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NATIONAL INFECTION PREVENTION AND CONTROL GUIDELINES FOR HEALTHCARE SERVICES IN KENYA

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National Infection Prevention and Control Guidelines For Health Care Services in Kenya

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FOREWORD

Infection Prevention and Control (IPC) is an essential cornerstone of quality clinical care in all health care settings. The changing pattern of infectious diseases and the emergence of microorganisms with antimicrobial resistance emphasize the need for all healthcare workers (HCWs) to understand and practice evidence-based infection prevention and control that will protect patients, clients, and healthcare workers (HCWs) from health care-associated infections (HAIs).

Healthcare-associated are those infections that patients acquire while receiving health care, previously linked to infections acquired during admission to hospital (called nosocomial infections), but the term now includes infections developed in various settings where patients obtain health care (e.g., long-term care, family medicine clinics, home care, and ambulatory care). They are a major problem for patient safety, leading to prolonged hospital stays, disabilities, increased resistance of microorganisms to antimicrobials, high costs for patients and their families, and death, and financial burden to the healthcare system. As such, the prevention and control of HAIs must be a top priority for settings and institutions that are committed to making health care safe. To provide high-quality health care services and prevent HAIs, healthcare workers must strictly adhere to IPC practices such as hand hygiene (HH) among others.

Based on data from a number of countries, it is estimated that each year, hundreds of millions of patients around the world are affected by HAIs. The burden of HAIs is several folds higher in low- and middle-income countries than in high-income ones. These guidelines should be used in conjunction with other relevant national documents, such as the Kenya National Infection Prevention and Control Policy for Health Care Services, Kenya National Strategic Plan for Infection Prevention and Control for Health Care Services, National Standards and Guidelines on Injection Safety and Medical Waste Management, and Guidelines for Tuberculosis Infection Prevention and Control for Health Care Workers in Kenya.

These policies and guidelines will assist health care providers, health care training institutions, and other IPC stakeholders in designing, implementing, monitoring, and evaluating IPC practices in Kenya.

Dr. Patrick Amoth, EBS

Ag. Director General

Ministry of Health

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These National Infection Prevention and Control Guidelines for Health Care Services in Kenya were revised through a consultative process led by the Ministry of Health (MOH) Division of Quality Assurance under the Directorate of Health Standards, Regulation and Quality Assurance with inputs from various stakeholders and partners. 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 the Centers for Disease Control and Prevention (CDC), the World Health Organization (WHO), the US Agency for International Development (USAID) Medicines, Technologies, and Pharmaceutical Services (MTaPS) program, the International Training and Education Center for Health (ITECH), the Infection Prevention Network Kenya (IPNET), and others across the health sector.

We acknowledge the USAID for providing technical and financial support for the review of these National Infection Prevention and Control Guidelines for Health Care Services in Kenya 2023 through USAID MTaPS Program implemented by Management Sciences Health.

Dr. Kigen Bartilol

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Ministry of Health

EXECUTIVE SUMMARY

Infection prevention and control (IPC) is of paramount importance in safeguarding public health and the well-being of healthcare workers. In Kenya, the need for comprehensive IPC guidelines cannot be overstated, especially given the unique context of a devolved healthcare system, consisting of both national and county healthcare facilities. These National IPC Guidelines have been developed to standardize and enhance IPC practices, safeguard against healthcare-associated infections (HAIs), address occupational safety concerns, combat antimicrobial resistance (AMR) and strengthen antimicrobial stewardship (AMS), strengthen pandemic preparedness and response, and manage the handling of human remains.

The guidelines outline essential standard precautions, including hand hygiene, proper use of personal protective equipment (PPE), cleaning, disinfection and sterilization, environmental care, linen and laundry management, safe injection practices, and safe waste disposal, respiratory hygiene/cough etiquette, as well as specific additional precautions for infectious diseases and conditions.

Effective governance and coordination are pivotal for the success of implementation of IPC measures. The guidelines stipulate the roles and responsibilities of national and county authorities in ensuring compliance and provide a framework for inter-sectoral collaboration.

Robust healthcare-associated infection surveillance is essential for early detection and containment. These guidelines establish a standardized HAIs surveillance system to track trends, identify risk factors, and inform interventions. Beyond the specific IPC practices the guidelines also highlights other critical aspects including Occupational Health and Safety, antimicrobial resistance and antimicrobial stewardship, management of epidemics and pandemics, as well as handling of human remains.

The implementation of these National Infection Prevention and Control Guidelines is a critical step towards safeguarding public health, enhancing the safety of patients and healthcare workers, and mitigating the impact of infectious diseases. By adopting and adhering to these guidelines, healthcare facilities at all levels will contribute to the reduction of healthcare-associated infections, reduce the risk of antimicrobial resistance, and the preparedness and response to epidemics and pandemics, ultimately improving the overall health and well-being of the nation. Effective coordination and collaboration between national and county healthcare authorities will be key to its success.

ACRONYMS AND ABBREVIATIONS

ABHR	Alcohol based hand rub.
AIDS	Acquired immunodeficiency syndrome.
AMR	Antimicrobial resistance
AMS	Antimicrobial stewardship
ARO	Antibiotic-resistant organism
BSC	Biological safety cabinet
BSL	Biosafety Level
CAUTI	Catheter Associated Urinary Tract Infection
CDC	Centers for Disease Prevention and Control [US]
CIPCAC	County IPC Advisory Committee
CJD	Creutzfeldt-Jakob Disease
CLABSI	Central Line Associated Bloodstream Infections COVID-19 Coronavirus Disease-2019
CQI	Continuous quality improvement
CSSD	Central Sterilization and Supplies Department
DOSH	Directorate of Occupational Safety and Health
DR-TB	Drug-Resistant Tuberculosis
EVD	Ebola virus disease
FBO	Faith-based organization
HAI	Healthcare-associated infection
HBV	Hepatitis B virus
HCF	Health care facility
HCV	Hepatitis C virus
HCW	healthcare worker
HH	Hand hygiene
HIV	Human Immunodeficiency Virus
HLD	High-level disinfection
IAIS	Intra-Amniotic Infection Syndrome
ICU	Intensive Care Unit
IPC	infection prevention and control
IPCC	infection prevention and control committee
KQMH	Kenya Quality Model for Health

LLD	Low-level disinfection
MDR	Multidrug-resistant
MDR-TB	Multidrug-resistant tuberculosis
MERS-CoV	Middle East Respiratory Syndrome - Coronavirus
mL	Milliliters
µm	Micrometers
MMS	Multimodal strategies
MOH	Ministry of Health
MRSA	Methicillin-resistant *Staphylococcus aureus*
MTaPS	Medicines, Technologies, and Pharmaceutical Services
NaDCC	Sodium dichloroisocyanurate
NGO	Non-governmental organization
OSH	Occupational Safety and Health
OR	Operating Room
PEP	Post-exposure prophylaxis
POASB	Peroxygen and organic acid surfactant blend
PPE	Personal protective equipment
ppm	Parts per million
PTB	Pulmonary Tuberculosis
QAC	Quaternary Ammonium Compound
SARS	Severe acute respiratory syndrome
SCIPCC	Sub-County Infection Prevention and Control Committee
SOP	Standard operating procedure
SSI	Surgical-site infection
TB	Tuberculosis
USAID	US Agency for International Development
UTI	Urinary tract infection
VAP	Ventilator-Associated Pneumonia
VRE	Vancomycin-resistant *Enterococcus*
WHO	World Health Organization
XDR-PTB	Extensively drug-resistant pulmonary tuberculosis

KEY TERMS

The following are the main definitions of terms that have been widely used in the document; a more comprehensive definition of other terms is included in the glossary at the end of the document:

Appropriate PPE: Personal protective equipment (PPE) worn to minimize exposure to hazards that cause serious workplace injuries and illnesses. These injuries and illnesses may result from contact with chemical, radiological, physical, electrical, mechanical, or other workplace hazards. In this case, the use and choice depend on the type of exposure and procedure being undertaken.

