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NATIONAL GUIDELINES ON HEALTHCARE ASSOCIATED INFECTIONS SURVEILLANCE

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National Guidelines on Healthcare Associated Infections Surveillance

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LIST OF ABBREVIATIONS

ABHR	Alcohol Based Hand Rub
ABUTI	Asymptomatic Bactremic Urinary Tract Infection
ASA	American Society of Anaesthesiologists
BAL	Bronchio Alveolar Lavage
BSI	Blood Stream Infection
CAUTI	Catheter Associated Urinary Tract Infection
CFU	Colony Forming Unit
CLABSI	Central Line Associated Blood Stream Infection
CLSI	Clinical & Laboratory Standards Institute
COPD	Chronic Obstructive Pulmonary Disease
CPE	Carbapenemase-producing Enterobacteriaceae.
CRE	Carbapenem Resistant Enterobacteriaceae
CVC	Central Venous Catheter
EBS	Elder of the Burning Spear
ER	Emergency Room
ESBL	Extended-Spectrum ß-Lactamase
HAI	Healthcare Associated Infection
HCF	HealthCare care Facility
HCW	Healthcare Worker
ICP	Infection Control Practitioner
ICU	Intensive Care Unit
IPC	Infection Prevention and Control
IV	Intravenous
KHIS	Kenya Health Information System
LMIC	Low- and Middle-Income Countries
MDRO	Multi Drug Resistant Organism
MFL	Master Facility List
MIC	Minimum Inhibitory Concentration
MLST	Multilocus sequence typing.
MOH	Ministry of Health
MRSA	Methicillin Resistant Staphylococcus Aureus
MSH	Management Sciences for Health
MTaPS	Medicines Technologies and Pharmaceutical Services Program
OR	Operating Room
PCR	Polymerase Chain Reaction
PFGE	Pulsed-field gel electrophoresis.

PIDAC	Provincial Infectious Diseases Advisory Committee
PPE	Personal Protective Equipment
PUD	Peptic Ulcer Disease
SAP	Surgical antibiotic prophylaxis
SSI	Surgical Site Infection
SUTI	Symptomatic Urinary Tract Infection
UTI	Urinary Tract Infection
VAP	Ventilator Associated Pneumonia
VRE	Vancomycin Resistant Enterococcus
WBC	White Blood Count
WHO	World Health Organization

FOREWORD

It is with great pleasure that I present the National Guidelines for Healthcare Associated Infections Surveillance for Kenya. These guidelines represent a significant milestone in our collective efforts to enhance healthcare quality and patient safety across the nation.

Healthcare Associated Infections (HAIs) present a significant risk to patients, healthcare professionals, and the broader healthcare infrastructure. These infections not only result in heightened illness and death rates but also impose a considerable economic burden on both individuals and the nation at large.

The formulation of these guidelines has been a collective effort involving healthcare experts, researchers, policymakers, and stakeholders from diverse sectors. These guidelines are based on the most reliable evidence available and align with international standards and recommendations. The primary objective is to offer healthcare facilities in Kenya a comprehensive framework for implementing effective surveillance programs for HAIs.

The guidelines cover essential aspects of HAI surveillance, encompassing definitions, methodologies for data collection, reporting mechanisms, and data analysis. They underscore the significance of a collaborative approach, promoting teamwork among infection prevention and control teams, laboratory staff, healthcare providers, and administrators. By adhering to these guidelines, we can instill a culture of continual improvement and evidence-based practices in infection prevention and control.

I urge healthcare facilities across Kenya to embrace these guidelines and integrate them into their existing infection prevention and control programs. By doing so, we will enhance our ability to detect emerging threats, identify trends, and implement timely interventions to prevent HAIs. Ultimately, this will lead to safer healthcare environments, improved patient outcomes, and a stronger healthcare system as a whole.

I commend the Ministry of Health, the National Infection Prevention and Control Unit, and all stakeholders involved in this endeavor for their unwavering commitment to advancing healthcare quality in Kenya. Let us unite in our efforts to combat healthcare-associated infections and create a healthier and safer future for all.

Dr. Patrick Amoth, EBS

Ag. Director General for Health

Ministry of Health

ACKNOWLEDGEMENT

This National HAI surveillance Guidelines for Health Care Services in Kenya 2022 was developed through a consultative process lead by the technical officers from the Ministry of Health (MOH), Patient Safety Unit within the Directorate of Health Standards, Regulation and Quality Assurance. The MOH acknowledges inputs made by the national and county government stakeholders together with the IPC experts and practitioners from various public and private health care and training institutions; faith-based organizations; and partners including Centers for Disease Prevention and Control (CDC), US Agency for International Development (USAID) Medicines, Technologies, and Pharmaceutical Services (MTaPS) program, International Training and Education Center for Health (ITECH), Infection Prevention Network Kenya (IPNET), and others across the health sector.

Dr. Bartilol Kigen

Ag. Director,

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Ministry of Health

EXECUTIVE SUMMARY

The National Guidelines for Healthcare Associated Infections Surveillance for Kenya serve as a comprehensive framework to strengthen healthcare quality and patient safety across the country. These guidelines provide healthcare facilities with the necessary tools and strategies to implement effective surveillance programs for Healthcare Associated Infections (HAIs).

HAIs continue to present a significant challenge to healthcare systems worldwide, resulting in increased morbidity, mortality, and economic burden. By establishing a robust surveillance system, we can monitor, prevent, and control these infections more effectively, ultimately improving patient outcomes and reducing healthcare costs.

The guidelines have been developed through a collaborative effort, involving experts from various sectors, including healthcare professionals, researchers, policy makers, and stakeholders. They are evidence-based, aligning with international standards and recommendations, and reflect the best practices in HAI surveillance.

By implementing these guidelines, healthcare facilities in Kenya can establish a culture of continuous improvement and evidence-based practice in infection prevention and control. The guidelines provide guidance on the implementation process, including the necessary infrastructure, training requirements, and quality assurance measures.

Surveillance data collected using these guidelines will enable healthcare facilities to identify emerging threats, monitor trends, and implement timely interventions to prevent HAIs. The guidelines also highlight the importance of data sharing and collaboration at the national level to facilitate a comprehensive understanding of the HAI landscape in Kenya.

In conclusion, the National Guidelines for Healthcare Associated Infections Surveillance for Kenya provide a vital resource for healthcare facilities to enhance their infection prevention and control efforts. By adopting these guidelines, we can create safer healthcare environments, improve patient outcomes, and strengthen the overall healthcare system in Kenya.

PURPOSE, SCOPE, AND RESPONSIBILITIES

Purpose

The primary purpose of this guideline is to ensure consistent and comprehensive HAI surveillance practices in healthcare facilities. This guideline is intended to cover the surveillance of device and procedure associated HAIs and MDROs by adhering to this guideline, healthcare facilities can significantly contribute to the reduction of healthcare-associated infections and the enhancement of patient safety and quality of care.

Scope

This guideline is applicable to all Level 4 and above healthcare facilities, including government-operated, private, and faith-based institutions. It encompasses the following:

Inpatient Areas

Surveillance for CLABSI, VAP, and CAUTI will be undertaken in all inpatient areas. This includes, but is not limited to, intensive care units, general wards, and specialized care units within the facility.

Inpatient and Outpatient Area

Surveillance for SSI will be conducted for abdominal, Orthopedic and dental surgeries while MDRO surveillance will be conducted for both inpatient and outpatient cases.

Responsibilities

It is the responsibility of healthcare facility administrators, infection control teams, healthcare workers, and relevant staff to ensure the successful implementation of this guideline.

This includes:

1. Appointing an infection control team.
2. Training staff in HAI surveillance protocols.
3. Regularly collecting and reporting HAI data as per the specified surveillance definitions
4. Implementing and monitor interventions to prevent and control infections.
5. Sharing feedback on HAI surveillance findings with relevant stakeholders.

INTRODUCTION TO HEALTHCARE ASSOCIATED INFECTIONS

Definition of Healthcare Associated Infections

Health care-associated infections (HAIs) are infections that patients acquire while receiving treatment for medical or surgical conditions and are the most frequent adverse event during care.

delivery. HAI is a major problem for patient safety and its impact can result in prolonged hospital stay, long-term disability, increased resistance of microorganisms to antimicrobial agents, a massive additional financial burden for the health system, high costs for patients and their families, and excess deaths. The risk to acquire HAI is universal and pervades every health-care facility and system worldwide, but the true burden remains unknown in many nations, particularly in developing countries(1).

HAIs are infections that first appear 48 hours or more after hospitalization or within 30 days after having received health care(2). Surgical site infection appears within 30 days of the procedure or within 90 days if there is an implant or foreign body(3).

Clinical evidence may be derived from directly observing the infection site or reviewing information in the patient's chart or other clinical records. The doctor's diagnosis alone is acceptable for some infections such as surgical site infection (SSI), unless there is compelling evidence to the contrary.

HAIs can be associated with various healthcare procedures, interventions, and devices, and they can affect patients of all ages, including new-born, children, adults, and the elderly.

HAIs can range from mild to severe, and in some cases, they can be life-threatening. The causes of HAIs can vary, but they are often associated with the presence of bacteria, viruses, fungi, or other pathogens in healthcare settings.

Healthcare settings include hospitals, clinics, nursing homes, Ambulatory Surgical Centers, Rehabilitation Centers, Home Healthcare, Urgent Care Centers, specialized facilities like cancer centers, mental health clinics, and dialysis centers.

The following are not considered HAIs:

Infections associated with complications or extensions of infections are already present upon admission unless a change in pathogen or symptoms strongly suggests the acquisition of a new infection.

- Infections in infants that were acquired transplacentally (e.g., herpes simplex, toxoplasmosis, rubella, cytomegalovirus, or syphilis) and became evident ≤ 48 hours after birth.
- Reactivation of latent infections (e.g., herpes zoster [shingles], herpes simplex, syphilis, or tuberculosis)

The following conditions are not infections:

- Colonization, which means the presence of microorganisms on the skin, on mucous membranes in open wounds, or in excretions or secretions that do not cause adverse clinical signs or symptoms.
- Inflammation that results from tissue response to injury or stimulation by non- infectious agents, such as chemicals

The following is a HAI that is not separately reported:

- A secondary BSI, which is a complication of another HAI (such as SSI)

The following is considered a HAI:

- Infections that occur in infants that result from passing through the birth canal.
- Any infection reported to the IPC program must meet the national standard definition for

a healthcare-associated infection (HAI), and the person performing the surveillance must decide that the clinical, laboratory, and other diagnostic information gathered on the patient satisfies the definition criteria.

Burden of Healthcare Associated Infections

HAIs have a significant impact on in-hospital mortality, the length of extra hospital stays, and extra costs for medical care. Patients admitted to intensive care units and those with HAIs have been found to be significant predictors of in-hospital mortality. Interventions must be implemented to prevent HAIs, especially in patients admitted to intensive care units(4).

The global prevalence of HAIs is about 0.14 % with the rate increasing by 0.06% annually. The highest rate of HAIs was found to be in Africa and the lowest prevalence found to be in America and West Pacific regions(5).

In developed countries, 5–15% of hospitalized patients and more than 50% of patients in intensive care units (ICUs) develop healthcare-associated infections (HAIs). In resource-limited countries, the magnitude of HAIs is underestimated or unknown due to the absence of a well-established surveillance system. The burden of HCAIs is assumed to be high in less developed countries because of health-care system deficiencies such as overcrowding in healthcare settings, understaffing, inadequate infection control practices, and lack of infection control policies(6).

The pooled prevalence of HAIs in Africa is reported at 12.8% which is higher than the prevalence reported in Asia (9.0%), Europe (6.5%) and the United States (4.0%) The prevalence of HAI in Kenya is not known, as there is limited HAI surveillance in most hospitals(7).

According to the World Health Organization (WHO) and other researchers, 7% of patients in high-income economies and 10% in emerging and developing economies acquire at least one type of HAIs, and of these patients, 10% die(8).

A HAI surveillance done in three Kenyan hospitals in 2010-2012 showed a prevalence of HAI in paediatric age groups was 5.8%. The three most common bacteria identified in the study were Klebsiella pneumoniae followed by Pseudomonas aeruginosa and Enterobacter cloacae, which was like that seen in other parts of Africa. A local study in Kenyatta National Hospital reported Pseudomonas aeruginosa, Klebsiella pneumoniae, Citrobacter species and Staphylococcus aureus as the most common organisms isolated among the HAI acquired in a mixed intensive care setting. Klebsiella (28.5%) followed by Enterococcus species (24.4%) were the organisms associated with device associated HAI as seen in most other developing countries(9).

Classification of HAIs

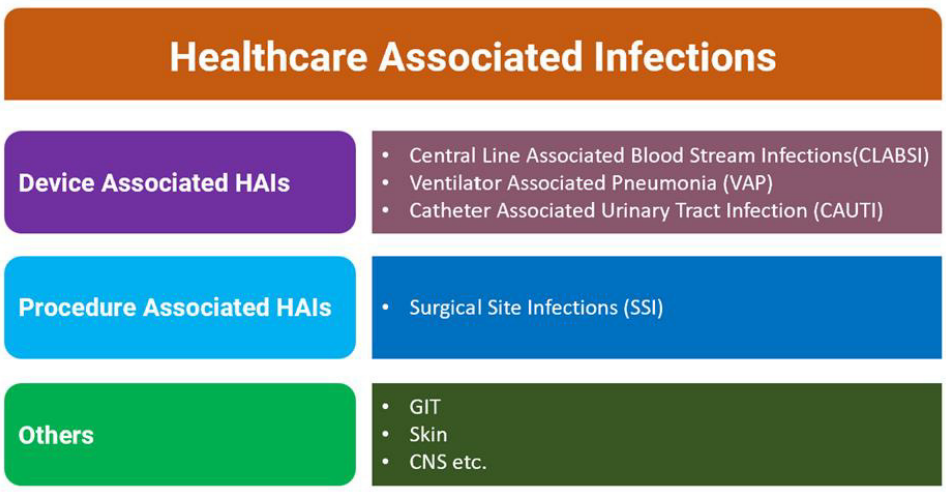


Figure 1-Classification of HAIs (Ref: Kenya National IPC Guidelines)

The most common HAIs include, device associated HAIs, procedure associated HAIs (e.g., SSIs) and MDROs

1. Devise associated HAIs.
   - » Catheter associated urinary tract infection (CAUTI): occurs after the urinary catheter is introduced in the patient.
   - » Ventilator associated pneumonia (VAP): occurs in patients who are intubated and are put on ventilators. This manifests as pneumonia with patches of consolidation in lungs.
   - » Central line associated bloodstream infections (CLABSI): This infection occurs in patients who have various kinds of lines inserted into the large veins/arteries.
2. Procedure associated HAIs.
   - » Surgical site infection (SSI): This infection occurs at or around the site of surgical incision.
3. Other HAIs which may occur during an admission include.
4. MDROs

Role of Infection Prevention and Control in HAIs

Every year, millions of people worldwide suffer from health care-associated infections (HAIs), even though many of these infections can be easily avoided. HAIs are a problem that affects every country and health system, regardless of their level of development or sophistication. It is crucial to prioritize the prevention of HAIs, as they have a significant impact on the ability of health systems to effectively respond to infection risks while providing clinical care to patients.

Infection prevention and control (IPC) is a practical and evidence-based approach aimed at protecting patients and health workers from avoidable infections. It plays a critical role in preventing healthcare-associated infections (HAIs) and safeguarding the well-being of patients and healthcare workers.

To prevent HAIs, measures such as standard precautions (including hand hygiene, use of gloves, gowns, eye protection, use of cough etiquette, and safe disposal of sharp instruments) and isolation precautions used to interrupt the risk of transmission of pathogens (contact, droplet, and airborne precautions) are recommended and implemented widely(10).

Healthcare facilities can prevent the transmission of infections between patients, healthcare workers, and visitors by adhering to IPC protocols. This not only protects vulnerable patients with compromised immune systems but also ensures the well-being of healthcare providers who are at risk of occupational exposure. Moreover, effective IPC measures can help contain outbreaks and prevent the dissemination of antibiotic- resistant organisms, thereby addressing the growing concern of antimicrobial resistance.

The implementation of IPC practices requires collaboration and commitment at all levels of the healthcare system. From policymakers to facility managers, healthcare workers to patients, everyone has a role to play in promoting and maintaining a culture of infection prevention and control. Education and training programs are essential to raise awareness and ensure compliance with best practices.

In the realm of patient safety and quality of care IPC stands out as a vital aspect that applies universally to every health worker and patient in any healthcare setting. Neglecting IPC protocols can result in harm and even fatalities. It is impossible to deliver quality healthcare without the implementation of effective IPC measures. As we face the threat of antimicrobial resistance (AMR) and strive to provide comprehensive and patient-centered healthcare services to all individuals, IPC plays a crucial role. There is an abundance of evidence demonstrating that following IPC best practices leads to significant reductions in HAIs and patient harm. The most favorable outcomes occur when IPC is supported by both political and management backing, integrated into clinical services, and embedded within a patient safety culture.

