure to each device (Ventilators, central venous catheter or urinary catheter) for all the patients during the selected time period.*

**Patient days are the total number of days patients are in the intensive care unit (ICU) during the selected time period*

f) Surgical Site Infection Rates (SSIs)

$$\text{SSI Rate} = \frac{\text{Number of cases over specified time period following specific operative procedure}}{\text{Total number of the same operative procedure in the same time period}} \times 100$$

**SSIs will be included in the numerator of a rate based on the date of procedure, not the date of the HAI event*

**SSI rates can be calculated separately for different types of operative procedures and stratified by the wound classification (clean, clean contaminated, contaminated, dirty)*

10. Plan to Update this National Clinical Guideline

This guideline will be reviewed and updated when new evidence emerges that is likely to influence the recommendations.

References

1. European Centre for Disease Prevention and Control. Protocol for the surveillance of healthcare-associated infections and prevention indicators in European intensive care units. Stockholm: ECDC; 2025.
2. Centre for Disease Prevention and Control. Patient Safety Component Manual. National Healthcare Safety Network (NHSN); 2025.
3. Centers for Disease Control and Prevention (CDC). Management of Multidrug-Resistant Organisms in Healthcare Settings. 2006; update March 18, 2024.
4. Centers for Disease Control and Prevention (CDC). Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings. 2007; last update 2023.
5. Ontario Agency for Health Protection and Promotion (Public Health Ontario), Provincial Infectious Diseases Advisory Committee. Best practices for surveillance of healthcare-associated infections in patient and resident populations. 3rd ed. Toronto, ON: Queen's Printer for Ontario; 2014.