Health care facility (HCF): In general, any location where healthcare is provided. HCFs range from small clinics and doctor's offices to urgent care centers and large hospitals with elaborate emergency rooms and trauma centers.

Healthcare worker (HCW): Any person whose main activities are intended to enhance the health of patients HCWs include the people who provide health services (doctors, nurses, pharmacists, laboratory technicians, etc.) and workers in management and support services (financial officers, cooks, drivers, cleaners, etc.).

Infectious agent: A bacterial, mycoplasmal, fungal, parasitic, or viral agent identified as causing illness in humans, human fetuses, or both.

Infection Prevention and Control: A practical, evidence-based approach that prevents patients and HCWs from being harmed by avoidable infections and, as a result, by antimicrobial resistance (AMR)

CHAPTER 1 | BACKGROUND

The health sector in Kenya has been conducting various IPC-related activities to raise awareness. In addition, various policies and guidelines have been established to address different aspects and segments of IPC in the country. Some of the existing documents on IPC include the Kenya National Infection Prevention and Control Policy for Health Care Services May 2021, the Kenya National Strategic Plan for Infection Prevention and Control for Health Care Services 2021-2025, the National Standards and Guidelines on Injection Safety (2018), and Guidelines for Tuberculosis Infection Prevention and Control for Health Care Workers in Kenya (2014).

In 2010, both Ministries of Public Health and Sanitation and the Ministry of Medical Services developed the first edition of the National IPC Guidelines for Health Care Services in Kenya, to be used by all levels of health care delivery settings to prevent and control HAIs and to safeguard the well-being and safety of patients, clients and HCWs. In 2015, the first edition of the IPC guideline document was revised to the second edition.

In 2021, to reflect the latest evidence, international guidance, and best practices for preventing the spread of infections in healthcare settings, the MOH, in collaboration with the USAID MTaPS program and other stakeholders, reviewed the Kenya Infection Prevention and Control Policy for Health Care Services and the Kenya Infection Prevention and Control Strategic Plan

This is the third edition of the National IPC Guidelines for Health Care Services in Kenya to provide evidence-based infection prevention and control guidance to protect patients, clients, and healthcare workers.

Scope of the Guidelines

This document provides guidance on the implementation of infection prevention and control practices in Kenya that are prerequisites for ensuring safe health care delivery and, therefore, improving patient outcomes and the overall quality of health services. The guideline is aligned with the WHO Guidelines on Core Components of Infection Prevention and Control Programmes (2016), which highlight the essentials for developing and improving an IPC program at the national, county, and health-facility levels in a systematic, stepwise manner that is tailored to specific needs and context for Kenya. It also supports the implementation of the National IPC Policy (2021) and the National Action Plan for Prevention and Containment of AMR (2017–2022) in Kenya. The programs that benefit from this guideline include water, sanitation, and hygiene; occupational health and safety (OSH); health care waste management; the Department of Laboratory Services; blood transfusion services; TB/HIV; and the Division of Vaccines and Immunization.

Target Audience

These guidelines are aimed at supporting and reinforcing IPC practices of HCWs at both public and private healthcare facilities (HCFs), nongovernmental organizations (NGOs), and faith-based organizations (FBOs). This includes managers, all HCWs - both clinical and non-clinical - members of multidisciplinary IPC committees across all levels, and those offering paramedical support, including home-based care.

Rationale and Purpose of the Guidelines

These IPC guidelines have been developed to ensure that healthcare facilities and organizations in Kenya have the necessary tools and resources to prevent the spread of infections and protect the health and safety of patients and HCWs.

These IPC guidelines were developed to:

1. Provide consistent guidance and recommendations for preventing the spread of infections in healthcare settings and ensure that HCFs and organizations across the country have access to the latest evidence-based recommendations for preventing the transmission of infectious diseases.
2. Promote patient safety: By following national IPC guidelines, HCFs and organizations can reduce the risk of infections transmission, improve patient outcomes, and enhance the overall quality of care.
3. Protect HCWs: The IPC guidelines can help to ensure that HCWs have the necessary tools and resources to protect themselves from acquiring infections and maintain their own health and well-being.
4. Meet regulatory requirements: These guidelines provide the minimum requirement for healthcare facilities accreditation.

5. Reduce healthcare costs: HAIs can have serious consequences, including increased morbidity and mortality, longer hospital stays, and higher healthcare costs. By following the national IPC guidelines, HCFs and organizations can help reduce the incidence of HAIs and the associated costs.

Multimodal Strategies (MMS) In IPC

A multimodal implementation strategy is a strategy consisting of several (3–5) elements or components that are implemented in an integrated way with the aim of improving an outcome and changing behavior. It includes tools, such as bundles and checklists, developed by multidisciplinary teams that consider the local conditions.

The five most common components are:

1. System change (availability of the appropriate infrastructure and supplies to enable IPC best practices)
2. Education and training of HCWs and key players (for example, managers)
3. Monitoring infrastructure, practices, processes, and outcomes and providing data feedback.
4. Reminders in the workplace/communications
5. Culture changes with the establishment or strengthening of a safe climate.

Using multimodal strategies (MMS) will facilitate the IPC process, involve and engage various stakeholders, and define and allocate responsibilities toward ensuring commitment and sustainability of an IPC program at the national, County and health-facility levels. All IPC activities should be contextually grounded and driven by a multimodal approach, which allows implementation in an integrated manner. This facilitates a group or team effort towards improving IPC practice and patient safety and reducing HAI and AMR.

Healthcare workers, supported by the IPC committee (IPCC), are responsible for applying the multimodal approach to various aspects of their work. Bundles of care and checklists should be incorporated into MMS. Leaders should provide both political and financial support, increasing accountability via monitoring and feedback, resulting in behavioral change and safe patient care. Successful MMS includes the involvement of champions or role models at the national, county, sub-county, and health-facility level.

Core Components of IPC

The WHO has identified the following core components of IPC programs at the national and facility levels: These core components are structured as a chain and are interdependent on each other to prevent and control infection transmission. These core components include a range of elements, from policy formulation to HCF bedside implementation[1].

1. **Leadership and management commitment:** Strong leadership and management commitment are essential for the success of an IPC program. This includes providing the necessary resources and support to implement and maintain IPC measures and ensuring that IPC is a priority for the organization.
2. **National and Facility IPC Programs:** Active, stand-alone, national IPC programmes with clearly defined objectives, functions and activities should be established for the purpose of preventing HAIs and combating AMR through IPC best practices. National IPC programs should be linked with other relevant national programmes and professional organizations. An IPC program with a dedicated, trained team should be in place in each health care facility for the purpose of preventing HAI and combating AMR through IPC best practices.
3. **IPC policies and procedures:** Clear and comprehensive policies and procedures are essential for ensuring that IPC measures are consistently followed in the healthcare setting. These should be based on the latest scientific evidence and best practices and should be reviewed and updated regularly.
4. **Training and education:** All HCWs should be trained in IPC measures, including HH, use of PPE, and infection control procedures. Training should be ongoing and tailored to the specific needs and roles of each HCW.
5. **HAI surveillance:** This is an important tool for identifying trends and patterns of infections in healthcare settings and for evaluating the effectiveness of IPC measures. By collecting and analyzing data on infections, HCFs and organizations can better understand the risks of infection transmission and implement appropriate measures to prevent the spread of infections.