To achieve effective IPC, continuous efforts are required at all levels of the health system, involving policymakers, facility managers, health workers, and individuals seeking health services.

In conclusion, infection prevention and control are paramount in the fight against healthcare-associated infections. It is a proactive approach that saves lives, reduces healthcare costs, and improves the overall quality of care. By prioritizing IPC, we can create safer healthcare environments and foster better health outcomes for all.

INTRODUCTION TO HEALTHCARE ASSOCIATED INFECTIONS SURVEILLANCE

Definition of HAI Surveillance

Surveillance is defined as "the ongoing, systematic collection, analysis, interpretation and evaluation of health data closely integrated with the timely dissemination of these data to those who need it".

The purpose of undertaking healthcare-associated infection (HAI) surveillance is to monitor and support improvement in the quality and safety of patient care within a healthcare facility. Data should not be collected just for the purpose of collecting data – the data needs to be used to support the implementation of strategies that will reduce the risk of patients acquiring HAIs. Effective surveillance systems are the drivers for change and make it possible to evaluate the effectiveness of IPC interventions.

An effective surveillance system is one that provides timely feedback to HCF clinicians and managers to enable change to happen.

Surveillance complements other prevention strategies including clinical interventions to improve the quality of care, adoption of evidence-informed practice and outbreak identification and management.

Essential components of the surveillance cycle

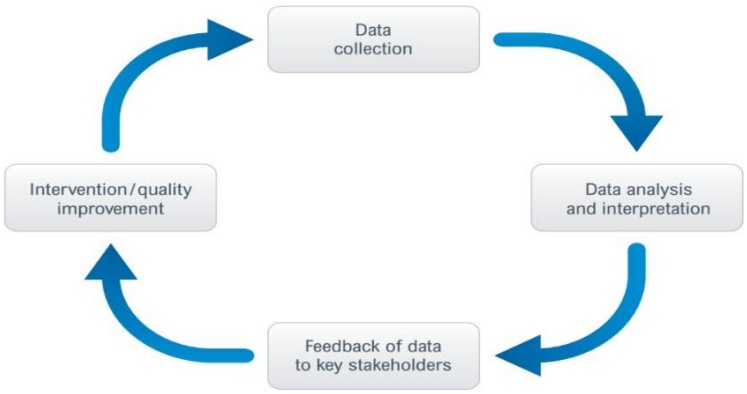


Figure 2-HAI surveillance Cycle

Rationale for surveillance

Surveillance of HAIs provides objective data on which to base decisions. Surveillance data enables us to determine whether a problem exists, identifies the size of the problem, and allows observation of trends over time. A sound surveillance system should:

1. Determine baseline HAI rates.
2. Detect changes in rates or distribution of HAI.
3. Facilitate investigation of significant increases in HAI rates
4. Determine the effectiveness of infection prevention measures.
5. Monitor compliance with established infection prevention practices.
6. Evaluate interventions and change in practice.
7. Identify areas where research would be beneficial.

Types of HAI surveillance

Surveillance can take two forms where Outcome surveillance measures the incidence of Healthcare Associated Infections (HAIs) such as Central Line Associated Bloodstream Infection (CLABSI), Catheter Associated Urinary Tract Infection (CAUTI), Ventilator Associated Pneumonia (VAP), Surgical Site Infection (SSI) and Multi-Drug Resistant Organisms (MDROs) cases and Process surveillance are the interventions implemented to prevent HAIs such as hand hygiene compliance, care bundles compliance, environmental cleaning, proper waste management.

Surveillance data is used in hospitals to make decisions about how to allocate resources, prevent disease outbreaks, and promote health. Some of the benefits of surveillance include early identification of outbreaks, monitoring disease trends, evaluation of public health interventions and appropriate resource allocation. The following are types of surveillance.

Active surveillance

Involves actively seeking out health care-associated infections on a regular basis by individuals trained in surveillance, usually IPC staff. This can be done by conducting surveys, interviews, or laboratory testing. IPC personnel seek out possible health care- associated infections on a regular basis (e.g., several times per week) using a variety of data sources and or determines whether an infection meets the criteria for a health care- associated infection based on the standardized case definitions.

Passive surveillance

A passive surveillance system consists of the regular, ongoing reporting of diseases and conditions in patients and resident populations. This involves collecting data on cases of a particular disease or condition that are reported. It equally collects data on disease incidence or adverse effects of medicines. It relies on staff and services, who are part of a reporting network, collecting data and generating reports. In passive surveillance there is no active search for cases, rather information from other sources e.g., laboratories, doctors' notes are collected.

Sentinel surveillance

This involves collecting data on cases of a particular disease or condition from a select group of people or settings. This data can be used to identify trends or patterns that may not be apparent from data collected from the general population.

Syndromic surveillance

This involves collecting data on symptoms or signs that may be associated with a particular disease or condition. This data can be used to identify potential outbreaks before they occur.

Environmental surveillance

This involves systematic collection, analysis, and interpretation of data about the physical environment of the healthcare setting, to identify and prevent the spread of infection. Environmental surveillance can be used to monitor a wide variety of environmental factors, such as: air quality, water quality, food safety, waste disposal, personal protective equipment (PPE), hand hygiene and infection control practices.

Surveillance Cycle

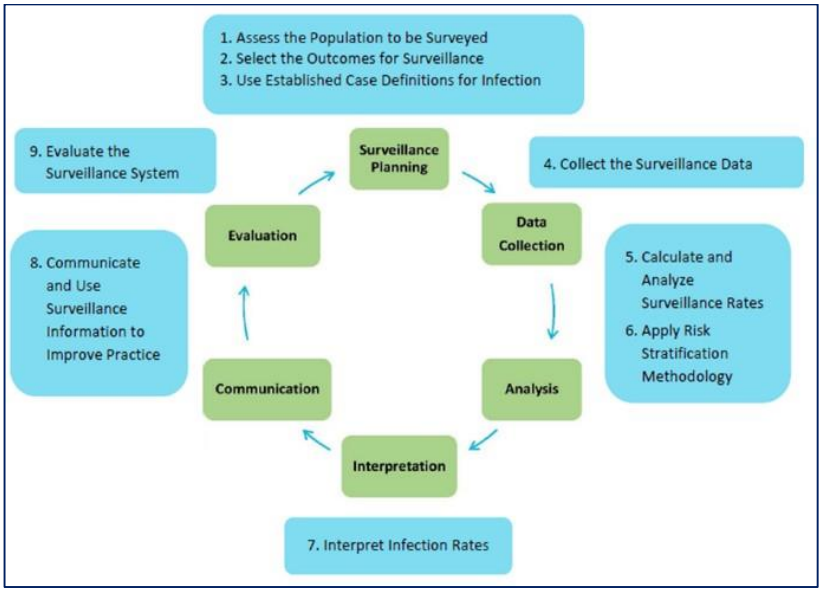


Figure 3-Surveillance Cycle. - Provincial Infectious Diseases Advisory Committee on Infection Prevention and Control (PIDAC-IPC) 2014

Surveillance Location

The location of surveillance may be inpatient, outpatient, or both.

- CLABSI, CAUTI and VAP will be surveyed only in inpatients.
- SSI and MDRO may be surveyed in both inpatients and outpatients.
- CLABSI, VAP, CAUTI and SSI care bundles will be surveyed in inpatients.

Inpatient locations

Locations serving patients whose date of admission to the healthcare facility and the date of discharge are different calendar days.

Intensive Care Unit (ICU): This unit is a nursing care area that provides intense observation, diagnosis, and therapeutic procedures for patients who are critically ill. The critical care could be surgical, medical, trauma, respiratory, neurological, etc.

Specialty Care Area (SCA): This area is a hospital location that includes one of the following types of specialty care areas: bone marrow transplant, solid organ transplant, inpatient acute dialysis, and hematology/oncology.

Other inpatient: This section includes any inpatient locations that do not have an ICU or SCA, e.g., inpatient medical, surgical, or other wards, step-down units, or operating rooms (ORs). The OR may include an operating room, c-section room, interventional radiology room, a cardiac catheterization lab, or a post-anesthesia care unit.

Outpatient locations

These locations serve patients whose date of admission to the healthcare facility and the date of discharge are the same calendar day. These may include any outpatient clinic, the Outpatient Emergency Department, or same day surgery and its 24-hour observation area.

Selection of HAIs Surveillance Indicators

The Ministry of Health undertook a rigorous process to select five healthcare-associated infections (HAIs) to monitor nationally, ensuring effective surveillance and focused intervention strategies. The goal was to address the significant impact of HAIs on patient safety and healthcare outcomes across the country.

The selection process began with a comprehensive review of available data and evidence on HAIs within the national healthcare system. This involved analyzing epidemiological reports, research studies, and input from healthcare providers to identify the most prevalent and impactful HAIs.

In addition to assessing the burden of HAIs, the Ministry of Health considered the severity of associated complications and the potential for preventability. Emphasis was placed on infections that contribute to increased morbidity, mortality, and healthcare costs, while also considering the feasibility of implementing surveillance and intervention programs. To ensure a holistic approach, the Ministry of Health engaged with a wide range of stakeholders, including healthcare professionals (public and private), infection prevention and control experts, public health officials, and patient advocacy groups. Their input was invaluable in understanding the practical challenges, emerging threats, and specific regional variations in HAI prevalence.

The selection process also considered the alignment with global best practices and recommendations, such as those provided by the World Health Organization (WHO), Centers for Disease Control and Prevention and other relevant international, regional, and in-country bodies. This ensured that the chosen HAIs were in line with internationally recognized priorities and standards.

Ultimately, the Ministry of Health selected five HAIs that represented a combination of high burden, preventability, severity, and feasibility of surveillance and intervention. These priority HAIs will serve as the basis for a national HAIs surveillance program, allowing for consistent monitoring, benchmarking, and targeted interventions to reduce the occurrence and impact of these infections.

Through this systematic and collaborative approach, the Ministry of Health aims to improve patient safety, enhance healthcare quality, and reduce the overall burden of HAIs in the country. The selection of these five priority HAIs reflects the commitment to evidence-based decision-making and the collective effort to promote safer and more effective healthcare delivery nationwide.

National HAIs surveillance allows aggregation of data from many healthcare facilities, leading to a larger dataset with increased statistical value. Nationwide trends can be identified to inform priorities for national infection prevention interventional policies.

Indicators selected for the national HAI surveillance include:

1. Outcome indicators- VAP, CAUTI, VAP and SSIs
2. Process indicators (Care bundles) for - VAP, CAUTI, VAP and SSIs

Surveillance Methodology

Hospital based HAIs surveillance requires active, patient-based, prospective, priority- directed surveillance (as defined below) of device/procedure associated infection events and their corresponding denominator data by a trained infection control focal person.

Active and passive surveillance

Active surveillance

1. Trained personnel, mainly IPC focal point vigorously look for HAIs.
2. Information is accumulated using a variety of data sources.

Passive surveillance

1. Persons who do not have a primary surveillance role, such as clinicians and ward nurses identify and report HAIs.

Patient-based and laboratory-based surveillance

Patient-based surveillance

1. Count HAIs, assess risk factors, and monitor patient care procedures and practices for adherence to infection control principles.
2. Requires ward rounds and discussion with caregivers.

Laboratory-based surveillance

1. Detection is based solely on the findings of laboratory studies of clinical specimens.

Prospective and retrospective surveillance

Prospective surveillance

1. Monitor patients during their hospitalization.
2. For SSIs, also monitor during the post-discharge period.

Retrospective surveillance

1. Identify infections via chart reviews after patient discharge.

Priority-directed and comprehensive surveillance

Priority-directed surveillance

a. Objectives for surveillance are defined.

b. The focus is on specific events, processes, organisms, and/or patient populations.

Comprehensive surveillance

a. Continuous monitoring of all patients for all events and/or processes

b. Highly personnel resource intensive if done manually.

Recommended Methodologies

These guidelines recommend that all surveillance will be:

» Active surveillance

» Patient-based surveillance

» Laboratory-based surveillance

» Prospective surveillance

» Priority-directed surveillance or Priority-directed surveillance

Surveillance Data Collection

Standard data collection forms will be used. The instructions on filling the form will be provided and numerator and denominator data will be collected for each indicator.

Numerator Data

The numerator is the upper portion of a fraction that is used to calculate a rate or ratio. In surveillance, it is usually the number of cases of a disease or event being studied.

Process Surveillance

Process indicators will track enablers and key steps that result in changes in outcome. To collect information process indicators, the surveillance personnel will look at the actions of HCWs to

improve quality or compliance e.g., compliance with care bundles.

Outcome Surveillance

The number of VAPs, CAUTIs, CLABSI, SSI and MDROS will be counted during the surveillance period.

Denominator Data

For both Process and outcome surveillance the total counts of the cohorts of patients at risk for acquiring an HAI will be collated. This will include:

» Total number of device days for device associated with HAIS.

» Total number of patients who have undergone surgery for SSIs.

» Total number of tested isolates for MDROs.

Sources of denominator data

» Device-associated BSI, VAP, and UTI incidence density rates: visits to patient care areas to obtain daily counts of the number of patients admitted and the number of patients with each commonly used devices associated with HAI (i.e., one or more central line, ventilator, or indwelling urinary catheter)

» Microbiology Laboratory: process laboratory reports

» For SSI rates: detailed logs from the operating room for each operative procedure

Surveillance Data Analysis

Key Concepts

Surveillance should yield incidence rates to allow inter- and intra-facility rate comparisons. Here are some important definitions and concepts:

1. Incidence and prevalence
    - *Incidence rate*: This rate is a measure of the frequency with which an event occurs in a population over a defined period. The numerator is the number of new cases that occur during the defined period, and the denominator is the population at risk.
    - *Prevalence rate*: This rate is the proportion of persons in a population who have a particular disease or condition (new and previously existing) at a specified point in time or over a specified period.
2. Descriptive and Inferential.
    - Descriptive statistics provide numerical information about variables (e.g., mean).
    - Inferential statistics make an assumption about a population based on a sample of the population (Z-test).

Calculating Rates

1. *CLABSI: The CLABSI rate per 1,000 central line-days is calculated by dividing the number of CLABSI by the number of central line-days and multiplying the result by 1,000.*
2. *VAP: The VAP rate per 1,000 ventilator-days is calculated by dividing the number of VAPs by the number of ventilator-days and multiplying the result by 1,000.*
3. *CAUTI: The CAUTI rate per 1,000 urinary catheter-days is calculated by dividing the number of CAUTIs by the number of catheter-days and multiplying the result by 1,000.*
4. *SSI: The SSI rates per 100 operative procedures are calculated by dividing the number of SSIs by the number of specific operative procedures and multiplying the results by 100..*
5. *MDRO Infection (Active) Surveillance: The MDRO infection incidence rate is calculated by dividing*

the number of infections of a certain MDRO type by the number of patient- days and multiplying the results by 1,000.

6. *MDRO Passive Surveillance: The numerator data are the Laboratory identified MDRO Events, while the denominator data are the number of patient-days, admissions, and encounters (for ER and outpatient locations).*

Describing The Rates

Common descriptive statistical measurements will be used. These will include:

Measures of Frequency

Rates, ratios, and proportions will be used to measure the occurrence and risk of an AI in a specific population during a given period.

1. Rate: an expression of the frequency with which an event occurs in a defined population; for example, the CLABSI incidence rate is 5.3 per 1,000 patient-days
2. Ratio: the value obtained by dividing one quantity by another; for example, the ratio of females to males is 2:1
3. Proportion: a type of ratio in which the values in the numerator are included in (i.e., are a subset of) the denominator; for example, 33% of the population is in risk category

Measures of Central Tendency

Measures of central tendency describe the values around the middle of a set of data. Two measures of central tendency used in healthcare surveillance are the arithmetic mean and the median.

1. The mean is the mathematical average of the values in a set of data. Although the mean is commonly used, it is important to remember that its value is affected by outliers (extremely low or high values)
2. The median is the middle value in a ranked set of data. Because half of the measurements in the data set lie below the median and half of the measurements lie above it, the value of the median is not affected by outliers.

Measures of Dispersion

Measures of dispersion measure the distribution of a set of data around its mean. Commonly used measures of dispersion in hospital epidemiology are the range and standard deviation.

1. The range is the difference between the smallest value and the largest value in a set of data.
2. The standard deviation is a measure that reflects the distribution of values around the mean.

Percentiles

Percentiles may be used to indicate the relative position of a measurement with respect to other measurements in a set of data. The median is the 50th percentile in a distribution of numbers because half of the values in the distribution are lower and half are higher than the median value. In addition to the median, the commonly used percentiles for reporting surveillance data are the 10th, 25th, 75th, and 90th percentiles.

Other Parameters

The above will be the basic parameters guided for HAI surveillance. A facility, depending on technical and other capacities may utilize the following:

1. Comparing Rates
    - *Z-test*: It is a statistical test used to determine if the rate difference between 2 independent groups is large enough to be statistically significant, that is, if it is unlikely to have occurred by chance.