1 Minimum requirements for infection prevention and control programmes, WHO, 2019.

6. **Multimodal Strategies for IPC:** These involve using multiple approaches and interventions simultaneously to reduce the risk of infections in healthcare settings. These strategies can be effective in addressing complex problems and can help achieve better outcomes than using a single intervention alone.
7. **Regular monitoring and feedback of IPC practices:** This involves the use of observation, self-assessment, and audits to regularly collect and analyze data on IPC practices and use the information to identify strengths, weaknesses, and opportunities for improvement. Feedback should be timely, actionable, and provided in a supportive manner to encourage continuous learning and improvement.
8. **Workload, staffing levels, and bed occupancy:** These can all impact the ability of an HCF to implement effective IPC measures. High workloads and staffing shortages can lead to fatigue and burnout among HCWs and increase the risk of errors and accidents, including the transmission of infections. Adequate staffing levels and a reasonable workload are essential for ensuring that HCWs have the time and resources to follow IPC guidelines and procedures and to provide safe and high-quality care to patients. High bed occupancy rates can make it more challenging to implement IPC measures such as the isolation of patients with infectious diseases. Adequate bed capacity and appropriate patient-to-staff ratios are important for ensuring that IPC measures can be effectively implemented and maintained.
9. **Environment, materials, and equipment for IPC at the facility level:** The physical environment in which healthcare is provided should be designed and maintained to minimize the risk of infection transmission. This includes ensuring that isolation space is available, that surfaces and equipment are regularly cleaned and disinfected, and that the ventilation system is functioning properly. Adequate supplies of PPE, such as masks, gloves, and gowns, should be available for staff to use as needed. Medical equipment should be properly maintained and disinfected between patients to prevent the spread of infection. This includes sterilizing equipment or using disposable equipment, as appropriate.

Structure of the Guideline Document

This document is structured into nine sections, giving specific guidance to IPC practices. The guidelines consist of the following parts: Basic Concepts of IPC, Governance and Coordination of IPC Programs, IPC Practices, Traffic Flow in Healthcare Settings, Occupational Health and Safety, Laboratory Practices, Healthcare-Associated Infections, Antimicrobial Resistance in Healthcare Settings, Epidemics and Pandemic Preparedness and Response, and Handling of Human Remains.

CHAPTER 2 | BASIC CONCEPTS OF IPC

Introduction

Healthcare-associated infections (HCAIs) are a major source of morbidity and mortality and are the second most prevalent cause of death globally[2].reventing harm to patients, HCWs, and visitors due to HAIs is fundamental to achieving safe, quality care and reducing AMR.

Similarly, preventing and reducing the transmission of infectious diseases that may pose global threats, such as pandemic influenza or influenza-like infection, coronaviruses, Ebola virus disease (EVD), and other emerging epidemic-prone pathogens, are paramount. Supported by many stakeholders in the field of IPC, the WHO has issued recommendations and specifications for effective IPC programs, identified as core components of IPC programs, and the approach for their implementation is presented in associated manuals for both the national, County and facility levels.

The core components of IPC programs include 16 competencies: IPC management and leadership, environment in healthcare facilities (HFCs), basic microbiology, AMR prevention, HAI surveillance, standard precautions, transmission-based precautions, decontamination and reprocessing of medical devices and equipment, central line-associated bloodstream infection (CLABSI) prevention, catheter-associated urinary tract infection (CAUTI) prevention, surgical site infections (SSI) prevention, prevention of health care-associated pneumonia, health care-associated outbreak prevention and management, IPC education and training, quality and patient safety, and occupational health.

The IPC program oversight is provided by a multidisciplinary committee which is led by chair preferably a doctor or a clinical microbiologist. A trained and dedicated IPC focal person coordinates IPC activities at all levels of service national and county. The proposed level of expertise and reporting hierarchy is to ensure the proper support to implement and execute an IPC program that will not only monitor and mitigate the ongoing risk of HAIs and AMR but will also be able to protect HCWs and the organization at the time of a large-scale outbreak or even a pandemic.

The IPC program is linked closely with the national, county, and facility structures for quality to ensure that IPC is adequately considered throughout the planning.

According to the WHO, the four most common HAIs are SSI, CAUTIs, CLABSIs, and ventilator-associated pneumonia (VAP).

The most common microorganisms causing HAIs include Staphylococcus aureus, especially methicillin-resistant Staph. aureus (MRSA), vancomycin-resistant Enterococcus (VRE), multidrug-resistant Gram-negatives (Extended Spectrum β-Lactamases [ESBLs]), and carbapenem-resistant Enterobacteriaceae (CRE) (e.g., Klebsiella spp., Escherichia coli, Acinetobacter baumannii, and Pseudomonas aeruginosa) and yeast infections, such as Candida auris.

In Kenya, the actual burden of HAIs has not been accurately quantified but is estimated to account for about Overall prevalence of HAI was 4.4 per 100 patient admissions[3]. With the emergence of new pathogens and antimicrobial resistance, managing HAIs is becoming a significant and increasing challenge globally. Although medical science has made significant advances in therapeutics, diagnostics, and knowledge of the disease process, the problem of HAIs persists throughout the world. Increased facility-based health care for immune-compromised patients and the extensive use of invasive techniques have exacerbated this problem. To prevent, identify, monitor, and control the spread of infections in health care facilities, comprehensive IPC practices are required. The consistent use of IPC policies and guidelines ensures that IPC practices are carried out in a standard way across all health care facilities in Kenya.

2 Haque M, et al, Strategies to Prevent Healthcare-Associated Infections: A Narrative Overview. Risk Manag Healthc Policy. 2020 Sep 28;13:1765-1780. doi: 10.2147/RMHP.S269315. PMID: 33061710; PMCID: PMC7532064.

3 Linus Ndegwa. Hospital-Acquired Infections Surveillance in Three Kenyan Hospitals, 2010-2012. Open Forum Infectious Diseases . 2014 Dec;2(1)

Sources of Infections

Infections can be acquired from two sources:

1. An endogenous route when the source of microorganisms is from the patient's own microflora (e.g., from the gut due to break in intestinal mucosal barriers caused by chemotherapy in cancer patients).
2. An exogenous route when the microbes are from outside sources (e.g., from contaminated hands of HCWs, items, equipment, and/or the environment).

Factors Influencing Healthcare-Associated Infections

1. *Factors related to microorganisms.*

Each microorganism has an infective dose, defined as the number of microorganisms required to cause an infection. Microorganisms with low infective doses spread more rapidly. In addition, if the person is immunosuppressed, the infective dose required to cause infection is reduced.

The pathogenicity of microorganisms, or virulence, is the capacity of a microbial strain to produce disease.

2. *Factors related to the host.*

The chance of acquiring infection also increases among those with open wounds (burns, trauma, or surgical wounds) or those who have indwelling devices, such as intravenous lines, urinary catheters, nasogastric and endotracheal tubes, and surgical drains.

It should be emphasized that even a healthy individual with a lack of previous exposure or immunization for vaccine-preventable diseases may acquire infection, especially from emerging and re-emerging microbial agents (e.g., dengue fever, Crimean-Congo hemorrhagic fever [CCHF], chikungunya, EVD, Middle East respiratory syndrome coronavirus [MERS-CoV], and Zika virus). Additionally, changes in pathogen characteristics in certain microbes, like influenza and norovirus, can lead to enhanced susceptibility to infections.

Modes of Transmission[4]

Microorganisms can be acquired through various routes, and some of them have the ability to use more than one route of transmission. The most common modes of microbial transmission in HCFs are as follows:

Direct Contact transmission

Direct contact transmission occurs through direct body contact with the tissues or fluids of an infected individual. Physical transfer and entry of microorganisms occurs through mucous membranes (e.g., eyes, mouth), open wounds, or abraded skin. Direct inoculation can occur from bites or scratches. Examples include organisms such as rabies, Microsporum, Leptospira spp., and staphylococci, including multidrug-resistant (MDR) species methicillin-resistant Staphylococcus aureus and Staphylococcus pseudintermedius (MRSP). This is probably the most common and highest-risk route of pathogen transmission to patients and personnel..

Droplet transmission

Droplet transmission occurs when microorganisms come into direct contact with mucous membranes in the mouth, eyes, and nose. This occurs during talking, singing, coughing, and sneezing, as well as during certain medical procedures. Most of the aerosol particles generated during coughing can be found in the air within 1 meter (approximately 3 feet). Within a few seconds, large-size particles (greater than 5 micrometers [µm]) fall quickly to the ground due to gravitational force, but some larger droplets may desiccate and become smaller while in the air due to loss of the moisture present in saliva. Direct transmission via this route can be prevented by wearing facial protection (a surgical mask and/or face shield) within 2 meters (approximately 6 feet) of the patient or upon entry into the patient's room.

Airborne transmission

Aerosol(airborne) transmission encompasses the transfer of pathogens via very small particles or droplet nuclei. Aerosol particles may be inhaled by a susceptible host or deposited onto mucous membranes or environmental surfaces. This can occur from breathing, coughing, sneezing, or vocalization of an infected individual, but also during certain medical procedures (e.g., suctioning, bronchoscopy, dentistry, inhalation anesthesia).

4 https://www.aaha.org/aaha-guidelines/infection-control-configuration/routes-of-transmission/

Very small particles may remain suspended in the air for extended periods and be disseminated by air currents in a room or through a facility. The most common microorganisms for which airborne precautions are necessary include Mycobacterium tuberculosis, varicella-zoster virus (chickenpox), and measles

Infection in a HCF can also occur from HCW injuries due to inappropriate use and disposal of contaminated sharps. Outbreaks of food poisoning due to the ingestion of contaminated food and water in the HCF can occur due to mishandling and improper storage of food. The need for adequate food hygiene facilities is of paramount importance because the consequences of an outbreak of food poisoning in HCFs can be life-threatening for susceptible patients. Hospital administrators are responsible for food hygiene in hospitals; they should ensure that a complete independent audit is conducted at least twice a year. The full report of such inspections should be submitted to the hospital administrator and the hospital infection prevention and control committee (IPCC).

Chain of Infection

The chain of infection refers to the way infections are transmitted. It is made up of six interconnected links (pathogen—the infectious agent, reservoir, portal of exit, mode of transmission, portal of entry, and susceptible host), each with a unique role that can be broken through the application of IPC practices. The microorganisms responsible for infectious diseases include bacteria, viruses, fungi, protozoa, and parasites[5].

Infectious Agent: Bacteria, viruses, fungi, protozoa, or parasites that cause infectious disease. Infectious agent transmission depends on the type, virulence, and infective dose of the microorganisms.

Reservoir: A place where microorganisms can multiply and/or survive. This could be in humans, animals, water (e.g., Legionella and Gram-negative bacteria in sinks), or contaminated food items and equipment. It is also important to note that an individual may become a carrier (i.e., they may continue to have microorganisms in their body without manifesting any signs and symptoms of infection).

Portal of Exit: A means by which microorganisms can leave a reservoir (through the mouth, respiratory tract, and gastrointestinal tract; aerosols from contaminated water; etc.) to reach a susceptible individual.

Mode of Transmission: Microorganisms move from one person to another through direct contact via the hands, respiratory droplets or secretions during coughing and sneezing, ingestion of contaminated food and water, and inoculation via needle stick injuries or mosquito bites.

Portal of Entry: An opening that allows the microorganism to gain access to a new person (host).

Susceptible Host: A person who is susceptible to infection.

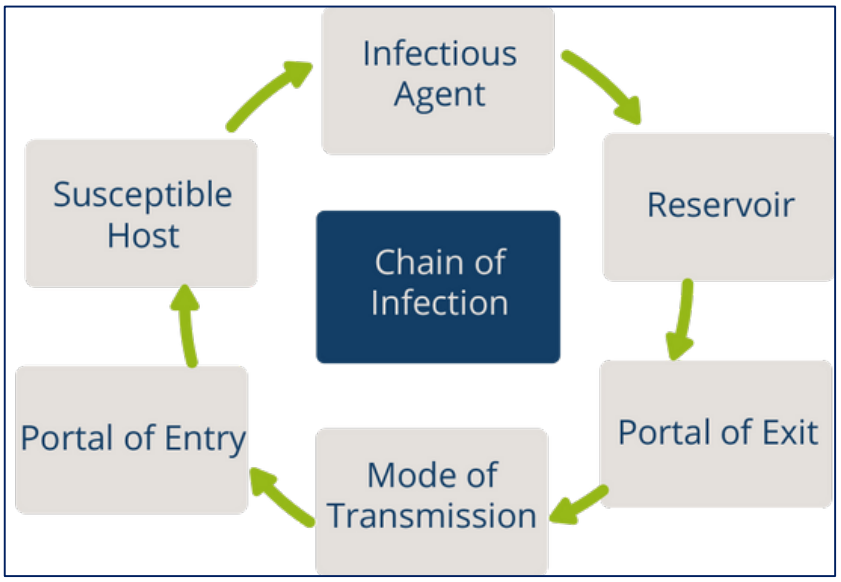


Figure 1-Chain of Infection

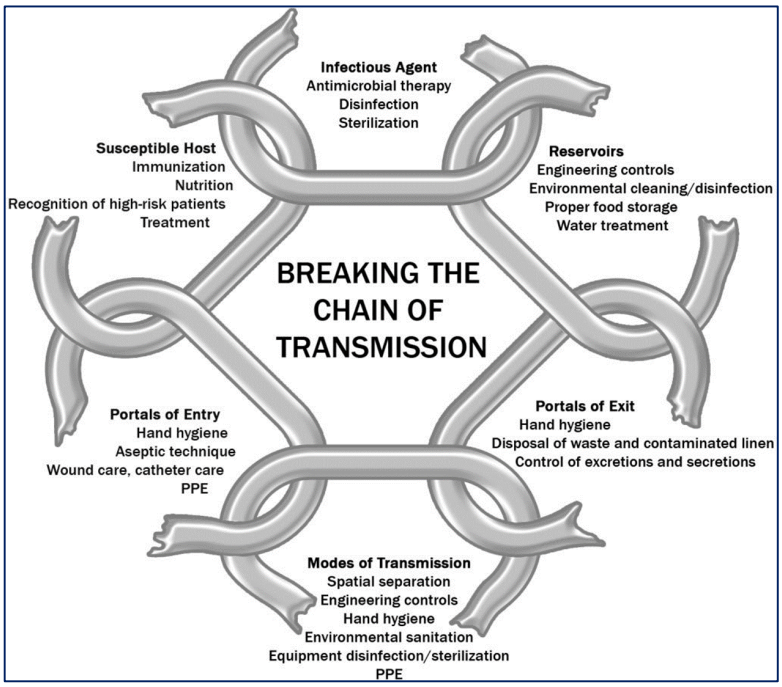


Figure 2-Breaking the Chain of Infection

CHAPTER 3 | GOVERNANCE AND COORDINATION OF IPC

Introduction

A comprehensive and well-coordinated IPC program is essential for patient and HCW safety. The IPC programs should have clear objectives and functions, and their activities coordinated by persons appointed officially (with a letter) as IPC Coordinator with defined scope of responsibilities.