- *p-value*: It is the probability of obtaining a value of the test statistic at least as extreme as the one that was actually observed, given that the null hypothesis is true.

2. Stratification and Standardization
3. Statistical error

Benchmarking

Benchmarking is the process of comparing oneself to others who are performing similar activities, to continuously improve. Although it is very appealing to compare one's rates externally with others' rates, the comparisons should be made only after ensuring that the following conditions are met:

» Criteria for defining a case are standardized and up to date.

» Criteria are consistently used by all participants and all data collectors.

» The population and time period for the study are well defined.

» The surveillance methodology is standardized and consistently used by all of the participants over time.

» Rates and ratios are calculated using the same numerators (number of cases) and denominators (population at risk).

» The size of the population studied (denominator) is large enough to provide an accurate estimate of the true rate.

» All data collectors receive training on how to collect data and use a standardized form.

» The facility and population that is compared is similar to the types of facilities and populations in an aggregate database used for external comparison (for example, data from a neonatal ICU is compared with data aggregated from other neonatal ICUs).

» There is a mechanism for ensuring the accuracy, sensitivity, and specificity of the collected data.

» The analysis and interpretation of the data provided by the benchmarking system is accurate and in a form that is understandable to the users.

» Feedback will be disseminated to those who can affect change.

Surveillance Reporting

A written report should be developed to provide a mechanism to interpret and disseminate surveillance data to stimulate performance improvement activities. Tables, graphs, and charts are effective tools for organizing, summarizing, and visually displaying data and should be used as applicable. The format and level of detail in each report will depend on the intended audience.

A surveillance report should:

1. Define the event, population, setting, and time period studied (e.g., surgical site infections in patients undergoing coronary artery bypass graft in hospital A from January through December 2003)
2. State the criteria used for defining a case. Specify the number of cases or events identified and the number in the population studied (e.g., 2 surgical site infections occurred during 179 total hip replacement procedures)
3. Explain the methodology used to identify the cases (e.g., case reports from personnel and review of medical records and laboratory results)
4. Identify the statistical methods and calculations used, when appropriate (e.g., fall rate in April = falls in April / # resident days in April x 1,000 or 3/414 x 1,000 =7.2 falls per 1,000 resident-days)

5. State the purpose for conducting surveillance (e.g., to reduce the rate of occurrence of an event)
6. Interpret the findings in a manner that is understandable to those who read the report.
7. Describe any actions taken and recommendations made for prevention and control measures.
8. Identify the author and date of the report.
9. Identify the recipients of the report.

Mechanism of reporting: After you prepare the report according to the above criteria (including conclusions and recommendations that are easy to understand), the following persons/bodies need to receive a copy of your final report:

1. Immediate supervisor, higher ranking administration, or any other healthcare facility employee who is required (by your facility's local policies) to be informed and/or are authorized to implement the suggested recommendation.
2. Ministry of Health or even higher national or international bodies (according to your country's health policies regarding certain outbreaks).
3. Healthcare workers who have immediate concerns about the report contents (e.g., the surgical team that performed the procedures for which you are reporting SSI rates)
4. Infection Control Practitioners (ICPs) who are directly involved in data collection as a way to keep them informed as well as promote quality improvements.

Feedback

Feedback of analyzed data in a timely manner to key stakeholders is an important requirement of surveillance programs to drive change and improve outcomes and has been demonstrated to be effective in reducing infections when provided to clinicians.

Surveillance results need to be communicated to appropriate committees and to the executive management who are accountable for patient safety and quality and have the ability to make changes within the facility.

SURVEILLANCE OF SPECIFIC HAIS

Surgical Site Infections

Definition of Terms

Surgical Site Infection (SSI)

Surgical site infections (SSIs), also known as surgical wound infections, occur in the incision site, deep tissues, organs, or cavities within 30 to 90 days following a surgical procedure or as a result of surgical intervention(11).

Operative procedure

A procedure that occurs during an operation, which is defined as a single trip to the operating room (OR) where a surgeon makes at least one incision through the skin or mucous membrane, including a laparoscopic approach, and closes the incision before the patient leaves.

Implant

A nonhuman-derived object, material, or tissue that is permanently placed in a patient during an operative procedure and is not routinely manipulated for diagnostic or therapeutic purposes. Examples include synthetic heart valves, mechanical heart, metal rods, mesh, sternal wires, screws, and cement.

Burden of SSIs

SSI is the most common healthcare-associated infection in low- and middle-income countries, and surgery can affect up to one-third of patients(11).

Although there is no comprehensive global data, the prevalence of SSI in low- and middle-income countries (LMICs) is higher than that in high income countries (HICs). According to estimates by the World Health Organization (WHO) in 2011, the incidence of SSI in high income countries ranges from 1.2 to 5.2%, while that in LMICs is 10.8%. In sub-Saharan Africa, the prevalence of SSI is 16%, ranging from 6.8 to 26%(12).

In a study to assess the pattern of pathogens and their Sensitivity isolated from surgical site Infections at the Aga Khan University Hospital, Nairobi, the SSI incidence rate was found to be 7.0% though this was relatively lower than the ones documented in other studies in Kenya(13). In a study to assess the incidence and risk factors for surgical site infection following emergency laparotomy at Kenyatta National Hospital, the overall incidence of SSI was 30.8% with male patients having infection rate of 20.8%(14).

Classification of SSI

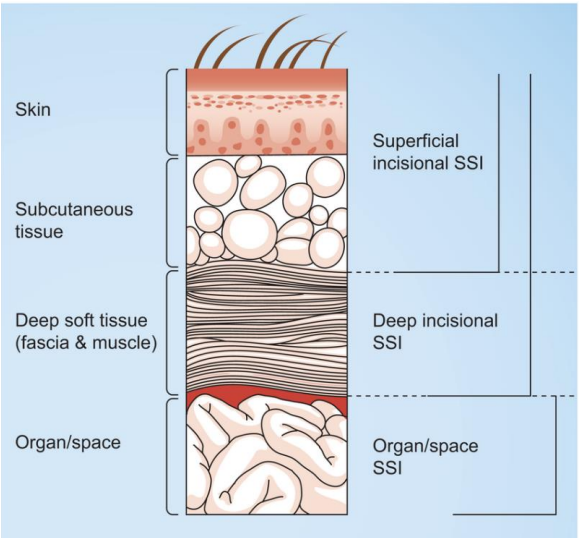


Figure 4-Classification of surgical site infections according to CDC National Nosocomial Surveillance System SSI: Surgical site infection

Superficial incisional SSI

A superficial incisional SSI involves only the skin and subcutaneous tissue of the incision and the date the SSI identified occurs within 30 days of the operative procedure.

Deep Incisional SSI

A deep incisional SSI involves deep soft tissues e.g., fascia and muscle layers and the date the SSI is identified occurs within 30 of the operative procedure depending on operation type.

Organ/Space SSI

An organ/space SSI involves any part of the body deeper than the fascia or muscle layers that are opened or manipulated during the operative procedure and the date the SSI is identified occurs within 30 days of the operative procedure and one year where the procedure involves an implanted material.

SSI Diagnostic criteria

Superficial incisional SSI

- Discharge of pus from the superficial incision
- Pain, tenderness, localized swelling, redness, or heat
- Positive culture from aseptically collected specimen.

Deep Incisional SSI

- Infection appears within 30 days of the procedure or within 90 days if there is an implant or foreign body, such as a prosthetic heart valve or joint prosthesis.
- Spontaneous dehiscence or "gaping" of wound
- Fever >38°C, localized pain, or tenderness
- Positive culture from aseptically collected specimen.

Organ/Space SSI

- Infection appears in an organ or space within 30 days of the procedure in the organ/space that is opened or manipulated during the operative procedure.
- There is purulent drainage from a drain that is placed into the organ/space.
- Organisms are identified from fluid or tissue in the organ/space by a culture.
- An abscess or other evidence of infection involving the organ/space is detected on gross anatomical or histopathological examination, or imaging test evidence is suggestive of infection.

Risk factors for SSI

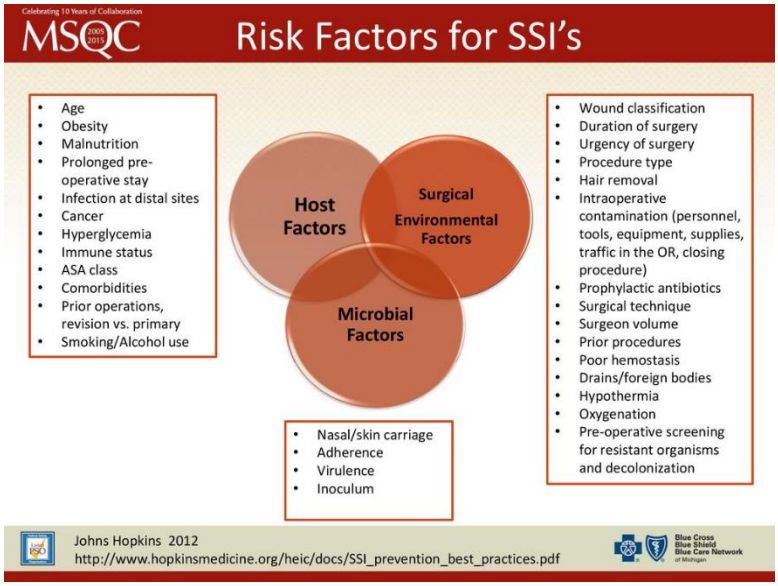


Figure 5-Risk factors for Surgical Site Infections

Impact of Surgical Site Infections

SSIs can have major implications for patients, hospitals, and society; they increase morbidity as well as mortality and as such may contribute to the burden on society in terms of healthcare costs (economic burden) and loss of years experienced in full health. SSIs may also result in excess healthcare utilization and costs. Studies have shown that costs can double, triple, or even increase six-fold for patients with an SSI compared with patients without an SSI depending on the type of surgery, health care setting, and type of infection(15).

Prevention of SSI (Surgical Care bundle)

The surgical bundle is a group of evidence-based interventions for patients undergoing surgery. When implemented together, these interventions result in better outcomes (reduce SSI) than when implemented individually.

Pre-Operative Measures

Preoperative bathing

- » It is good clinical practice for patients to bathe or shower **prior** to surgery.
- » A plain or antimicrobial soap is recommended for this purpose.

Optimal timing for preoperative surgical antibiotic prophylaxis (SAP)

SAP refers to the prevention of infectious complications by administering an effective antimicrobial agent prior to exposure to contamination during surgery. Successful SAP requires delivery of the antimicrobial agent in effective concentrations to the operative site before contamination occurs. Microbial contamination of the wound during the procedure can be of exogenous or endogenous origin. The benefit of the routine use of SAP prior to non-clean and implant surgery to prevent SSI has long been recognized.

Key considerations:

- » Administration of Surgical antibiotic prophylaxis (SAP) prior to the surgical incision when indicated (depending on the type of operation).
- » Administration of SAP within 60 minutes before incision, while considering the half-life of the antibiotic
- » **Abdominal surgery**: Cefazolin, cefoxitin, cefotetan, ceftriaxone, ampicillin– sulbactam,

Clindamycin or vancomycin + aminoglycoside or aztreonam or fluoroquinolone, Metronidazole + aminoglycoside

- **Orthopedic surgery**: Cefazolin, Clindamycin, vancomycin
- **Dental surgery**: Antimicrobial prophylaxis is not routinely indicated in healthy patients undergoing dental or oral surgery procedures. However, there are some exceptions when prophylaxis is recommended, as it reduces the risk of postoperative complications, including implant failure, local infection, or sinusitis. Amoxicillin, for penicillin-allergic patients, alternatives include azithromycin, clarithromycin, or metronidazole.

Timing of SAP

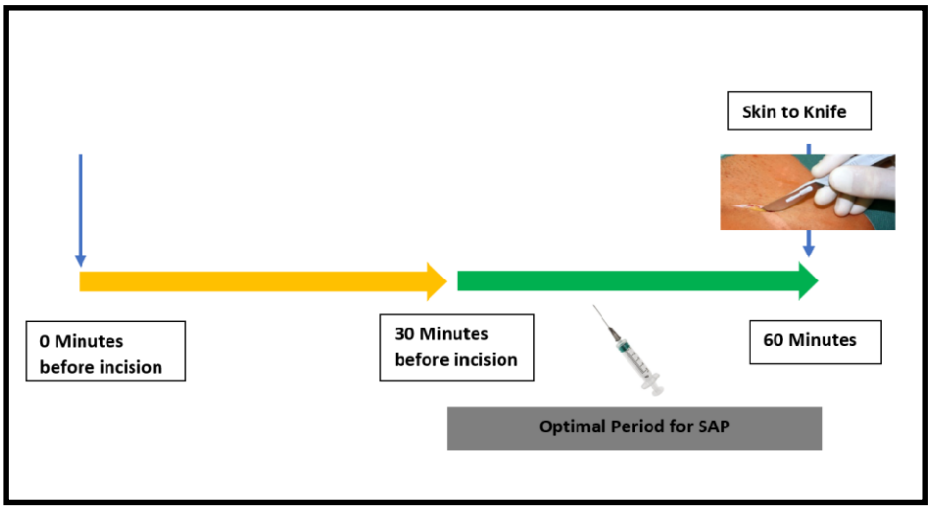


Figure 6-Timing of Surgical Antibiotic Prophylaxis

Mechanical bowel preparation and the use of oral antibiotics

Preoperative oral antibiotics combined with mechanical bowel preparation (MBP) should be used to reduce the risk of SSI in adult patients undergoing elective colorectal surgery. MBP alone (without administration of oral antibiotics) should not be used for the purpose of reducing SSI in adult patients undergoing elective colorectal surgery.

Hair removal

There is prevalent practice of surgical site hair shaving as a part of preoperative preparation. There is uncertainty regarding the benefit versus harm of shaving for SSI. In one study to assess whether shaving impact on surgical site Infection, the overall SSI rate was 11.42% but there was no statistically significant difference in SSI rates between patients who underwent preoperative surgical site hair removal by shaving (232) and who did not have shaving (232) on all the three different assessment timelines in postoperative period, namely, day 7, 14, and 30(16).

Another study concluded that compared with no hair removal, there may be little difference in risk of SSI when clippers or depilatory cream are used (low-certainty evidence). However, there are probably fewer SSIs when hair is not removed compared with shaving with a razor (moderate-certainty evidence). If hair has to be removed, moderate-certainty evidence suggests using clippers or depilatory cream probably results in fewer SSIs and other complications compared with shaving using a razor. There may be a small reduction in SSIs when hair is removed on the day of, rather than the day before, surgery(17).

This guideline advice that patients undergoing any surgical procedure should not have hair at the site of incision removed. If necessary, it should be removed only with a clipper.

Figure 7-Surgical Clippers

Surgical site preparation

Surgical site preparation refers to the preoperative treatment of the intact skin of the patient within the operating room. Preparation includes not only the immediate site of the intended surgical incision, but also a broader area of the patient's skin. The aim of this procedure is to reduce the microbial load on the patient's skin as much as possible before incision of the skin barrier.

- Use alcohol-based antiseptic solutions based on chlorhexidine gluconate (CHG) for (CHG 2% in isopropyl 70% alcohol) for surgical site skin preparation in patients undergoing surgical procedures.
- For intra-oral dental surgeries, the surgical site should be kept aseptic and the patient appropriately prepared and draped for the procedure. It is recommended that the patient rinse with chlorhexidine gluconate for 30 seconds immediately before surgery. A sterile field has to be maintained at all times to avoid contamination of the implant surface.

Surgical hand preparation

The purpose of routine hand hygiene in patient care is to remove dirt, organic material and reduce microbial contamination from transient flora. In contrast to hygienic hand hygiene through handwash or handrub, surgical hand preparation must eliminate the transient flora and reduce the resident flora. In addition, it should inhibit the growth of bacteria under the gloved hand.

- Surgical hand preparation should be performed either by scrubbing with a suitable antimicrobial soap and water or using a suitable Alcohol-based Hand Rub (ABHR) before donning sterile gloves.
- When performing surgical hand antisepsis using an antimicrobial soap, scrub hands and forearms for 2–5 minutes.

Preoperative and/or Intraoperative Measures

Enhanced nutritional support.

Consider administration of oral or enteral multiple nutrient-enhanced nutritional formulas for the purpose of preventing SSI in underweight patients who undergo major surgical operations.

Perioperative discontinuation of immunosuppressive agents

Do not discontinue immunosuppressive medication prior to surgery for the purpose of preventing SSI.

Perioperative oxygenation

Adult patients undergoing general anesthesia with endotracheal intubation for surgical procedures should receive an 80% fraction of inspired oxygen (FiO2) intraoperatively and, if feasible, in immediate postoperative period for 2-6 hours to reduce risk of SSI.

Maintaining normal body temperature (normothermia)

Hypothermia (or low body temperature) is defined as a core temperature below 360C and is common during and after major surgical procedures lasting more than one hour. Exposure to a cold operating room environment and anaesthetic-induced impairment of thermoregulatory control are the most common events leading to hypothermia.

Maintain Normothermia (temperature range from 36 -37.2 0C) during the perioperative period in surgical patients who have an anesthesia duration of at least 60 minutes.

Use of warming devices in the operating room and during the surgical procedure for patient body warming with the purpose of reducing SSI is recommended.

Use of protocols for intensive perioperative blood glucose control

Blood glucose levels rise during and after surgery due to surgical stress. Surgery causes a stress response that results in a release of catabolic hormones and the inhibition of insulin. Moreover, surgical stress influences pancreatic beta-cell function, which results in lower plasma insulin levels.

- » Use protocols for intensive perioperative blood glucose control for both diabetic and non-diabetic adult patients undergoing surgical procedures to reduce the risk of SSI.
- » For both diabetic and non-diabetic patients, the target is to maintain the perioperative glucose level between 7.8-11.1 mmol/L.
- » It is imperative to ensure normoglycemia preoperatively, intraoperatively, and postoperatively.

Maintenance of adequate circulating volume control/normovolemia

Wound healing and resistance to infection is dependent on tissue oxygen tension. In addition, sufficient tissue oxygenation is essential for collagen synthesis and wound repair and is improved by adequate arterial oxygenation. Ideally, perioperative fluid therapy prevents tissue hypoxia by maximizing the cardiac output and thus improving arterial oxygenation.

- » Use goal-directed fluid therapy (GDFT) to maintain adequate perfusion intraoperatively to reduce the risk of SSI.

Drapes and gowns

- » Use either sterile, disposable, non-woven or sterile, reusable woven drapes and surgical gowns during surgical operations for the purpose of preventing SSI.
- » Avoid the use of plastic adhesive incise drapes with or without antimicrobial properties for the purpose of preventing SSI.

Postoperative Measures

Surgical antibiotic prophylaxis prolongation

- » Prolongation of SAP administration after completion of the operation is discouraged for the purpose of preventing SSI. Discontinue antibiotic prophylaxis within 24 hours after surgery.
- » Perioperative antibiotic prophylaxis should not be continued to the presence of a wound drain for the purpose of preventing SSI.

Surveillance Of Surgical Site Infections

The surveillance of HAI is one of the core components of an effective IPC programme. However, defining, detecting, reporting, and interpreting HAI, including SSI, is challenging and requires expertise, time, and resource dedication.

Aims of surveillance

- The primary aim of surveillance is the collection of data on SSI rates in order to obtain a measure of the magnitude of the problem.
- These data must then be analyzed to identify and investigate trends, including a careful interpretation of results.
- Surveillance data should guide the identification of improvement actions and evaluate the effectiveness of these interventions. In this context, the feedback of SSI rates to relevant stakeholders is important.
- to examine and monitor the impact of prevention measures for controlling the incidence of SSI.
- to compare the incidence of SSI over time and with those of other hospitals, if appropriate and feasible.

Key Points

SSI definitions: Given the lack of quality microbiology laboratory support, definitions based on clinical signs and symptoms should be prioritized.

Additional indicators: In addition to data considered essential for SSI diagnosis (outcome indicators), other process and practice indicators are included in data collection to document compliance with important measures to prevent SSI (surgical care bundles).

Surveillance team

Data related to SSI and process and practice indicators for surveillance should be recorded primarily by trained surgical staff/IPC team using standardized forms.

Setting up a surveillance team

Assembling a team of individuals who are motivated to conduct SSI surveillance and disseminate the findings within a health facility is key to success. The size and composition of this team will depend on the interest and availability of local clinical staff, but important disciplines that should be represented in include but not limited to:

- Surgeons
- Anesthetists
- Surgical Ward Staff
- Theatre staff
- IPC staff
- Health Records and Information Officers
- Pharmacists
- Microbiologist

Establishment of support systems

A well-functioning surveillance should be supported by a written plan that states goals and objectives, and other supporting elements including informatics services, computer support and evaluation and reporting methods.

Post-discharge surveillance

- This guideline is based on post-discharge surveillance up to 30 days post-surgery and 90 days follow up for infections after implant surgery.

» Post-discharge surveillance is often challenging, particularly in developing countries where patients may live in remote areas and transport is non-existent or inefficient.

» To mitigate these obstacles, telephone follow-up with patients will be effective.

» There is the need for patient education, based on pre-discharge instructions to recognize signs of infection and to take pictures of the wound if any suspicion emerges.

Enrolment into surveillance

Who to enroll.

Prioritize a particular population, such as a specific type of surgery- E.g., Abdominal hysterectomy, breast surgery, caesarean section.

All eligible patients of a defined target population should be enrolled into the surveillance work.

Exclusion criteria from SSI surveillance.

These should be determined by individual hospitals. This might include patients who are unable to communicate independently or who might be difficult to contact for some other reason.

SSI Surveillance duration

» All eligible patients under surveillance for SSI must be followed up during the initial admission period until discharge and monitored for readmission.

» To detect an SSI, procedures are to be monitored for the following periods.

» Surgery without implants - 30 days

» Surgery with implants - 90 days

SSI Surveillance data collection

In SSI surveillance, there are two major time periods for data collection:

a. Peri-operative period - Around the time of the operation itself (that is, inpatient)

b. Post Discharge/operative period - The 30-day or 90-day period after the operation

Peri-Operative Period

» Each patient will require one form per operation.

» If a patient goes back to the theatre for a new (unrelated) operation, then a new form should be started.

- If this is within 30 days of the previous surgery, then the surveillance from the previous surgery should be discontinued.
- If more than 30 days have passed, then this should be considered as a distinct surgical episode.
- If a patient has two anatomically distinct procedures during the same operation (for example, bilateral inguinal hernia repair), it may be logistically easier to complete two forms as these represent two separate operations from a surveillance perspective.

Post-operative period

After the surgical operation has taken place, the second phase of data collection begins, which will normally last for the 30-day or 90-day period after the operation.

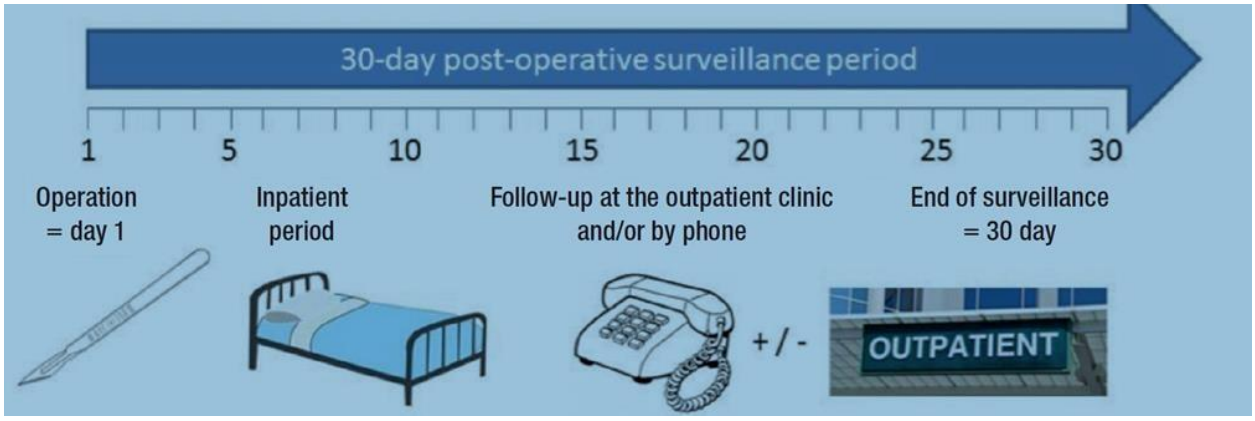
» Each operation will require one postoperative form.

» Information should be given to the patient and clear instruction/training delivered to allow the patient to actively report any signs and symptoms of infection. Across the whole 30-day period, a total of three reviews of the patient are recommended. Ideally, these would be

spaced out so that these occur at roughly the end of week 1, week 2 and week 4.

» For patients with prolonged follow-up a total of five follow-up interactions ***(7 days, 14 days, 30 days, 60 days, and 90 days) is recommended.***

» Follow-up calls to patients should be made by a trained staff member involved in the surveillance work.



Scope of SSI Surveillance

This guideline applies to all health facilities that perform surgical procedures. The surveillance will narrow down to the following surgical procedures.

1. Abdominal Surgeries
2. Orthopedic Surgeries
3. Dental Surgeries

SSI Surveillance Data Sets

Surgical Care Bundles (Process) data sets

Numerator Data

a. *Intraoperative Blood glucose measured*-The number of surgeries whose blood glucose was measured at any point during the operation (Between skin incision and wound closure)

b. *Intraoperative blood glucose Level*-The level of blood glucose in mmol/L recorded during the intraoperative period. This will be compared with the prescribed range and recorded as hyperglycemic, normoglycemic or hypoglycemic.

c. *Preoperative Surgical Antibiotic Prophylaxis given within 60 minutes of incision.* -The number of patients who received recommended surgical antibiotic prophylaxis within 60 minutes of the skin incision.

d. *Preoperative hair removal*-The number of surgeries where hair was not removed by whichever means prior to the surgery.

e. *Method of hair removal where necessary*-Number of surgeries where surgical clippers were used to remove hair prior to surgery.

f. *Use of chlorhexidine+Alcohol or Povidone Iodine+Alcohol to clean surgical incision site prior to surgery*-A number of surgeries where chlorhexidine+Alcohol or Povidone Iodine+Alcohol was used to clean the surgical incision site prior to surgery.

g. *Postoperative body temperature measurement*-Number of surgeries where body temperature

was measured taken within one hour after wound closure? (Applies for surgical procedures lasting at least one hour)

h. *Postoperative temperature*--Level of temperature recorded in °C. This will be compared with the prescribed range and recorded as hyperthermic, normothermic or hypothermic.

Denominator data

Total number of surgeries enrolled for surveillance.

Calculating Compliance rate

Examples

The number of surgeries whose blood glucose was measured x 100 Total number of surgeries enrolled for surveillance.

Number of surgeries with elevated blood sugar (hyperglycemia x 100 Total number of surgeries enrolled for surveillance

The number of patients who received recommended surgical antibiotic prophylaxis x 100 Total number of surgeries enrolled for surveillance.

SSI (Outcome) data sets

Numerator data

Total number of SSIs reported during the surveillance period.

Denominator data

Total number of surgeries (the 3 categories in the scope) performed during the surveillance period.

NB:

1. It is ideal to enroll **all** surgeries for surveillance.
2. Due to various challenges leading to low enrolment rates, the guideline recommends that for reliable and quality data a facility should aim to enroll at least 80% of its surgeries. In this case, and for purposes of this guideline, the **total number of surgeries enrolled for surveillance** will be used as the denominator to calculate the SSI rate.

Calculating SSI rate

SSI rate = Total number of SSIs reported during the surveillance period x 100 Total number of surgeries enrolled for surveillance

Loss to follow-up

Threshold that is acceptable.

» Some have suggested that <5% loss leads to little bias, while >20% poses serious threats to validity.

The effect on calculating the SSI rate.

» Loss to follow up varies with the group enrolled for surveillance and may affect the study findings.

Recommendations on how to go about it.

» When analyzing and sharing your findings, it is good practice to demonstrate the follow-up rate.

Central Line-Associated Bloodstream Infection (CLABSI):

Operational Definitions

Central Venous Catheter (CVC): An intravascular catheter that terminates at or close to the heart, or in one of the great vessels AND is used for infusion, withdrawal of blood, or hemodynamic monitoring. These include aorta, pulmonary artery, superior vena cava, inferior vena cava, brachiocephalic veins, Internal jugular veins, subclavian veins, external iliac veins, common iliac veins, femoral veins, umbilical artery/vein.

Eligible Central Line: A Central Line (CL) that has been in place for more than two consecutive calendar days (on or after CL Day 3), following the first access of the central line, in an inpatient location, during the current admission.

Central line days: The count of central lines on an inpatient unit that is recorded in the monthly denominator summary data. This count begins on the first day the central line is present, regardless of access.

A laboratory-confirmed bloodstream infection: a bacterial or fungal pathogen that is not a common commensal organism, detected from one or more blood specimens and unrelated to infections at other sites.

Inclusion criteria: Properties of target population to which the study's results should be generalizable.

Definition of CLABSI

CLABSI is said to be present if there is a confirmed blood stream infection by laboratory which meets any one of the following criteria in all age groups(18):

- Patient has a recognized pathogenic microbe cultured from one or more blood cultures, which is not related to an infection at another site.
- Patient has at least any of these signs or symptoms
  - Fever (>38.0°C)
  - Chills
  - Hypotension
- The pathogen is not related to infections at any other site or, if the pathogenic microbe is a common commensal, it must be isolated from two or more blood cultures sampled on different occasions.

Epidemiology and Local burden

CLABSIs not only are costly to health care systems and individuals but can also increase morbidity and mortality significantly in both developed and developing countries. CLABSIs are serious infections but often preventable when evidence-based guidelines such as CLABSI care bundle are used during the insertion and maintenance of central venous catheters.

A prospective surveillance study conducted in 106 hospitals between January 2018 and December 2019 in Saudi Arabia, and with data from 14 different types of intensive care units (ICUs), indicated overall CLABSI rate of 3.24 per 1,000 central line-days(18) a study in South Africa indicated a rate of 26.3/1 000-line days while one in Ethiopia indicated a rate of 1.4 cases per 1000 central line days(6,19,20).

A study on the predictors and prevalence of central line associated blood stream infections among adult patients in critical care units at Kenyatta National Hospital yielded a CLABSIs rate of 3.53%(21).

Risk factors

- *Patient Characteristics*- Immunocompromised host/neutropenic hosts Severe skin burns, or protein calorie malnutrition Prolonged hospital stay prior to device placement *Provider Characteristics*-Emergency insertion Excessive device manipulation Incomplete adherence to safe insertion practices Failure to remove unnecessary devices Low nurse- to-patient staffing ratio (catheter hub care)

» *Device Characteristics-* Site of insertion Number of lumens Indication for use (total parenteral nutrition, chemotherapy)

Complications

Death, end organ failure, thrombosis, AMR

Additional information about CLABSI:

» *Symptoms:* The symptoms of CLABSI may include fever, chills, redness, swelling, or pain at the site of the central line.

» *Diagnosis:* CLABSI is diagnosed by collecting blood sample from the central line and testing it for bacteria that tested Positive from a peripheral blood culture with any one of the following:

- At least threefold higher number of organisms grown from the catheter versus the peripheral blood culture on simultaneously drawn cultures.
- Growth from the catheter-drawn blood culture occurring at least two hours before growth of the same organism from a percutaneously drawn blood culture.

» *Treatment:* CLABSI is treated with antibiotics. The type of antibiotic used will depend on the bacteria that is causing the infection.

» *Prognosis:* The prognosis for CLABSI depends on a number of factors, including the patient's overall health, the type of bacteria that is causing the infection, and the promptness of treatment.

Prevention (care bundles)

This is a group of evidence-based practices that, when implemented together, have been shown to improve patient outcomes. Care bundles for Central Line-Associated Bloodstream Infections (CLABSI) typically include the following interventions:

Insertion bundles

» *Hand hygiene:* This is the most important intervention for preventing CLABSI. Healthcare workers should wash their hands with soap and water or use an alcohol-based hand sanitizer before and after touching a patient, their environment, or any medical equipment.

» Use of chlorhexidine in 70% alcohol for skin antisepsis: Chlorhexidine in 70% alcohol for skin antisepsis is an effective way to reduce the risk of infection during central line insertion.

» *Use of maximal sterile barriers (MSBs)* during central line insertion: MSBs are a set of personal protective equipment (PPE) that help to prevent the introduction of bacteria into the bloodstream during central line insertion. They include a sterile gown, gloves, mask, and cap.

» *Antimicrobial-impregnated central line dressings:* These dressings can help to reduce the risk of infection by killing bacteria that may be present on the skin around the central line.

» *Central line care bundle monitoring and feedback:* It is important to monitor compliance with the care bundle and provide feedback to staff on areas where improvement is needed. This can help to ensure that the care bundle is implemented consistently and effectively.

Maintenance bundles

» *Hand hygiene:* Before touching a patient or any inserted device Healthcare workers should wash their hands with soap and water or use an alcohol-based hand sanitizer.

» *Prompt removal of unnecessary central lines:* Central lines should only be left in place as long as necessary. Once they are no longer needed, they should be removed as soon as possible to reduce the risk of infection.

» *Disinfect* the catheter hubs, injection ports, and connections before accessing the line.

» Replace administration sets other than sets used for lipids or blood products every 96 hours.

» *Frequency of dressing changes*: The frequency of dressing changes may vary depending on the type of dressing used and the patient's condition. However, most experts recommend changing dressings at least once a week.

» *Use of antimicrobial-impregnated dressings:* Antimicrobial-impregnated dressings can help to reduce the risk of infection by killing bacteria that may be present on the skin around the central line.