In Kenya, the IPC program is established both at the national and county levels, as illustrated in the figure below:

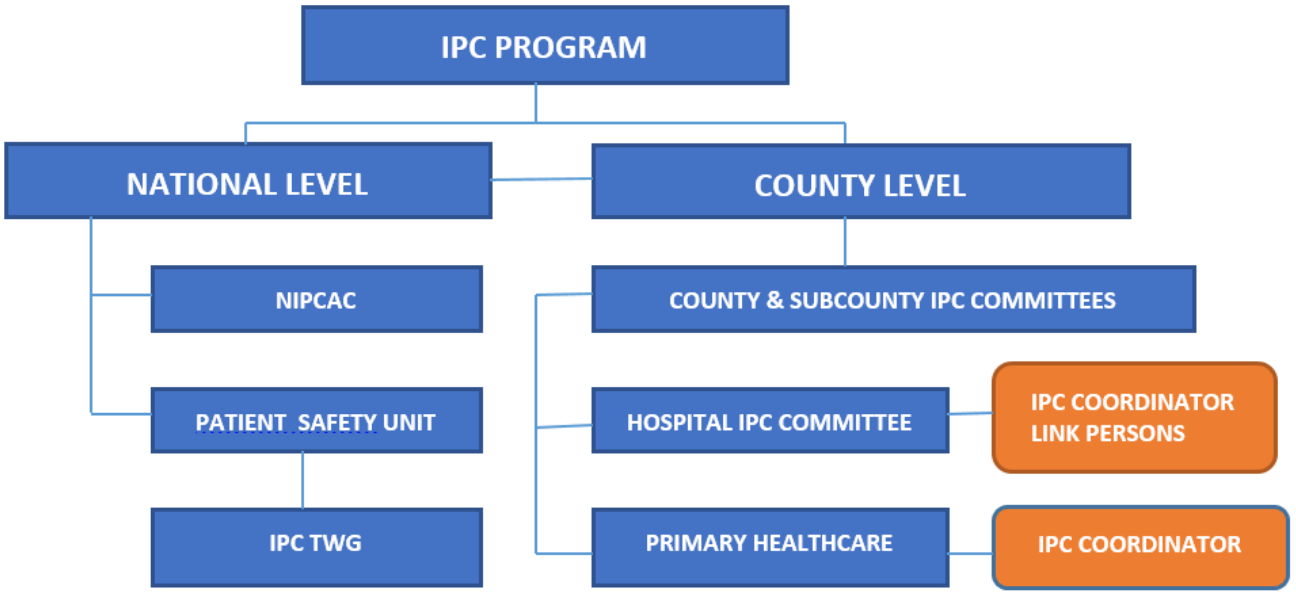


Figure 3-Organization of the IPC Program

National Level

National Infection Prevention and Control Advisory Committee

Structure

Chairperson: Director General Health

Secretary: Head Patient Safety unit

Members:

- Ministry of Health Departments of:
  - Curative Services
  - Environment
  - National AIDS and STI Control Program (NASCOP)
  - National Public Health Laboratory
  - Division of Disease Surveillance and Response (DDSR)
  - Intergovernmental Division
- Development partners
- Implementing partners
- Training institutions

» Private healthcare facilities

» Faith-Based Organizations

Functions

» Oversee the standardization and implementation of National IPC policies, guidelines and standards.

» Provide technical guidance on IPC.

» Facilitate monitoring of IPC activities in all HCFs in the public and private sectors in Kenya

Patient Safety Unit

The Patient Safety Unit operates under the Division of Quality Assurance within the Directorate of Health Standards, Regulation and Quality Assurance in the MOH. It consists of three programs, namely:

1. Patient and health worker safety
2. Infection Prevention and Control
3. Antimicrobial Resistance

Functions

» Develop and review national IPC guidelines and other relevant Patient and health worker safety, IPC and AMR documents (including policies, strategic plans, and standard operating procedures [SOPs]) in collaboration with relevant stakeholders).

» Design and monitor HAI surveillance system.

» Advise on implementation of MMS to prevent transmission of infections and reduce AMR.

» Develop and adapt IPC training curriculum and information, education, and communication materials.

» Provide technical support to County and facilities IPC Committees and their IPC Focal Persons.

» Training and technical assistance to HCWs at all levels of care.

» Support establishment of IPC programs at county, subcounty and facility levels

» Establish a system for monitoring, evaluating, and reporting key IPC indicators.

» Prepare and disseminate an annual report of IPC activities at the country level.

» Coordinate facility IPC and AMR assessments annually or when needed.

» Coordinate partners involved in IPC activities, promoting linkages to relevant national programs, including Occupational Health and Safety; Quality of Health Care Services; Water, Sanitation, and Hygiene; AMR; Immunization; and Laboratory Services, as well as training establishments, academic and scientific professional organizations, and others.

» Integrate IPC in WHO's International Health Regulations (IHR) and ensure preparedness related to public health emergencies of international concern (PHEIC)

IPC Technical Working Group

In order for the Patient Safety Unit to achieve its functions it collaborates with other TWGs, which include IPC, Environment, Surveillance, and AMR.

County Level

County Infection Prevention and Control Advisory Committee (CIPCAC)

The CIPCAC provides oversight to the IPC program at the County level.

Structure

Chairperson: County Director of Health

Secretary: County IPC Coordinator

Members include but are not limited to:

- County Chief Nursing Officer
- County Laboratory Officer
- County Pharmacist
- County Disease Surveillance Officer
- County Clinical Officer
- County Public Health Officer
- County AMR Focal Officer
- County OSH Officer
- County Quality Improvement Officer
- Monitoring and Evaluation Lead
- Private Hospitals Representative
- Faith-based Hospitals Representative
- Implementing Partners

Functions

- Develop and implement county IPC work plans.
- Oversee the implementation of the national IPC guidelines for health care services in the county.
- Ensure that HCWs obtain the appropriate IPC training.
- Provide technical support to HCFs in the county.
- Receive, analyze, and provide feedback on IPC surveillance reports.
- Mobilize resources for implementation of the County IPC program.
- Ensure availability of IPC infrastructure, materials, supplies, and equipment necessary for safe IPC practices.
- Map and coordinate with IPC implementing partners at the County level.
- Provide input to the development of national IPC frameworks and training programs.
- Support annual scheduled audits and assessments of IPC activities and infrastructure.

County IPC Coordinator

The IPC Coordinator will have a clinical background and be trained in IPC.

Responsibilities

- Serve as the secretary of the CIPCAC.
- Coordinate all IPC-related surveillance, assessments, and audits.
- Ensure that all HCWs are vaccinated against Hepatitis B virus and any other as need arises e.g., during epidemics and pandemics.
- Ensure facility IPC Coordinators and HCWs are adequately trained as per the national IPC curriculum.
- Convene quarterly meetings with Sub-County IPC Coordinators.
- Keep custody of the County IPC training database.
- Participate in the IPC OSH program matters.
- Be a member of the County outbreak emergency response team.

- Oversee the county implementation of national IPC policy, strategy, guidelines, procedures, and SOPs.
- Coordinate with stakeholders within the county to ensure that IPC activities are implemented.
- Advise the County commodities officer on the quality and quantity of IPC supplies and equipment.
- Monitor and evaluate implementation of IPC activities at the county and facility levels.
- Review reports and action plans submitted by facility IPC Coordinators.
- Generate County IPC progress reports and present findings to the CIPCAC.
- Distribute IPC documents and updates provided by the National IPC Coordinator to all facilities within the County.
- Provide technical advice and progress reports to the County Health Management Team for the IPC component.

Sub-County County Level

Sub-County IPC Committee (SCIPCC)

The SCIPCC will implement the National IPC Guidelines in HCFs within their jurisdiction. The SCIPCC should also ensure that health care providers obtain the appropriate IPC training and supervise IPC practices in HCFs.

Structure

Chairperson: Sub-County Medical Officer of Health

Secretary: Sub-County IPC Coordinator

Members include, but are not limited to:

- Sub-County Health Management Team
- Health implementing partners
- Faith-based facilities representative
- Private facilities representative

Sub-County IPC Coordinator

The sub-county IPC coordinator will have a clinical background and be trained in IPC.

At the sub-county level, a sub-county IPC Coordinator will be appointed.

Their duties will replicate those of the county IPC coordinator at the sub-county level and attend quarterly County IPC meetings convened by the County IPC Coordinator.