» *Use of chlorhexidine skin antisepsis:* Chlorhexidine skin antisepsis is an effective way to reduce the risk of infection at the central line insertion site.

» *Avoidance of non-essential line manipulation:* Healthcare workers should avoid non-essential line manipulation, such as accessing the line for blood draws or medication administration, as this can increase the risk of infection.

» *Prompt identification and treatment of complications:* If a patient develops a complication related to their central line, such as redness, swelling, or pain at the insertion site, it is important to identify and treat the complication promptly to prevent infection.

CLABSI Surveillance

Introduction

Central Line Associated Bloodstream Infection (CLABSI) surveillance is an important tool for infection prevention and control. By tracking CLABSI rates, healthcare facilities can identify risk factors for CLABSI and implement interventions to reduce CLABSI rates. This can help to improve patient safety and reduce the burden of healthcare-associated infections. The methodology employed addresses both outcome and process interventions.

Steps involved in conducting CLABSI surveillance in clinical or hospital settings are as follows:

1. *Define the population to be monitored.* The first step is to define the population of patients who will be monitored for CLABSI. This may include all patients who have a central line inserted, or it may be limited to a specific subset of patients, such as those who are in the ICU or those who have a certain type of central line.
2. *Develop a case definition*. The next step is to develop a case definition for CLABSI. This definition should specify the criteria (inclusion and exclusion) that must be met for a case to be considered a CLABSI. The criteria may include the type of central line, the location of the central line, the presence of signs and symptoms of infection, and the results of laboratory tests.
3. *Collect data*. Once the case definition has been developed, the next step is to collect data on CLABSI cases. This data may be collected from a variety of sources, such as patient records, daily observations, laboratory reports, and infection control logs.
4. Analyze *the data*. Once the data has been collected, it is analyzed to identify trends and patterns in CLABSI rates. This analysis may include comparing CLABSI rates over time, comparing CLABSI rates between different populations of patients, and identifying risk factors for CLABSI. At this point, CLABSI may be identified as per the case definition as follows:

   » *Suspected case:* A suspected case is a case that meets the following criteria:

   - The patient has a central line in place.
   - The patient has signs and symptoms of infection, such as fever, chills, or redness, swelling, or pain at the site of the central line.

- The patient does not have positive blood cultures.

» *Probable case:* A probable case is a case that meets the following criteria:

- The patient has a central line in place.
- The patient has signs and symptoms of infection, such as fever, chills, or redness, swelling, or pain at the site of the central line.
- The patient has a positive peripheral blood culture.

» *Confirmed case:* A confirmed case is a case that meets the following criteria:

- The patient has a central line in place.
- The patient has a positive peripheral blood culture.
- The bacteria isolated from the blood cultures is the same as the bacteria isolated from the central line.

Take action. Provide feedback to the concerned clinical area for appropriate action. Then take appropriate steps to reduce CLABSI rates. This may involve implementing infection control interventions, such as hand hygiene training, maximal sterile barrier precautions, and aseptic techniques.

Process surveillance: Process surveillance may be employed as a way of identifying root causes of increased cases of CLABSI. The processes that can be audited include Care bundles and hand hygiene.

Inclusion and Exclusion criteria

By understanding the inclusion and exclusion criteria for CLABSI surveillance, health workers and healthcare facilities can ensure that they are collecting accurate data on CLABSI rates. This data can then be used to identify risk factors for CLABSI and implement interventions to reduce CLABSI rates.

» Inclusion criteria for CLABSI surveillance

» A patient must have had a central line catheter for equal to or more than 48 hours.

» The patient must NOT have any other sources of infection.

» The central line was inserted in the health facility.

» A positive culture within 24 hours of central line removal

» Patients who have signs and symptoms of infection, such as fever, chills, or redness, swelling, or pain at the site of the central line.

Rates Calculations

The CLABSI rate per 1000 central line days is calculated by dividing the number of CLABSIs by the number of central line days and multiplying the result by 1000.

$$\text{CLABSI Rate} = \frac{No.\ of\ CLABIs}{No.\ of\ Central\ Line\ Days} * 1000$$

Ventilator-Associated Pneumonia (VAP)

Definitions

Pneumonia

A lung infection diagnosed by using a combination of clinical, radiological and laboratory criteria.

Ventilator-associated pneumonia (VAP)

Ventilator-associated pneumonia (VAP), a hospital acquired pneumonia that occurs more than 48 hours after mechanical ventilation, is a common complication of mechanical ventilation with a high mortality rate(22).

The infection is usually as a result of one or both of the following:

- Colonization of the aerodigestive tract consisting of the organs and tissues of the respiratory tract (pharynx, larynx, trachea, bronchi, and lungs) and the upper digestive tract (esophagus) with pathogenic microorganisms.
- Aspiration of contaminated respiratory secretions and/or regurgitated stomach contents which infiltrate the lungs leading to pneumonia.

Epidemiology

Ventilator-associated pneumonia (VAP) is associated with high morbidity and mortality rates among critically ill patients. The incidence varies between 5% and 67%, depending on case mix and diagnostic criteria, and accounts for 80% of all hospital acquired pneumonias.

According to 2007 data from the European Union, the incidence of VAP was 7% and the incidence density was 8.0/1000 device days. An earlier Polish multicenter study conducted from 2002 to 2003 reported VAP incidence as 6%. However, newer data from 2010 to 2014 and 2015 confirm higher VAP incidence at approximately 9%(23).

Though there is relatively little information available about the Kenyan epidemiology of ventilator-associated infections, a local study done early 2015 reported a 54% incidence of VAP in ICU patients at a tertiary referral hospital. Ventilator associated(24).

Pneumonia is reported to be the most common healthcare-associated infection among patients requiring mechanical ventilation.

Ventilator-Associated Pneumonia (VAP) Care Bundle

The VAP care bundle is a set of evidence-based interventions for patients on mechanical ventilation that when implemented together results in reduction of risk of VAP and therefore leads to best patient outcomes. These interventions include:

1. Elevation of the head of the bed to between 30 and 45 degrees
2. Daily "sedation interruption" and daily assessment of readiness to extubate.
3. Peptic ulcer disease (PUD) prophylaxis
4. Daily oral hygiene
5. Hand hygiene

VAP Surveillance

The ventilator associated pneumonia surveillance through the implementation of the five elements of the VAP care bundle, monitoring, and evaluation of compliance with the care bundle in form of process surveillance and the monitoring of incidence of VAP cases as an outcome surveillance.

A case of ventilator-associated pneumonia (VAP) will be defined a pneumonia where the patient has been on mechanical ventilation for 48 hours or more on the date of event, with day of ventilator placement being Day 1, AND the ventilator was in place on the date of the event or 24 hours before.

Note: If the ventilator was in place prior to inpatient admission, the ventilator day count begins with the intubation and mechanical ventilation date in the first patient location.

If a break in mechanical ventilation occurs for at least 24 hours, ventilator day count starts anew upon reintubation and/or re-initiation of mechanical ventilation.

Surveillance of VAP shall be conducted in critical care areas (inpatient or Emergency Department) to include all adult patients who meet the case definition, no prior signs, and symptoms of pneumonia at the time of or within 48 hours of intubation and initiation of mechanical ventilation, and no contra-indication for head of bed elevation. The exclusion criteria will be critically ill adult patients who are not mechanically ventilated, presence of signs and symptoms of pneumonia at the time or within 48 hours of intubation and initiation of mechanical ventilation, those with contraindication for elevation of head of bed (e.g., cervical spine instability and posterior circulation stroke) and children.

The VAP surveillance shall begin with an active and prospective surveillance over a 3- month period to conduct daily assessment of patients who have been on mechanical ventilation for 48 hours or more. This surveillance will help the facilities to establish the baseline of VAP rates. Patients on mechanical ventilation will be recorded in a register daily. On the fourth month, the daily assessment of mechanically ventilated patients for VAP and the daily recording of patients on mechanical ventilation will continue while the implementation of the five-element VAP care bundle will commence with daily monitoring and evaluation of compliance with the VAP care bundle will also kick off as part of the VAP surveillance. Any patients suspected or identified as having VAP through passive surveillance by a clinician will be included in the data.

Diagnosis

Diagnosing VAP requires a high index of clinical suspicion, radiographic examination, and microbiologic analysis.

Using the provided standardized diagnostic criteria, VAP cases will be categorized as follows:

- VAP A: Clinical symptoms and signs plus radiological findings
- VAP B: VAP A plus microbiological findings

Clinical Signs/Symptoms for VAP

For ANY PATIENT, **at least one** of the following:

Fever (> 38.0°C or > 100.4°F)

- Leukopenia (≤ 4000 WBC/mm3) or leukocytosis (≥ 12,000 WBC/mm3)
- For adults ≥ 70 years old, altered mental status with no other recognized cause.
- And at least two of the following:
  - New onset of purulent sputum or change in character of sputum, or increased respiratory secretions, or increased suctioning requirements.
  - New onset or worsening cough, or dyspnoea, or tachypnoea
- Rales or bronchial breath sounds
- Worsening gas exchange (for example: O2 desaturations (for example: PaO2/FiO2 ≤ 240)
- Increased oxygen requirements, or increased ventilator demand

Radiological Evidence

Two or more serial chest imaging test results with **at least one** of the following:

- New and persistent or
- Progressive and persistent
- Infiltrate
- Consolidation
- Cavitation

Note: In patients without underlying pulmonary or cardiac disease (for example: respiratory distress syndrome, bronchopulmonary dysplasia, pulmonary oedema, or chronic obstructive pulmonary disease), one definitive imaging test result is acceptable.

Laboratory

At **least one** of the following:

- Positive culture result from lower respiratory tract specimen (specifically, BAL or endotracheal aspirate)
- Organism identified from blood.
- Organism identified from pleural fluid.

VAP Surveillance Data Sets

Compliance with VAP care bundle

Numerator

Number fully complied with VAP bundle (fully complied with VAP bundle= all six components were implemented for an individual patient at the point of assessment. This will attract a score of 1, failure to fully implement the six VAP bundle elements attracts a score of 0)

Denominator

Number of VAP care bundle assessments done

Calculation of VAP care bundle compliance rate

Number fully complied with VAP bundle divided by the Number of VAP care bundle assessments done multiplied by 100.

Ventilator-Associated Pneumonia Rates

The VAP numerator is the Number of VAP events.

The diagnosis of VAP is made using a case definition adapted from centers for disease control and prevention (CDC) and the provided diagnosis criteria, and the cases are confirmed by a multidisciplinary Infection Prevention and Control Team (Critical care area IPC Link Person, IPC Chair, IPC Coordinator, Microbiologist are critical members).

Denominator

The VAP denominator is Number of ventilator days.

All patients who are on mechanical ventilation are counted physically and recorded daily in a register as ventilator days.

Calculation of VAP rates

The VAP rate per 1,000 ventilator-days is calculated by dividing the number of VAP by the number of ventilator-days and multiplying the result by 1,000.

Process of data collection

This being a quality improvement focused surveillance, it will entail both process and outcome monitoring. The process surveillance will be on the implementation and monitoring with the implementation of the six elements of VAP care bundle, while the outcome surveillance will be on the identification of VAP rates.

Every day, the primary care nurse allocated to care for the mechanically ventilated patient in the inclusion criteria will assess compliance with the VAP care bundle and complete a standardized scoring checklist for each patient. The primary nurse is also responsible for recording in the form any radiologic and microbiologic findings, including the causative organism(s) if applicable.

The Critical Care Area Infection Prevention and Control (IPC) Link Person will on a daily basis count and record all patients on mechanical ventilation in a designated register and assess the mechanically ventilated patients for VAP. The VAP assessment will be done using the VAP criteria checklist and a VAP assessment tool will be completed for all suspected or identified VAP cases.

The Infection prevention and control coordinator will be responsible for the data analysis, aggregation, dissemination to all relevant stakeholders and posting the VAP rates to HIS platform.

Catheter Associated Urinary Tract Infection (CAUTI)

Catheter-associated urinary tract infections (CAUTIs) are one of the most common nosocomial infections and can lead to numerous medical complications from the mild catheter encrustation and bladder stones to the severe septicemia, endotoxic shock, and pyelonephritis(25).

Definition

- CAUTI is defined as a symptomatic urinary tract infection (SUTI) or asymptomatic bacteremic UTI (ABUTI) in a patient who had an indwelling urinary catheter at the time of or within 48 hours before onset of the event.
- An indwelling catheter is defined as a drainage tube that is inserted into the urinary bladder through the urethra, left in place, and is connected to a closed collection system.
- CAUTI includes both culture-confirmed UTI (UTI-A) and non-culture confirmed UTI (UTI-B) that are healthcare-associated. In places with adequate microbiology laboratory capacity UTI-A is the preferred surveillance definition as a positive urine culture is the gold standard for diagnosis of a UTI. However, in places where laboratories cannot reliably perform urinary cultures, UTI-B may be used to capture suspected AUTIs recognizing that it is less specific than UTI-A.
- Collecting surveillance data using both UTI-A and UTI-B definitions is not recommended - if there is capacity to perform urinary cultures, UTI-A should be used alone. However, if a choice is made to collect data on both definitions, if both UTI-A and UTI-B are met, UTI-A should be reported.
- The following are excluded from CAUTI surveillance.
  - They have a single in-and-out catheterization.
  - The catheterization is intermittent (i.e., insertion and removal of a catheter into the bladder every 3-6 hours for the drainage of urine).
  - They have suprapubic catheterization.
  - They are undergoing treatment for a UTI when the catheter is inserted.

Burden of CAUTI

Urinary tract infections (UTI) are among the most common bacterial infections and affect about 150 million individuals annually worldwide(26).

Catheter Associated Urinary Tract Infection contribute to at least 40% of hospital-acquired infections. CAUTI has been associated with substantial morbidity in acute care settings and extended care facilities at rates of 20% and 50% respectively. CAUTI rates vary widely from up to 5% for single brief catheterization to 100% for indwelling catheters over a duration of 4 days(27).

In the south-eastern part of Asia, the eastern part of the Mediterranean, Europe, the western side of the Pacific, and the South and North Americas, the occurrence of catheter-acquired urinary tract contamination

per 1,000 catheter days was 15.71, 9.86, 8.99, 6.90, and 5.70, respectively with a mean level of 8.50. Cases with ICU-acquired symptomatic CAUTI had a considerably greater total ICU death rate and

a remarkably shorter overall ICU duration of stay than the case with ward-acquired symptomatic CAUTI(28).

In a Uganda study at Kabale Regional Referral Hospital, the Incidence of CAUTI among patients with indwelling urinary catheters was found to be 15.3%(29). A study at Kenyatta National Hospital indicated an incidence density of hospital acquired catheter associated urinary tract infection at 32 per 1000 Catheter-days in the critical care unit with a cumulative incidence was 28.7%(30).

The National IPC infection Prevention and Control Guidelines for Healthcare Setting in Kenya, recommends implementation of CAUTI prevention bundle to reduce the risk of CAUTI. However, the uptake of the bundle as well as the incidence of CAUTI has not been documented in most hospitals.

CAUTI Prevention

A bundled approach shall be utilized to prevent CAUTI. HAIs bundles are a grouping of best practices interventions that individually improve care, but when applied together result in substantially greater improvement. Bundle element compliance can be measured as "yes or no" (an all or none approach).

Urinary Tract catheter bundle

The urinary catheter bundle is a group of evidence-based interventions for patients with urinary catheters. When implemented together, these interventions result in better outcomes (reduce UTI) than when implemented individually. Four key bundle components of care are recommended for all patients to prevent or reduce the risk of CAUTI. these are:

1. Avoid unnecessary urinary catheters.
2. Insert the catheter using aseptic technique.
3. Maintain catheters based on recommended guidelines (daily care)
4. Review catheter necessity daily and remove promptly if unnecessary.

<u>Avoid unnecessary urinary catheters.</u>

Non-invasive devices should ever be used unless absolutely necessary; this also includes urinary catheters. Studies have found as many as 21% of hospital patients with indwelling urinary catheters lack proper indications for insertion, and as many as 41% to 58% catheters in place overall were subsequently found to be unnecessary.

Appropriate indications

1. Perioperative use for selected surgical procedures
    - Patients undergoing urologic surgery or other surgery on contiguous structures of the genitourinary tract.
    - Anticipated prolonged duration of surgery (catheters inserted for this reason should be removed in the post-anesthesia care unit)
    - Patients anticipated receiving large-volume infusions or diuretics during surgery.
2. Need for intraoperative monitoring of urinary output.
    - Urine output monitoring in critically ill patients
    - Management of acute urinary retention and urinary obstruction
    - Assistance in healing of open sacral or perineal wounds in incontinent patients
    - Patient requires prolonged immobilization (e.g., potentially unstable thoracic or lumbar spine or multiple traumatic injuries such as pelvic fractures)

Insert urine catheters using aseptic technique.