Facility Level

Hospital IPC Committees

Structure

- Chairperson: Senior clinical member of the institution with background knowledge on IPC/Infectious Diseases
- Secretary: Facility IPC Coordinator

Members: Multidisciplinary at level of decision-making heads of departments

- Microbiologist/pathologist
- Physician/medical officer
- Nursing Service Manager
- Pharmacist
- Housekeeping Manager/Supervisor
- Medical laboratory technologist

- Kitchen supervisor/caterers
- Laundry services manager
- Maintenance manager/Biomedical engineer
- Commodity officer
- Public-health officer in charge
- OSH Officer
- Quality Improvement team Leader
- Hospital administrator
- Other relevant medical disciplines

Functions

- Ensure adequate resources are available to implement an effective IPC program.
- Review and approve the IPC annual work plans for implementation, audits and surveillance.
- Provide timely feedback on audits data and surveillance of HAIs and multidrug-resistant organisms (MDROs) to the health management team (HMT), relevant health care personnel and departments.
- Ensure implementation of the National IPC policy, guidelines, and standard operating procedures (SOPs).
- Document any scientific evidence identified during IPC implementation.
- Monitor and evaluate IPC performance through regular audits and surveillance.
- Ensure capacity building for hospital staff on IPC.
- Appoint and supervise the IPC Link Persons in the clinical care areas.
- Identify IPC Champions.
- Provide guidance during outbreaks.
- Ensure updated and/or new policies, SOPs and other necessary IPC information are readily available to all HCWs.
- Maintain quality and specifications of IPC supplies.
- Be key advisor in matters related to hospital infrastructure, construction and renovations.
- Consider newsletter publication on a regular basis for providing information and increasing awareness on IPC-related issues.

Role of Hospital IPC Coordinator

The recommendation is a minimum ratio of one full-time equivalent IPC Coordinator per 250 beds. However, fewer patients per IPC Coordinator is advised; for example, one IPC Coordinator per 100 beds due to increasing patient acuity and complexity, as well as the multiple roles and responsibilities of modern practitioners (WHO, 2016).

The hospital IPC Coordinator will be charged with the following responsibilities:

- Ensure that National IPC policy and guidelines are implemented.
- Coordinate IPC activities in the hospital, e.g.,
  - IPC training
  - IPC induction for new staff, interns, and students
- Coordinate IPC audits, HAI surveillance, and outbreak management.
- Implement continuous IPC quality improvement processes.
- Facilitate development of hospital IPC work plan.
- Participate in forecast and quantifying of IPC supplies.

- » Ensure IPC supplies are requested, ordered, evaluated, and distributed.
- » Provide relevant IPC SOPs to all departments.
- » Supervise and support the IPC Link personnel in various departments.
- » Collaborate with IPC Champions to promote best IPC practices.
- » Monitor and evaluate IPC activities.
- » Submit IPC report to the County IPC Coordinator.

IPC at Level 2 and 3 Facilities

The facility health management team shall appoint a dedicated and trained IPC Coordinator to coordinate the implementation of National IPC guidelines at the facility level.

CHAPTER 4 | INFECTION PREVENTION AND CONTROL PRACTICES

Introduction

Infection prevention and control (IPC) is a practical, evidence-based approach preventing patients and health workers from being harmed by avoidable infections. Effective IPC requires constant action at all levels of the health system, including policymakers, facility managers, health workers and those who access health services[6].

Preventing and controlling infections in HCFs involves two tiers of approach: standard precautions and additional (or transmission-based) precautions.

Standard precautions are practices that should be used, as a minimum, in the care of all patients in health care settings, regardless of their diagnoses or presumed infection status. Implementing standard precautions is the primary strategy for prevention of HAIs.

Additional precautions are IPC practices required in addition to standard precautions. They are based on the mode (means) of transmission of the infectious agent, which may be airborne, droplet, or contact; therefore, these practices are also referred to as transmission-based precautions.

Standard Precautions

Hand Hygiene

Effective hand hygiene is a critical component of standard precautions and ensures patients' and health workers' safety. It is the simplest and most cost-effective measure to reduce infection transmission.

Skin flora are transient microorganisms found on the skin surface layers (epidermis); are easily transmitted through physical contact between patients, HCWs, and the health care environment; and have been implicated in HAI. Transient flora can be easily removed through good HH practices.

Resident flora are microorganisms that live in the deeper skin layers (dermis) and being part of normal flora, are more difficult to remove.

Transmission can occur either by direct contact with the patient or indirectly via contact with medical equipment or the patient's surroundings. This occurs in five sequential steps, as follows:

Organisms are present on the patient's skin, in blood and body fluids, or have been shed onto inanimate objects or on immediate patient surroundings.

Organisms transferred into the hands of the HCW.

Organisms are able to remain viable on the hands.

HH is ineffective, missed opportunity, or inappropriate HH agent or action.

The contaminated hands of the caregiver come into direct contact with another patient (direct contact) or with an inanimate object that will come into direct contact with a patient (indirect contact).

WHO's 5 Moments for Hand Hygiene (WHO 2009) during patient care include the following circumstances:

1. Before touching a patient
2. Before clean or aseptic procedure
3. After blood/body fluid exposure risk
4. After touching a patient
5. After touching patient's surroundings

6 https://www.who.int/health-topics/infection-prevention-and-control#tab=tab_1

Other moments of HH are listed as follows:

- Upon arriving at and before leaving the healthcare facility
- Before putting on gloves
- After removing gloves
- Before handling clean patient-care instruments
- After handling contaminated patient-care equipment
- After using the toilet and wiping or blowing one's nose

There are four types of HH:

- Hand washing
- Alcohol-based hand rubbing
- Surgical hand scrubbing
- Surgical hand rubbing

Hand Washing

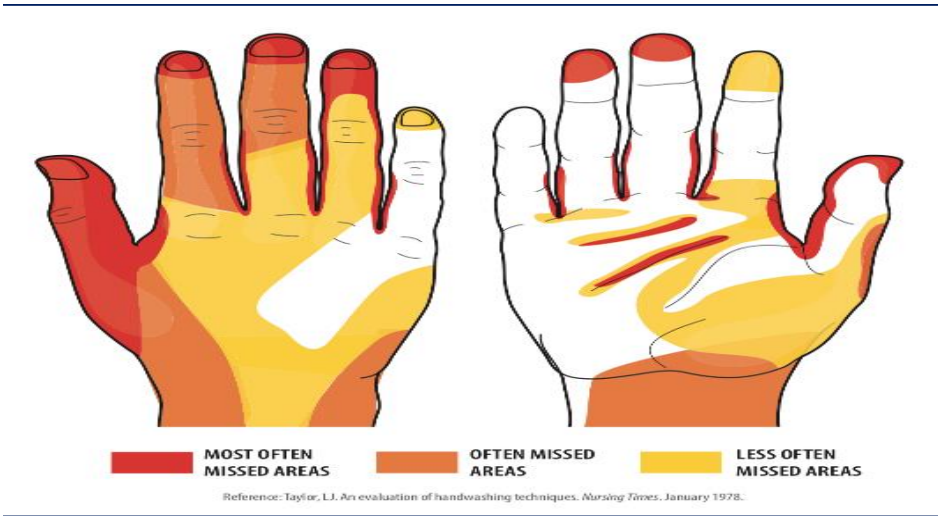


Figure 4-Areas Commonly missed during hand hygiene

The three elements that are essential for effective hand washing are soap (liquid soap), clean running water, and friction. The purpose of hand washing is to remove dirt, organic material, and transient microorganisms from the skin.Appropriate hand-washing infrastructure entails having sinks with elbow-, foot-, or sensor-operated taps.

Steps for hand washing:

1. Remove all jewelry.
2. Wet hands with running water.
3. Apply hand-washing soap. **(Washing hands with plain water without soap is not effective).**
4. Rub hands to form lather.
5. To effectively clean hands, apply friction to rub:
   - Palm to palm
   - Right palm over back of left hand and vice versa
   - Palm to palm with fingers interlaced.

- Interlocked hands to clean knuckles,
- Rotational motion of each thumb,
- Left fingertips on the right palm, and vice versa.
- Rub each wrist using rotational movement.
- Rinse hands thoroughly with clean running water

6. Dry hands with single-use towels or air-dry them. Avoid using common or shared towels, which might contaminate hands. Do not use air dryers due to aerosolization.

Do not wear artificial fingernails or extenders when in clinical areas and in direct contact with patients. Keep natural nails short.

Patients and family members should be instructed on proper hand washing. Hand washing is recommended, particularly when hands are visibly dirty.

Note: *Routine hand washing should take 40–60 seconds.*

Figure 5-Handwashing Steps

Hand-washing products should be handled according to these instructions:

Store hand-washing liquid soap in appropriate dispensers.

If reusable containers are used, clean thoroughly and dry them before refilling.

Alcohol-Based Hand Rub

The purpose of alcohol-based hand rub (ABHR; sanitizer) is to inhibit or kill transient and resident flora. ABHR should only be used when hands are not visibly dirty. Use at least 5 milliliters (mL) of ABHR

ABHRs containing 60–80% v/v ethanol or equivalent should be used for all routine HH practices in most healthcare environments.

There are some infectious agents against which ABHRs have limited effectiveness, such as Clostridioides difficile, norovirus, and other non-enveloped viruses. When caring for patients who have diarrhea, soap and water should be used for HH after contact with the patient and their immediate environment.

Note: WHO recommends ABHR formulations with ethanol or isopropyl alcohol above 70% concentration

Figure 6-Handrubbing Steps

Surgical Hand Scrub and rub

Prior to performing any surgical procedure, all surgical personnel, including surgeons and assistants, must perform a surgical hand scrub to remove debris and transient microorganisms and to reduce resident flora on their hands, lasting not less than 3 minutes. The warm, moist conditions inside surgical gloves provide an ideal environment for the growth of microorganisms. Hand washing with antiseptics before the surgical procedure helps prevent the growth of microorganisms and reduces the risk of transmitting infections to the patient if the surgeon's gloves develop holes, tears, or nicks during a procedure.

Alternatively, hand washing with liquid soap and running water followed by antiseptic containing chlorhexidine has been shown to yield significantly greater reduction in microbial counts on hands. ABHR have more immediate activity, and they lower the quantity of skin flora to such an extent that it takes several hours to grow back.

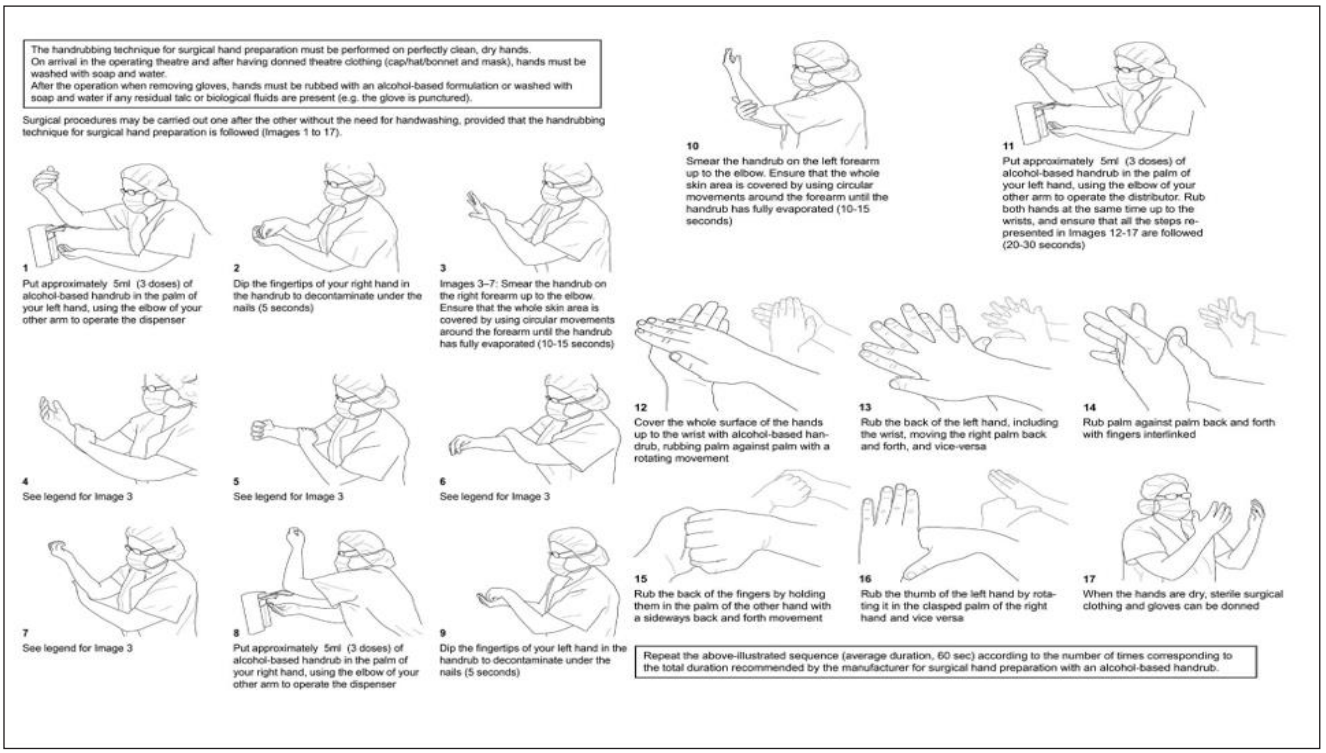


Figure 7-Surgical Hand-Scrub Steps

Improving Hand Hygiene Compliance

Hand hygiene compliance entails cleaning hands at the right moment with the right products using the right technique and the right time.

Hand hygiene has been known to reduce the transmission of microorganisms and to prevent infections, although compliance remains a challenge in HCFs.

The following steps increases compliance:

- Wide dissemination of current guidelines on HH.
- Involvement of healthcare leadership in promoting and enforcing implementation of the guidelines.
- Employing educational methods, including role modeling, mentoring, monitoring, and providing positive feedback.
- Use performance improvement approaches targeted at all health care staff, not just doctors and nurses.
- Consider the needs of staff for convenient and effective options for HH and provide appropriate resources.
- Introduce reward incentives to encourage positive behavior.
- Distribute and put up HH reminders within the facility.
- Provide sufficient HH infrastructure and supplies.

Obstacle	Strategy
Lack of knowledge	Provide education with supportive literature, videotaped instructions, and hand hygiene demonstrations. Provide personnel with education and feedback on infection rates. Provide a program on HH for patients and their families.
Lack of motivation	Provide direct observation and feedback on a regular basis (Appendix 20). Use mentors and role models.
Unavailability of Hand Hygiene facilities	Ensure that hand hygiene facilities are conveniently located throughout the HCF. Make running water available. Make hand hygiene facilities available in rooms where health care procedures are performed. Make soap and disposable towels available in adequate and continuous supply. Make ABHR available in wall-mounted dispensers or in small containers at the point of care.
Non-acceptance of Hand Hygiene	Provide hand hygiene products that have a high level of acceptability for staff. Take into consideration the appropriateness, cost, and supply of such products.
Dermatitis	Ensure a constant supply of lotions in small, non-refillable containers and provide ABHR with emollients to prevent skin dryness.

Table 1-Obstacles to hand hygiene

Factors to Note:

HCWs should be aware of the following considerations:

1. Cuts and abrasions on cuticles, hands, and forearms should be covered with waterproof dressings. If covering them in this way is not possible, surgical staff with skin lesions should not perform surgical operations until the lesions heal.
2. Gloves should not replace HH and should not be sanitized or washed.
3. HCWs should follow instructions on proper use of gloves.
4. Long fingernails serve as possible reservoirs for microbes and tend to puncture gloves more easily.