- Perform hand hygiene immediately before and after insertion.
- Use aseptic technique for the catheter insertion.
- Sterile Gloves, a drape, and sponges
- Sterile or antiseptic solution for cleaning the urethral meatus.
- Single-use packet of sterile lubricant jelly for insertion
- Use as small a catheter as possible that allows proper drainage, to minimize urethral trauma.

Appropriate maintenance:

- Maintain a sterile, continuously closed drainage system.
- Keep catheter properly secured to prevent movement and urethral traction.
- Keep collection bag below the level of the bladder at all times.
- Maintain unobstructed urine flow.
- Empty collection bag regularly, using a separate collecting container for each patient, and avoid allowing the draining spigot to touch the collecting container.
- Maintain meatal care with routine hygiene (bathing)
- Use aseptic technique when the collection system must be replaced (in case of obstruction or infection)

Daily review of the catheter's necessity and prompt removal when unnecessary

- The duration of catheterization is the most important risk factor for the development of an infection.
- Daily review of the catheter's necessity should be conducted using the same criteria for appropriate insertion shown above. The catheter should be removed immediately if no longer indicated.

CAUTI Surveillance Methodology

Surveillance of CAUTI should be active, selective, prospective, and patient-based and focused on in-patient areas.

Trained HCWS will document use of the CAUTI prevention care bundle for all patients with urethral catheters and record patients suspected of having a CAUTI in the MOH CAUTI register. Corresponding denominator data will be recorded in the Urine Catheter Days Daily Tracking Form daily by the nurse in charge.

IPC focal point will on a regular basis visit the ward and review the completeness of the MOH CAUTI register, Urethra Catheter Maintenance Bundle Checklist, Urine Catheter Days Daily Tracking Form, and a sample of files of patients reported with CAUTI.

On a monthly basis s/he will compile the CAUTI report from the ward tools and submit the information to the IPC County focal point and the National IPC program.

CAUTI Case Definition

For a UTI to be considered CAUTI, Patient MUST HAVE had an indwelling **urinary catheter in place** at the time of specimen collection **or** Patient had an indwelling urinary catheter removed within the 48 hours prior to specimen collection.

CAUTI includes both culture-confirmed UTI (UTI-A) and non-culture confirmed UTI (UTI- B) that are healthcare-associated. In places with adequate microbiology laboratory capacity UTI-A is the

preferred surveillance definition as a positive urine culture is the gold standard for diagnosis of a UTI. However, in places where laboratories cannot reliably perform urinary cultures, UTI-B may be used to capture suspected AUTIs recognizing that it is less specific than UTI-A.

UTI-A

Microbiologically confirmed symptomatic UTI

Diagnosis requires at least **ONE** of following criteria (no other cause)

- Fever >38°C
- Urgency
- Frequency
- Dysuria
- Suprapubic tenderness

AND

- Positive urine culture (≥105 microorganisms/mL [≤2 species])

UTI-B

Microbiologically unconfirmed symptomatic UTI

Diagnosis requires at least **TWO** of following criteria (no other cause)

- Fever >38°C
- Urgency
- Frequency
- Suprapubic tenderness

AND More than **ONE** of the following criteria (no other cause)

- Positive dipstick urine
- Pyuria (≥ 10 white blood cells/mL)
- Organisms/gram of unspun urine
- ≥2 urine cultures same uropathogen ≥102 organisms/mL
- Physician diagnosis of UTI
- Physician appropriate treatment for UTI

Note: Sample collection and handling must follow laid down sample collection and handling guidelines to prevent sample contamination.

CAUTI Data Sets

The following data must be collected to facilitate proper CAUTI surveillance process.

- Total number of catheter days for that month, (this forms the denominator).
- Total number of patients with CAUTI for that month (numerator). Individual forms are required for every patient who develops CAUTI.

Guidance on when to complete CAUTI Surveillance Form

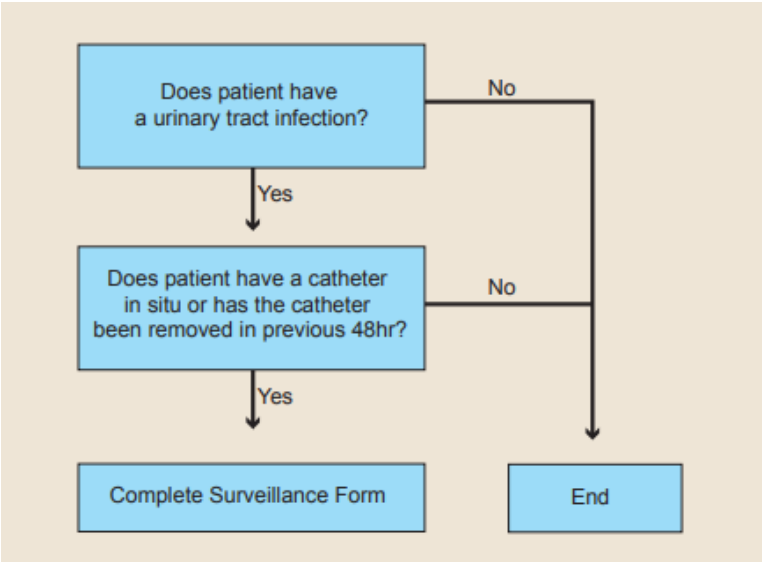


Figure 8-Guidance for CAUTI Diagnosis

Numerator

Total number of patients with CAUTI for that month

Denominator

Total number of catheter days for that month Calculating CAUTI Rates

CAUTI Incidence rate

Number of CAUTI x 1000 Number of Catheter Days

Uptake of CAUTI prevention care bundle Rate

Total number patients of with compliance of care bundle x 100 Total number of patients with catheters

Multidrug Resistant Organisms (MDROs)

The emergence of multidrug-resistant organisms (MDROs) is a major public health concern. Bacteria such as extended-spectrum ß-lactamase (ESBL) Escherichia coli, ESBL Klebsiella pneumoniae, carbapenem-resistant (CR) Enterobacterales, methicillin-resistant Staphylococcus aureus (MRSA), vancomycin-resistant Enterococcus spp. (VRE), and multidrug-resistant (MDR) non-fermenting species such as Pseudomonas aeruginosa and Acinetobacter baumannii are increasing in prevalence(31).

The WHO recently established a priority list of microorganisms to inform research priorities for the development of new antibiotics, with carbapenem-resistant Acinetobacter baumannii (CRAB) and Pseudomonas aeruginosa, third-generation or carbapenem-resistant Enterobacteriaceae, vancomycin-resistant Enterococcus spp. And methicillin-resistant Staphylococcus aureus considered critical and of high priority(32).

Definitions

A multidrug resistant organism (MDRO) is an organism predominantly bacteria that is resistant to at least three classes of antimicrobial agents (WHO).

Multidrug Resistant Organisms surveillance is the monitoring of the incidence of specified organisms of clinical interests. It is laboratory-based surveillance.

MDRO are of concern because they:

- Are resistant to many antibiotics commonly used to treat infection.
- Patients colonized with MDRO are at risk of progressing to clinical infection.
- Eradication may not be possible for colonized patients.
- Increase patient morbidity and mortality.
- Second-line antibiotics may be required for treatment that may be less effective and have more side effects.
- Act as a reservoir of resistant genes for transmission to other organisms
- May colonize the environment for long periods (depending on the organism)

Contact transmission is the primary mode of spread for MDRO via:

- Transient carriage on the hands of health care workers
- Contamination of surfaces and equipment

A combination of measures is required to control the spread of MDRO including antimicrobial stewardship, infection prevention and control interventions and appropriate screening.

Colonization: The presence of microorganisms on skin, mucous membranes, open wounds or excretions or secretions but is not causing adverse clinical signs or symptoms.

Contamination: Presence of microorganisms that do not multiply or cause clinical problems

Burden of MDROs

Globally, rates of multidrug-resistant organisms (MDROs) vary, making accurate measurement challenging. In hospitals, MDRO prevalence rates range from 5% to 38% globally, with an average of 18.2%. Europe has rates between 20% and 70%, while Africa ranges from 7% to 18%, and North America ranges from 2% to 9%. In Sub-Saharan Africa, reported MDRO prevalence in 2016 was estimated at 10.3% (range of 7% to 18%), varying by country. The highest prevalence was reported in Cameroon (75%) and Nigeria (45%), while Congo (1%) and Mauritania (1%) had the lowest (WHO, 2016). In Kenya, MDRO prevalence was reported at 21.3%. The most commonly identified organisms include Acinetobacter spp, Pseudomonas aeruginosa, Klebsiella pneumoniae, and Enterobacter cloacae with the highest resistance observed in Enterobacteriaceae and Acinetobacter spp with 78.9% and 61.6% resistance to ≤3 drugs, respectively. The highest MDRO prevalence was observed among clinical samples from ICU, neonates, and surgical wards. The burden of MDROs in Africa is attributed to poor infection control, limited access to quality healthcare, and antibiotic misuse(31,32).

MDROS Surveillance

Surveillance for multidrug-resistant organisms (MDRO) is a cornerstone for infection prevention efforts. Recommended laboratory-based surveillance strategies for MDROs range from passive surveillance of routine clinical microbiology laboratory results (Passive MDROs Surveillance) to active surveillance screening of cultures (Active MDROs Surveillance).

The MDRO surveillance can be facility wide or targeted units, patient based, or laboratory based, colonization or infection, passive or active, retrospective, or prospective, and optional or required strategies.

Passive MDROs Surveillance

Surveillance of Routine Clinical Microbiology Laboratory Results

The simplest form of MDRO surveillance is monitoring of clinical microbiology isolates resulting from tests ordered as part of routine clinical care. This method is particularly useful to detect emergence of new MDROs not previously detected, either within an individual healthcare facility or community wide.

All laboratories should use a standard definition for identification and reporting of these MDROs. This surveillance program measures both healthcare associated infection and colonization attributed to the MDRO of interest. Because it is based solely on positive culture results without accompanying clinical information, they do not distinguish colonization from infection, and may not fully demonstrate the burden of MDRO- associated disease.

This involves cumulative retrospective analysis of antimicrobial susceptibility data (antibiogram), obtained as part of routine care from diagnostic cultures of clinical specimens in the referring clinical microbiology laboratory, and interpreted in accordance with international guidelines (e.g., Clinical Laboratory Standards Institute (CLSI) guidelines).

Microbiology laboratories carrying out analysis of microbiological specimens should comply with the following criteria.

Microbiology laboratories carrying out analysis of microbiological specimens should comply with the following criteria.

- Be accredited/certified for the analysis of microbiology samples, including implementation of the required internal and external quality control programs,
- Documentation of an adequate volume of sample processing activity
- Capability of cryopreservation of MDR organisms
- Ability to collect, elaborate and present cumulative antibiotic susceptibility data Sample referral is recommended for those facilities not able to meet the above criteria.

Active MDROs Surveillance

Active Surveillance Screening of Cultures

Another form of MDRO surveillance is the use of active surveillance screening of cultures to identify patients who are colonized with a targeted MDRO. High risk patients for MDRO colonization should be the focus of active surveillance.

Active surveillance is often used for the disease which is at the verge of elimination and eradication and also in the time of outbreak investigation. It can also be used to check the validity of passive surveillance where designated staff review the records physically, visit the health facility and confirm with the health practitioner to find the particular cases. Designated staffs review the records physically, visits the health facility, and confirms with the health practitioner to find the particular cases. It requires more resources to execute. Reporting is usually more accurate here as it is performed by those specially assigned to conduct this activity.

The decision to use active surveillance screening as part of an infection prevention and control program requires additional support for successful implementation, including:

1. Personnel to obtain the appropriate cultures,
2. Microbiology laboratory personnel to process the cultures,
3. Mechanism for communicating results to caregivers,
4. Concurrent decisions about use of additional isolation measures triggered by a positive culture (e.g., Contact Precautions) and mechanism for assuring adherence to the additional isolation measures.

Steps in Carrying Out MDRO Surveillance in a Health Facility

Step 1: Define Objectives and Scope

The first step in implementing MDRO (Multidrug-Resistant Organism) surveillance is to clearly define your objectives and scope. Determine what specific MDROs you want to monitor, such as methicillin-resistant Staphylococcus aureus (MRSA) or carbapenem- resistant Enterobacteriaceae (CRE), and

decide which healthcare settings you want to include, such as facility location (e.g., surgical ward, entire facility etc.).

Step 2: Establish a Surveillance Team

Form a dedicated surveillance team consisting of healthcare professionals, such as infection preventionists, epidemiologists, microbiologists, and data analysts. This team will be responsible for overseeing the surveillance activities and analyzing the collected data.

Step 3: Develop Case Definitions

Create standardized case definitions for the targeted MDROs. These definitions should specify the clinical and laboratory criteria for identifying cases. For example, you might define a case of MRSA as a patient with a positive MRSA culture from a clinical specimen.

Step 4: Determine Data Collection Methods

Decide how you will collect the necessary data for MDRO surveillance. This typically involves reviewing microbiology laboratory records, infection control records, patient medical records, and other relevant sources. Ensure that you have access to these data sources and establish protocols for data collection.

Step 5: Implement Data Collection and Reporting

Start collecting the required data according to your defined case definitions. This may involve routine monitoring of microbiology reports, reviewing patient charts, or extracting data from electronic health records. Develop a system for reporting MDRO cases to the surveillance team and establish a timeline for regular reporting.

Step 6: Analyze and Interpret Data

Analyze the collected data to identify trends, patterns, and outbreaks of MDROs. Utilize statistical and epidemiological methods to calculate incidence rates, prevalence, and other relevant measures. Interpret the findings and communicate them to key stakeholders, such as infection control committees or healthcare administrators.

Step 7: Provide Feedback and Recommendations

Use surveillance data to provide feedback and recommendations to healthcare providers and facilities. This may include targeted interventions, such as enhanced hand hygiene protocols or isolation precautions, based on the identified MDRO patterns. Collaborate with the infection prevention team to implement appropriate control measures.

Priority Multidrug Resistant Organisms

The WHO list is divided into three categories according to the urgency of need for new antibiotics: critical, high, and medium priority.

Priority 1: CRITICAL

The most critical group of all includes multidrug resistant bacteria that pose a particular threat in hospitals, nursing homes, and among patients whose care requires devices such as ventilators and blood catheters. They can cause severe and often deadly infections such as bloodstream infections and pneumonia.

These organisms Include:

- Acinetobacter baumannii, carbapenem-resistant
- Pseudomonas aeruginosa, carbapenem-resistant
- Enterobacteriaceae, carbapenem-resistant, ESBL-producing.

These bacteria have become resistant to a large number of antibiotics, including carbapenems and

third generation cephalosporins – the best available antibiotics for treating multi-drug resistant bacteria.

Priority 2: HIGH

- *Enterococcus faecium*, vancomycin-resistant
- *Staphylococcus aureus*, methicillin-resistant, vancomycin-intermediate, and resistant
- *Helicobacter pylori*, clarithromycin-resistant
- *Campylobacter* spp., fluoroquinolone-resistant
- *Salmonellae*, fluoroquinolone-resistant
- *Neisseria gonorrhoeae*, cephalosporin-resistant, fluoroquinolone-resistant

Priority 3: MEDIUM

- *Streptococcus pneumoniae*, penicillin-non-susceptible
- *Hemophilus influenzae*, ampicillin-resistant
- *Shigella* spp., fluoroquinolone-resistant

The second and third tiers in the list – the high and medium priority categories – contain other increasingly drug-resistant bacteria that cause more common diseases such as gonorrhea and food poisoning caused by salmonella.

Methicillin Resistant Staphylococcus aureus (MRSA)

MRSA stands for Methicillin Resistant Staphylococcus aureus. The term is used to describe a number of strains of the bacterium Staphylococcus aureus, which have developed resistance to antibiotics commonly used to treat Staphylococcal infections. MRSA is an opportunistic bacterium that may colonize and grow readily on the skin and mucous membranes of a person, without harm to that person. It is commonly isolated from warm, moist body sites such as the nose, groin, and perineum. MRSA colonization can lead to infection such as infected skin lesions(33).

Carbapenemase-producing Enterobacteriaceae (CPE)

Enterobacteriaceae is the name given to a family of bacteria that normally lives in the human gastrointestinal tract. Carbapenemase producing Enterobacteriaceae (CPE) has developed resistance to carbapenem antibiotics e.g., meropenem by producing enzymes that hydrolyse most β-lactam antibiotics. Therapeutic options are exceedingly limited for patients with CPE infections due to the resistance to most antibiotics.

Patients colonized with CPE are a reservoir creating a risk for transmission to other patients as well as developing endogenous infections themselves. Other intermediate vectors for spread between patients include contaminated hands of healthcare workers, contaminated equipment, and environment (particularly faecally contaminated equipment). CPE positive patients should always be managed on contact precautions(34).

Extended-spectrum beta-lactamase (ESBL) producing enterobacteriaceae.

Some bacteria produce an enzyme called extended-spectrum beta-lactamase (ESBL) that inactivates penicillin and third generation or "extended spectrum" cephalosporins e.g., ceftazidime and cefotaxime resulting in antibiotic resistance. ESBL producers occur in gram negative bacteria commonly Enterobacteriaceae in the human gastrointestinal tract e.g., E. Coli, Klebsiella species.

Colonized patients are a reservoir for ESBL producing bacteria creating a risk for transmission to other patients as well as developing endogenous infections themselves. Other intermediate vectors for spread of ESBL producing bacteria between patients include contaminated hands of healthcare workers, contaminated equipment, and environment (particularly faecally contaminated equipment).

Risk assessment for ESBL producing bacteria should always be made as some spread more easily than others especially in hospital settings. ESBL Klebsiella pneumoniae and other ESBL species are more transmissible than ESBL E-Coli within hospitals(35).

Vancomycin-resistant Enterococci (VRE)

Vancomycin resistance occurs in Enterococcus faecium (and less often E. faecalis) due to the acquisition of a VanA or VanB resistance determinant. The human gastrointestinal tract is the major reservoir for VREs. VRE is primarily a healthcare associated pathogen. Colonized patients are a reservoir for VRE creating a risk for transmission to other patients as well as developing endogenous infections themselves.

Other intermediate vectors for spread of VRE between patients include contaminated hands of healthcare workers, contaminated equipment, and environment (particularly faecally contaminated equipment). VRE positive patients should always be managed with contact precautions.

Case Definitions for MDROs

Gram-negative MDROs:

Gram-negative MDROs include *pseudomonas aeruginosa*, Acinetobacter *baumannii* and *Enterobacteriaceae spp*. To be considered for MDRO criteria, the above three organisms are required to be tested for at least one agent in at least 3 antimicrobials classes: b- lactams (penicillins and cephalosporins), aminoglycosides, fluoroquinolones, and carbapenems. Carbapenem resistant *pseudomonas aeruginosa* and *Acinetobacter baumanii* are notifiable MDROs.

For MDR *Pseudomonas aeruginosa*:

They should be resistant to all agents tested in at least 3 antimicrobial classes, including penicillins, cephalosporins, aminoglycosides, fluoroquinolones, and carbapenems.

For MDR *Acinetobacter baumannii:* These organisms should be resistant to all agents tested in at least 3 antimicrobial classes, including penicillins, cephalosporins, aminoglycosides, fluoroquinolones, carbapenems, and sulbactam.

For MDR *Enterobacteriaceae spp*:

They should be resistant to all agents tested in at least 3 antimicrobial classes, including penicillins, cephalosporins, aminoglycosides, fluoroquinolones, carbapenems.

Carbapenem-resistant Enterobacteriaceae (**CRE**): - Enterobacteriaceae that meets the following criteria: Intermediate or resistant to imipenem, meropenem, ertapenem and doripenem by using MIC method, and confirmed by molecular method.

Enterobacteriaceae spp resistant to 3rd generation cephalosporins (ESBL-Ent) and Carbapenems (CRE) are notifiable MDROs.

Gram-positive MDROs:

Gram-positive MDROs include MRSA and VRE.

MRSA: Includes S. aureus cultured from any specimen that is oxacillin resistant based on standard susceptibility testing methods or a positive result from molecular testing for mecA and PBP2a; these methods may also include positive results of specimens tested by approved PCR test for MRSA.

VRE: Any Enterococcus spp. (regardless of whether it has been identified to the species level) that is resistant to vancomycin.

Laboratory specimens for MDRO screening

- For CRE (or CPE), VRE, & ESBL, the following specimens are required:
- Faeces sample /rectal swab or stoma with visible faecal matter. The same swab/faecal sample can be used for all three MDROs.

- Indwelling urinary catheter (including nephrostomy or SPC) specimen of urine.
- Wound swab / abdominal drain/endotracheal tubes sample.

For MRSA screening specimens:

A swab is used to collect clinical samples from the following sites:

- Nose (one swab for both nostrils).
- Groin (one swab for both sides).
- Perineum (natal cleft).
- Wounds, including decubitus ulcer (pressure sore) or surgical wound.
- Medical device insertion sites, e.g., IV, tracheostomy, drains.
- Umbilicus in neonates.
- Catheter urine (if patient has an indwelling urinary catheter).
- Sputum (from patients with recent MRSA respiratory tract infection).

For CPE screening, the following specimens are collected:

- Faecal sample or rectal swab with visible faecal matter.
- Indwelling urinary catheter specimen of urine.
- Wound swab / abdominal drain sample.

MDRO Data Sets

Facilities may choose to monitor one or more of the following MDROs: MRSA, VRE, ESBL-

K. pneunoniae, ESBL-E. coli, CRE (CRE-Klebsiella and CRE-E. coli), and multidrug-resistant Acinetobacter spp.

Numerator Data: Number of infections of a certain MDRO type.

Denominator Data: Number of patient days and admissions. Patient days and admissions are reported by location.

Data Analysis: Data can be stratified by time (for example, month, quarter, etc.) and patient care location.

MDRO Infection Incidence Rate = Number of HAIs by MDRO type / Number of patient days

x 1000

Prevention & Care Bundles

Measuring the compliance with precautionary measures on a routine basis will provide the healthcare institution with information on its success in these interventions. For ease of implementation and monitoring, the following precautionary measures may be packaged into an MDRO Bundle:

Administrative support

- Implementing system changes to ensure prompt and effective communications e.g., computer alerts to identify patients previously known to be colonized/infected with MDROs.
- Providing the necessary number and appropriate placement of hand washing sinks and alcohol-containing hand rub dispensers in the facility
- Maintaining staffing levels appropriate to the intensity of care required
- Enforcing adherence to recommended infection control practices (e.g., hand hygiene, Standard and Contact Precautions) for MDRO control.

Active surveillance

- Surveillance is a critically important component of any MDRO control program, allowing detection of newly emerging pathogens, monitoring epidemiologic trends, and measuring the effectiveness of interventions.
- Multiple MDRO surveillance strategies have been employed, ranging from surveillance of clinical microbiology laboratory results obtained as part of routine clinical care, to use of ASC to detect asymptomatic colonization.
- Antimicrobial management, including antimicrobial stewardship programmes.
- Recommendations for control of MDROs must include attention to judicious antimicrobial use.

IPC Measures

- Practice of isolation precautions such as contact precautions for patients or residents identified with MDROs.
- Hand hygiene in accordance with institutional guidelines
- Environmental hygiene in accordance with institutional guidelines
- Antiseptic body baths (or wipes for bedridden patients or residents) to reduce bioburden in patients or residents identified with MDROs.
- Education: Facility-wide, unit-targeted, and informal, educational interventions to focus on behavior change through improved understanding of the problem MDRO that the facility was trying to control.

ROLE OF THE LABORATORY IN HAI SURVEILLANCE

Laboratories play a crucial role in the surveillance of healthcare-associated infections (HAIs) by providing essential support for the identification, monitoring, and control of these infections. The following are key roles of laboratories in HAI surveillance:

Pathogen Identification

Laboratories are responsible for identifying the causative agents of HAIs, including bacteria, viruses, fungi, and parasites by utilizing various diagnostic techniques, such as culture, molecular biology methods (PCR, sequencing), and serological tests, to determine the microorganisms responsible for the infection.

Antimicrobial Susceptibility Testing

Laboratories perform antimicrobial susceptibility testing to determine the sensitivity of the identified pathogens to various antimicrobial agents. This information is vital for selecting the most effective treatment and guiding infection control measures.

Molecular Typing

Molecular typing methods, such as whole-genome sequencing, pulsed-field gel electrophoresis (PFGE), multilocus sequence typing (MLST) are used to track the genetic relatedness of pathogens. This helps identify outbreaks and transmission patterns within healthcare settings.

Data Reporting

Laboratories collaborate with healthcare facilities and public health agencies to report HAI data. Timely and accurate reporting is essential for tracking trends, identifying outbreaks, and implementing appropriate control measures.

Outbreak Investigations

When a potential HAI outbreak is identified, laboratories play a central role in investigating and confirming the source and extent of the outbreak. They may employ molecular typing to determine the relatedness of isolates.

Research and Development

Laboratories also contribute to the research and development of new diagnostic methods and technologies for HAI surveillance. This includes the evaluation of emerging diagnostic tools and techniques.

HAI DATA FLOW

The diagram bellow illustrates the flow of data from the facilities to the central data warehouse and Kenya Health Information System (KHIS).

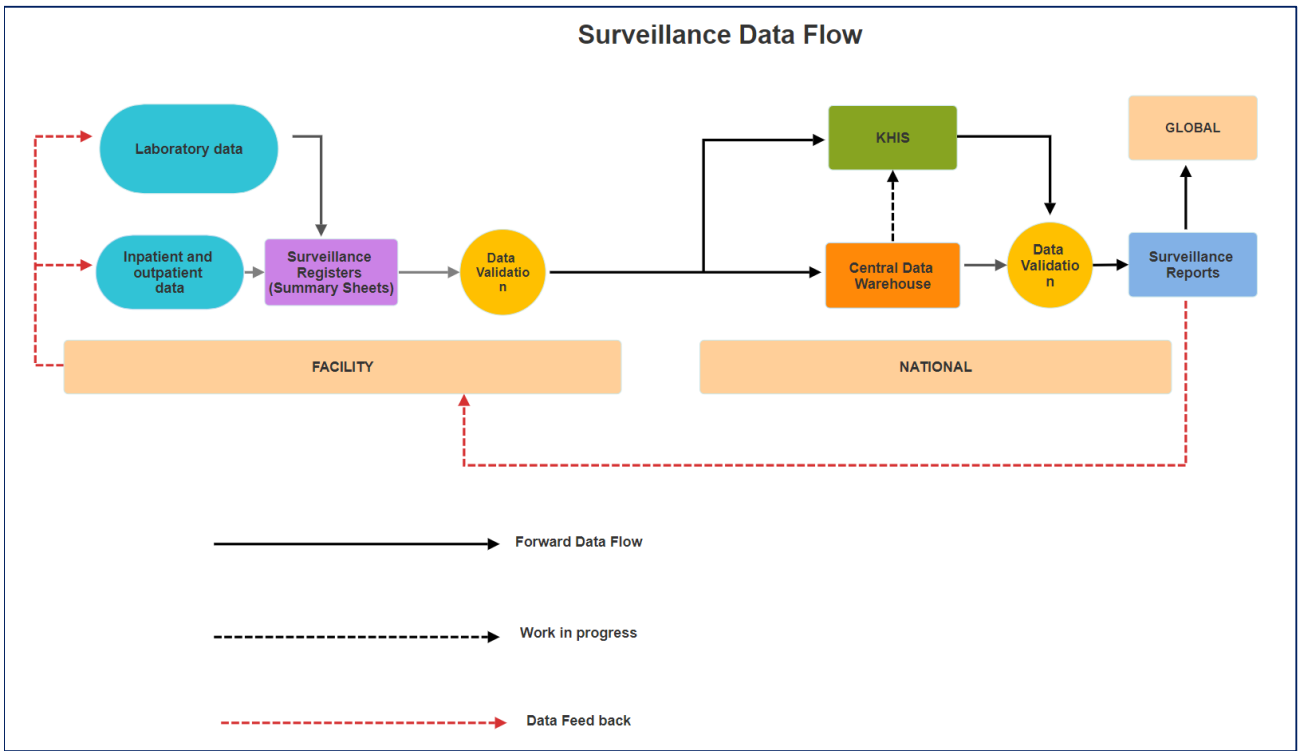


Figure 9-HAI Data Flow

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ANNEXES

Annex 1: List of Contributors

NAME	ORGANISATION
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ANNEX 1a: SURGICAL SITE INFECTION SURVEILLANCE FORM

<table>
<tr><th colspan="4">Part 1: Demographic Data</th></tr>
<tr><td colspan="2">County: _____ Sub County: _____ MFL
Code: _____ Patient IP/Number:
Patient Name: _____ Date of Birth: DD/MM/YY</td><td colspan="2">Patient ID Number: _____ Patient Phone number: _____
Patient Alternative Phone number: _____Date of Admission: DD/MM/YY
Date of Procedure: DD/MM/YY</td></tr>
<tr><td colspan="4">ASA Classification
☐ Normal healthy person
☐ Mild systemic disease (e.g., hypertension, well controlled diabetes)
☐ Severe systemic disease not incapacitating (e.g., moderate COPD, diabetes, malignancy)
☐ Incapacitating systemic disease that is a constant threat to life (e.g., pre-eclampsia, heavy bleeding)
☐ Moribund patient, not expected to survive with or without operation (e.g., major trauma)</td></tr>
<tr><td colspan="4">Surgical Wound Class
☐ Clean = Sterile tissue with no resident bacteria e.g., neurosurgery
☐ Clean-contaminated = CONTROLLED entry to tissue with resident bacteria e.g., hysterectomy
☐ Contaminated = UNCONTROLLED entry to tissue with bacteria e.g., acute gastrointestinal perforation
☐ Dirty / infected = Heavy contamination (e.g., soil in wound) or infection already established</td></tr>
<tr><td colspan="4">Surgical Details
Type of Surgery Nature of Surgery
☐ Cesarean Section ☐ Other Abdominal surgeries ☐ Emergency
☐ Orthopedic surgery with implant ☐ Orthopedic surgery without implant ☐ Elective
☐ Dental surgery with implant ☐ Dental surgery without implant</td></tr>
<tr><td colspan="4">Start Time (Knife to Skin incision): h:mm ☐ AM ☐ PM.
End Time (wound closure): h:mm ☐ AM ☐ PM.
Surgeon: ☐ Consultant ☐ Medical officer (MO) ☐ MO-intern ☐ Clinical Officer (reproductive Health)</td></tr>
<tr><th colspan="4">Part 2: Preoperative Surveillance-Surgical Care Bundles</th></tr>
<tr><td>1a. Intraoperative Blood glucose measured.
☐ Yes ☐ No
1b. Intraoperative blood glucose Level:
_____ Mmol/L</td><td>2a. Preoperative Surgical Antibiotic Prophylaxis given within 60 minutes of incision.
☐ Yes ☐ No</td><td>3a. Was Hair Removed Prior to surgery?
☐ Yes ☐ No
3b..If yes, what was used?
☐ Razor (razor blade, surgical blade, Shavers)
☐ Surgical Clipper
☐ Shaving cream</td><td>4a. Was the surgical site cleaned using chlorhexidine+Alcohol or Povidone Iodine+Alcohol.
☐ Yes ☐ No ☐ N/A
5a. Was body temperature taken within one hour after wound closure? (Applies for surgical procedures lasting at least one hour)
☐ Yes ☐ No ☐ N/A
5b. Postoperative temperature (˚C) _____</td></tr>
</table>

Part 3: Diagnosis of SSI (Before Discharge) Date SSI Diagnosed DD/MM/YY			
Surgical Site Infection? Yes ☐ No ☐ (Determine with case definition tick boxes below)			
☐ **Superficial SSI (skin/subcutaneous) e.g., cellulitis** ☐ Purulent drainage (pus) from superficial incision OR ☐ Organism identified (if culture done) OR ☐ Superficial incision deliberately re-opened AND ☐ Infection symptoms OR ☐ Surgeon/attending physician diagnosis	☐ **Deep SSI (fascia/ muscle) e.g., deep abscess** ☐ Purulent drainage (pus) from deep incision OR ☐ Deep incision dehiscence or deliberately opened by surgeon AND ☐ Organism identified (if culture done) AND ☐ Infection symptoms OR ☐ Deep infection/ abscess found on imaging	☐ **Organ/space SSI Deeper than fascia/muscle e.g., endometritis (organ), peritonitis (space)** ☐ Purulent drainage (pus) from sterile organ or space (from an inserted drain) OR ☐ Organ or space infection/abscess found on imaging/examination. OR ☐ Organism identified from fluid/tissue from organ/ space	
Microbiological Findings			
Microbiology culture results	Specimen Taken Date ..... Type.....	Organisms Identified	Antibiotic Resistance/Sensitivity R..... I..... S.....
Part 4: Post Discharge Surveillance			
Post discharge Review: No Implant-At Discharge, 14 days, and 30 days after the date of surgery With Implant - At Discharge, 14 days, 30 days, 6 months, and 12 Months after the date of surgery **Surgical Site Infection? Yes ☐ No ☐ (Refer Below) Date SSI Diagnosed mm/dd/yyyy**			
Diagnosis made: ☐ **Via Phone Call by an HCW** ☐ **By a health care worker (Revisit or by a different facility)**			
Superficial SSI	☐ **Deep SSI (fascia/muscle) e.g. deep**	☐ **Organ/space SSI Deeper than fascia/muscle e.g.,**	
(skin/subcutaneous) e.g.,	**abscess**	**endometritis (organ), peritonitis (space)**	
cellulitis ☐	☐ Purulent drainage (pus) from deep incision	☐ Purulent drainage (pus) from sterile organ or space (from	
Purulent drainage (pus) from	OR	an inserted drain)	
superficial incision ☐	☐ Deep incision dehiscence or deliberately	OR	
OR Organism identified (if culture	opened by surgeon AND	☐ Organ or space infection/ abscess found on imaging/ examination	
done) ☐	Organism identified (if culture done)	OR	
OR Superficial incision deliberately re- opened ☐ AND Infection symptoms ☐	AND ☐ Infection symptoms OR ☐ Deep infection/abscess found on imaging	☐ Organism identified from fluid/tissue from organ/ space	

OR			
Surgeon/attending physician			
diagnosis ☐			
Microbiological Findings			
Microbiology culture results	Specimen Taken Date …… Type……	Organisms Identified	Antibiotic Resistance/ Intermediate/ Sensitivity R…… I…… S……

ANNEX 1b-POST DISCHARGE SURGICAL SITE INFECTION FOLLOW-UP SCRIPT.

Introduction

Patient Name: …… Patient IP No: ……

Date of Surgery: …… Type of Surgery: ……

Name of H/F: …… Patient Surveillance ID: ……

Date of call: ……

Post-discharge Patient Follow-up Script

Hello, this is [**YOUR NAME**] from [**HEALTH FACILITY**]. I would like to speak to [**PATIENT NAME**] Is this [**PATIENT NAME**]?

If no: ask if you can speak to the patient or if there is a better time to call back to speak to the patient. If the respondent transfers the call to the patient, then continue as below. If the respondent gives you a better time to call back, note the time and make a follow-up call at that time.

If yes: My records show that you had a Surgery on [**DATE OF OPERATION**]. Is this correct? ☐ Yes ☐ No If No, corrected information

Thanks for that. As discussed, when you were being discharged, I am calling today to check that you are doing well and that your wound has healed as it should. Do you have 5 to 10 minutes to answer a few questions?

If the respondent mentions that the patient has died ask what the date of death was, thank the respondent, provide condolences, and then end the call. Then report the date of death: DOD DD/MM/YY **If not a good time, note a better time to call: _____**

Your answers are very important to us and combined with hundreds of others will help to improve the quality of care at [**HEALTH FACILITY**]. I want to assure you that all your responses will be kept confidential.

I would like to start with asking about fluid that may have come from your wound. A small amount of clear or bloody fluid from a healing wound is normal. I am interested in fluid we call **pus** that is a sign of an infection in your wound. Pus is usually thick and cloudy or milky and can sometimes have an unpleasant smell.

	Question	Parameter Being Assessed	Interviewer Guidance	Response	
				YES	NO
1	At any point did you see pus coming from your surgical wound?	Purulent Discharge	Not clear but Cloudy, Yellow or Green		
2	Did you notice redness or darkening around your wound that got worse instead of better?	Erythema			
3	Did the area around your wound ever become swollen?	Swelling	Enlargement of the wound area in your belly or abdomen causing pain or limited your movement.		
4	While there was redness and/or swelling around the wound, did you have pain at the site that was worse than you expected?	Pain	Pain that got worse beyond how it was before		
5	While there was redness and/or swelling around the wound, did you have fever?	Fever	Measured temperature above 38° C F or have a period of feeling warm or shivering with at least one other symptom including headache, muscle aches, loss of appetite, or general weakness		

If the respondent reports any symptoms of SSI, encourage them to return to clinic or call their doctor for follow up (Sign and provide a date when recommend a patient with SSI to return to the clinic or call their doctor).

Signature ……date ……

Thank you for taking the time to answer these questions. Do you have any questions for me? If you think of any questions later, you can reach our team at:

Note: Please complete the table if your call to the patient goes unanswered or does not go through.

Contact Attempt	Date	HCW Name
1st		
2nd		
2nd		

ANNEX 2a: CLABSI DIAGNOSTIC CRITERIA

<table>
<tr><td colspan="4">Part 1: Demographic Data</td></tr>
<tr><td colspan="2">County: .....
Sub County: .....
MFL Code: .....
IP/Number:
Patient Name: .....
Date of Birth: DD/MM/YY</td><td colspan="2">Patient ID Number: .....
Patient Phone number: .....
Patient Alternative Phone number: .....
Date of Admission DD/MM/YY
Date of Procedure: DD/MM/YY</td></tr>
<tr><td colspan="4">CLINICAL FINDINGS
Patient had a central line in place for at least 48 hours ☐
(On the date of the BSI event the central line had been in place for a period of >48 hours AND was in place on the date of the BSI event or within the previous 24 hours)
PLUS
The patient has a recognized pathogen isolated from one or more positive blood cultures and is not related to an infection at another site ☐
OR
Patient had a central line in place for at least 48 hours ☐
(On the date of the BSI event the central line had been in place for a period of >48 hours AND was in place on the date of the BSI event or within the previous 24 hours)
PLUS
The same (matching) potential contaminant organism is cultured from two or more blood cultures drawn on separate occasions within 24 hours ☐PLUS.
The patient has AT LEAST ONE of the following signs and symptoms
☐Fever (>38°C)
☐Chills
☐Hypotension</td></tr>
<tr><td colspan="4">CONCLUSION
CLABSI PRESENT ☐ CLABSI ABSENT ☐</td></tr>
<tr><td>Microbiological Findings</td><td colspan="3"></td></tr>
<tr><td>Microbiology culture results</td><td>Specimen Taken
Date ……
Type……</td><td>Organisms Identified</td><td>Antibiotic Resistance/Sensitivity
R……
I……
S……</td></tr>
</table>

ANNEX 2b: CLABSI RATE TOOL

Part 1: Demographic Information	
Facility name: …… MFL Code: …… County: …… Subcount: …… Sub County: …… MFL Code: ……	UNIT/WARD: ……

Month	Year

Date	Number of Patients having a Central Line	Number of Patients with a Blood stream infection (From Form 3a)
1.		
2.		
3.		
4.		
5.		
6.		
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11.		
12.		
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26.		
27.		
28.		
29.		
30		
31.		
Total		

ANNEX 2C.1. CLABSI PRE-INSERTION BUNDLE COMPLIANCE CHECKLIST

Facility Name……

MFL CODE……

DEPT/UNIT……

Assessment completed by……

Date ……. /……../…….

Regular monitoring with feedback of results to staff can maintain or improve adherence to CLABSI precautions practices. Use this tool to identify gaps and opportunities for improvement. Monitoring may be performed in any type of patient care location where patients are mechanically ventilated.

Instructions: Observe 3-4 patient with a central line. Observe each practice and check a box if adherent, Yes or No. In the column on the right, record the total number of "Yes" for adherent practices observed and the total number of observations ("Yes" + "No"). Calculate adherence percentage in the last row.

	CLABSI PREVENTION PRACTICE	PT. 1	PT. 2	PT.3	PT.4	Adherence by Task	
						YES	YES+NO
1	Hand Hygiene performed	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐		
2	Skin preparation performed using chlorhexidine in70% alcohol solution before the procedure and 1 minute allowed	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐		
3	Sterile drapes used to cover the patient	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐		
4	Mask, Hat, Gown, and Gloves are worn throughout the procedure, including all others entering the room during the procedure must wear	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐		
5	Aseptic technique is maintained throughout the procedure	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐		
6	Site cleaned with chlorhexidine in 70% alcohol, sterile transparent dressing applied and, sterile caps applied on all hubs	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐		

Number of Correct Practices Observed ("# Yes") = …….	Total number of Central Line Observations ("YES+NO") = …….	Adherence % = (Total "# Yes" ÷ Total "# Observed" x 100)

ANNEX 2C.2. CLABSI MAINTENANCE BUNDLE COMPLIANCE CHECKLIST

Facility Name: ……

MFL CODE: ……

DEPT/UNIT: ……

Assessment completed by: ……

Date ……. /……../……

Regular monitoring with feedback of results to staff can maintain or improve adherence to CLABSI precautions practices. Use this tool to identify gaps and opportunities for improvement. Monitoring may be performed in any type of patient care location where patients are mechanically ventilated.

Instructions: Observe 3-4 patient with a central line. Observe each practice and check a box if adherent, Yes or No. In the column on the right, record the total number of "Yes" for adherent practices observed and the total number of observations ("Yes" + "No"). Calculate adherence percentage in the last row.

	CLABSI PREVENTION PRACTICE	PT. 1	PT. 2	PT.3	PT.4	Adherence by Task	
						YES	YES+NO
1	CVC is needed	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐		
2	CVC dressing is intact	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐		
3	Hand hygiene performed before manipulating the CVC	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐		
4	Non-intact dressing is changed using aseptic technique. Skin cleaned disinfected with chlorohexidine in 70% alcohol	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐		
5	Aseptic technique is maintained throughout the procedure	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐		
6	Site cleaned with chlorhexidine in 70% alcohol, sterile transparent dressing applied and, sterile caps applied on all hubs	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐		
7	All stop cocks have sterile caps	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐		
8	Sterile caps are disinfected using chlorohexidine in 70% alcohol before assessing	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐		

Number of Correct Practices Observed ("# Yes") = ……	Total number of Central Line Observations ("YES+NO") = ……	Adherence % = (Total "# Yes" ÷ Total "# Observed" x 100)

ANNEX 3A: VAP DIAGNOSTIC CRITERIA

Part 1: Demographic Data			
County: Sub County MFL Code Patient IP/Number: Patient Name: Date of Birth: DD/MM/YY		Patient ID Number: Patient Phone number: Patient Alternative Phone number: Date of Admission: DD/MM/YY Date of Procedure: DD/MM/YY	
RADIOLOGICAL FINDING Two or more serial chest imaging test results with AT LEAST ONE of the following New and persistent **OR** Progressive and persistent ☐ Infiltrate ☐ Consolidation ☐ Cavitation			
CLINICAL FINDINGS The Patient has **AT LEAST ONE** of the following: ☐ Fever (> 38.0°C or > 100.4°F) ☐ Leukopenia (≤ 4000 WBC/mm3) or leukocytosis (≥ 12,000 WBC/mm3) ☐ For adults ≥ 70 years old, altered mental status with no other recognized cause. And **AT LEAST TWO** of the following: ☐ New onset of purulent sputum or change in character of sputum4, or increased respiratory secretions, or increased suctioning requirements. ☐ New onset or worsening cough, or dyspnea, or tachypnea ☐ Rales or bronchial breath sounds ☐ Worsening gas exchange (for example, O2 desaturations [for example, PaO2/FiO2 ≤ 240]7, increased oxygen requirements, or increased ventilator demand)"			
CONCLUSION **VAP PRESENT** ☐ **VAP ABSENT** ☐			
Microbiological Findings			
Microbiology culture results	Specimen Taken Date …… Type……	Organisms Identified	Antibiotic Resistance/Sensitivity R…… I…… S……

IF VAP PRESENT TRANSFER THE INFORMATION TO VAP RATE CALCULATION FORM

ANNEX 3B: VAP RATE TOOL

Part 1: Demographic Information	
Facility name: …… MFL Code: …….. County: …….. Subcounty: …….. Sub County: …….. MFL Code: ……..	UNIT/WARD: ……

Month	Year	
Date	**Number of Patients on Mechanical Ventilation**	**Number of Patients with VAP (From Form 3a)**
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
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26.		
27.		
28.		
30.		
31.		
TOTAL		

ANNEX 3C. VAP BUNDLE COMPLIANCE CHECKLIST

Facility Name : ……..

MFL CODE : ……DEPT/UNIT : ……

Assessment completed by : ……

Date ……. /……../…….

Regular monitoring with feedback of results to staff can maintain or improve adherence to VAP precautions practices. Use this tool to identify gaps and opportunities for improvement. Monitoring may be performed in any type of patient care location where patients are mechanically ventilated.

Instructions: Observe 3-4 patient with a central line. Observe each practice and check a box if adherent, Yes or No. In the column on the right, record the total number of "Yes" for adherent practices observed and the total number of observations ("Yes" + "No"). Calculate adherence percentage in the last row.

	VAP PREVENTION PRACTICE	PT. 1	PT. 2	PT.3	PT.4	Adherence by Task	
						YES	YES+NO
1	Head of bed is positioned at 30-45 degrees.	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐		
2	If tracheostomy or endotracheal tube is in use, ties are clean and secure.	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐		
3	Oral suction equipment is stored in a clean area (not on floor or bed).	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐		
4	Oral care with an antiseptic agent is performed per policy.	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐		
5	Hand hygiene is performed, and gloves are donned before providing care.	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐		
6	After care, gloves are removed, and hand hygiene is performed before the next task.	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐		
7	Sterile water is used to rinse reusable respiratory equipment.	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐		
8	Condensate in the ventilatory circuit is removed AND tubing is below the mouth to keep condensate from draining into the patient/resident.	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐		
9.	Intubation kits are appropriately stored in a clean area.	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐		
10.	Clean and dirty respiratory equipment are stored in separate areas.	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐	YES☐ NO☐		

Number of Correct Practices Observed ("# Yes") = …….	Total number of Central Line Observations ("YES+NO") = …….	Adherence % = (Total "# Yes" ÷ Total "# Observed" x 100)

ANNEX 4A: CAUTI DIAGNOSTIC CRITERIA

Part 1: Demographic Data	
County :	Patient ID Number: _____
Sub County :	Patient Phone number: _____
MFL Code :	Patient Alternative Phone number: _____
Patient IP/Number :	Date of Admission: DD/MM/YY
Patient Name : ..... Date of Birth: DD/MM/YY	Date of Procedure: DD/MM/YY

CLINICAL FINDINGS

Patient had an indwelling urinary catheter that had been in place for more than 2 consecutive days in an inpatient location on the date of event AND was **EITHER.**

☐ Present for any portion of the calendar day on the date of event OR

☐ Removed the day before the date of event.

PLUS **AT LEAST ONE** of the following signs or symptoms

☐ Fever (>38.0°C

☐ Suprapubic tenderness

☐ Costovertebral angle pain or tenderness

☐ Urinary urgency

☐ Urinary frequency

☐ Dysuria

CONCLUSION

CAUTI PRESENT ☐ **CAUTI ABSENT** ☐

Microbiological Findings (From a urine culture with no more than two species of organisms identified, at least one of which is a bacterium of >105 CFU/ml

Microbiology culture results	Specimen Taken Date ..... Type.....	Organisms Identified	Antibiotic Resistance/ Sensitivity R..... I..... S.....

ANNEX 4B: CAUTI RATE TOOL

Part 1: Demographic Information		
Facility name : …… MFL Code : …… County : …… Subcounty : …… Sub County : …… MFL Code : ……		UNIT/WARD ……
Month	Year	
Date	Number of Patients having a urinary catheter	Number of Patients UTI (From Form 3a)
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
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20.		
21.		
22.		
23.		
24.		
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26.		
27.		
28.		
29.		
30.		
31.		
Total		

CAUTI RATE= $\frac{\text{Number of Patients with UTI}}{\text{Number of Patients with a urinary catheter}} \times 1000$

ANNEX 5A: MDROS SURVEILLANCE TOOL

MINISTRY OF HEALTH

MDRO SURVEILLANCE FORM

(MDRO/MOH/2023/1)

HOSPITAL NAME: _____ DATE: | | | | | | |

FACILITY MHFL CODE: _____

A. DEMOGRAPHIC DETAILS:

1. Name: _____

2. Age: _____ 3. Sex: ☐ Male ☐ Female

4. Physical Address: _____

5. LAB ID NO: _____ 6. IP/NO: _____

7. Date of Admission: | | | | | | |

8. Ward on Admission: _____

9. Department: _____

10. Diagnosis on Admission: _____

11. Previous admission in Health Facility: ☐ No ☐ Yes

If yes to (11), specify: Name of Health Facility: _____

Date of Discharge: | | | | | | |

B. POSITIVE CULTURE:

1. Organism Isolated: _____ 2. Date of Positive Report: | | | | | | |

3. Date of Specimen Taken: | | | | | | | 4. Specimen Type: _____

5. Location (Ward) During Specimen _____

ISOLATE ORGANISM:

1. Methicillin-resistant *Staphylococcus aureus* (MRSA)
2. MDR *Acinetobacter baumannii*
3. ESBL *Klebsiella pneumoniae*
4. Carbapenem-resistant Enterobacteriaceae (CRE)
5. ESBL *Escherichia coli*
6. Vancomycin-resistant Enterococcus (VRE)
7. Carbepenem-resistant *Pseudomonas aeruginosa*
8. OTHERS Specify: _____

D. ISOLATE STATUS:

1. Infection
2. Colonizer (Proceed to F)
3. Contaminant (Omit subsequent questions)

E. TYPE OF INFECTION:

1. Blood stream infection (BSI) (Proceed to F if MRSAB)
2. Surgical site infection (SSI)
3. Urinary tract infection (UTI)
4. Hospital acquired pneumonia (VAP)
5. Hospital acquired pneumonia (Non-VAP)
6. Skin & Soft Tissue Infection (SSTI)
7. Intra-abdominal Infection
8. OTHERS, specify: _____

F. CULTURE POSITIVE STATUS

1. Health Care-Associated, Own Facility
2. Health Care-Associated, other MOH Facility
3. Health Care-Associated, non MOH Facility
4. Not Health Care-Associate

REPUBLIC OF KENYA

Ministry of Health