2.Personal Protective Equipment (PPE)

PPE is specialized clothing or equipment worn by HCWs for protection against infectious materials. PPE provides a physical barrier between microorganisms and the wearer, thereby preventing microorganisms from contaminating hands, faces, clothing, and feet. PPE reduces, but does not completely eliminate, the risk of acquiring an infection. PPE should be used effectively, correctly, and whenever there is a risk of exposure to pathogenic microorganisms.

Note: The use of PPE such as gloves does not replace the need to follow basic IPC measures such as hand hygiene. When selecting PPE, consider:

- The probability of exposure to blood and other body fluids
- The type and amount of body fluids involved.
- The probable presence of an infectious agent and the means of transmission

Principles for Using PPE

HCWs should:

- Wear scrubs before doing any PPE while working in clinical areas.
- Assess the risk of exposure to blood, other body fluids (excretions or secretions) and choose PPE accordingly.

» Avoid any contact between contaminated PPE and surfaces, clothing, or people outside the patient care area.

» Dispose of used PPE appropriately.

» Not share PPE.

» Change PPE and perform HH in between patients.

» Not reuse disposable PPE

» Follow proper cleaning procedures for reusable PPE, e.g., face shields, before reuse.

The table below gives a guide to the types of PPE and their recommended uses:

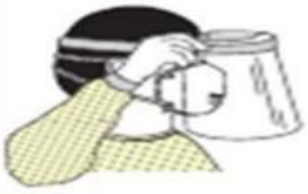
No.	Personal Protective Equipment	Use	Illustration
1	Gloves	Protect hands from contamination by patient blood or body fluids. Protect patient from normal skin flora of healthcare worker	
2	Gowns and Aprons	Protect skin and clothing	
3	Face Masks Respirators	Protect mucous membranes of mouth and nose. Prevent inhalation of infectious aerosols	
5	Goggles	Protect eyes	
6	Face Shields	Protect mucous membranes of face, mouth, nose, and eyes	

Table 2-Guide to the types of PPE

Gloves

Gloves should be worn in addition to, not as a substitute for hand hygiene. Understanding when to use and when not to use gloves can help maintain safety and reduce costs.

Gloves are not required if there is no anticipated contact with mucous membranes, blood, other body fluids (secretions or excretions). Appropriate use of gloves also entails using the correct type of gloves for the right procedure or purpose. The general principles for using gloves:

- When indicated, put on gloves before contact with the patient or immediately before the task or procedure.
- To prevent cross-contamination of body sites, change gloves between care activities and procedures with the same patient.
- Change gloves between patients.
- Wear gloves while handling laboratory specimens.
- Remove gloves immediately after completing care or procedure, at the point of use, to avoid contaminating environmental surfaces.
- Do not wear gloves while walking in corridors or riding in elevators/lifts.
- Perform HH immediately after removing gloves.
- Do not wash, sanitize, or reuse single-use disposable gloves.
- Utility or heavy-duty gloves are cleaned for reuse.
- Wear the correct size of gloves.
- Change gloves during prolonged surgical cases to enhance safety against risk of worn-out gloves.
- Keep fingernails trimmed (less than 3 millimeters below the finger pads).
- Pull gloves up over cuffs of gown (if worn) to protect the wrists.
- Do not use oil-based hand lotions or creams, because they can damage latex rubber in surgical and examination gloves.
- Do not use latex gloves if you have a latex allergy.
- Do not store gloves in areas where there are extremes of temperature.

Glove pyramid

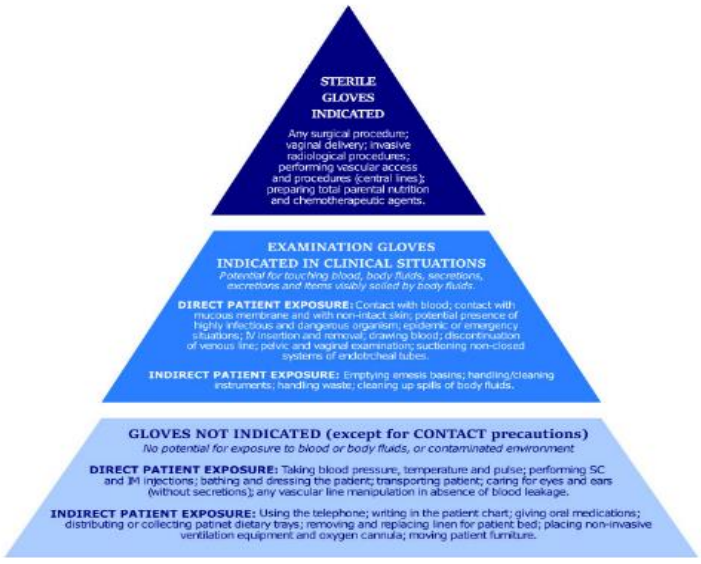


Figure 8-Glove Pyramid

Surgical Masks

Surgical masks protect the mucous membranes of the nose and mouth during procedures and patient care activities. A surgical mask should be worn in circumstances where splashes of blood, other body fluids (secretions and excretions) are likely, e.g., secretions like droplets of a patient or HCW who has communicable disease. A

mask should be well fitting covering the nose to the lower part of the chin. Surgical masks help protect against droplets that are more than 5 µm and they are single use.

Surgical masks are made of triple-layered fabric as follows:

» The outer layer consists of water resistant (hydrophobic) material.

» Middle layer that filters microorganisms and particulates contained in the droplets.

» The inner layer is made of an absorbent (hygroscopic) material.

Ear-loop surgical mask *Tie-on surgical mask*

Figure 9-Surgical Masks

Respirators

A respirator such as an N95 mask protects HCWs from inhaling respiratory pathogens that are transmitted via the airborne route. This helps prevent the spread of infectious diseases transmitted through droplet nuclei that are less than 5 µm such as tuberculosis (TB).

Respirators should be worn by:

» HCWs attending to a patient who has a communicable disease that is spread via the airborne route.

» Visitors to a patient who has a communicable disease that is spread via the airborne route.

These masks are for single use only and should be discarded after 4 to 6 hours of use. However, if a mask is wet, damaged, or visibly dirty, it should be changed.

Note:

» All staff wearing medical respirators (e.g., N95 respirators) must have undergone a fit test to ensure that the correct size respirator is used to provide optimal protection. Always perform a facial seal check after donning a respirator.

» People with chronic respiratory, cardiac, or other medical conditions that make breathing difficult should check with their health care provider before using a respirator because it can make it more difficult for the wearer to breathe.

» Respirators with exhalation valves should not be used when sterile conditions are needed.

» Respirators are not designed for children or people with facial hair. Because a proper fit cannot be achieved on children and people with facial hair, the respirator may not provide full protection.

Figure 10-Respirators

Protective Eyewear (Goggles, Visors, and Face Shields)

Protective eyewear includes safety goggles, visors, and face shields. HCWs should wear protective eyewear to protect the mucous membranes of their eyes during procedures and patient care activities that could generate splashes or sprays of blood or body fluids (secretions or excretions).

Masks and eyewear should be worn when performing any task where an accidental splash into the face is likely to occur. If face shields are not available, goggles or visors and a mask can be used together.

Figure 11-Facial Protection

Gowns

Gowns are worn to protect uncovered skin and to prevent soiling of clothing during procedures and patient care activities that are likely to generate splashes or sprays of blood and body fluids (secretions or excretions). Impermeable gowns are preferable.

Gowns should not be worn outside the patient care area. Soiled or wet gowns should be removed immediately.

Note: If both a gown and gloves are worn, the gown should be put on first so that gloves can cover the cuffs.

Disposable gown

Reinforced disposable gown

Figure 12-Types of Gowns

Aprons

Aprons are used to protect clothes from contamination. Plastic aprons are recommended for procedures during which splashes, or spillage of blood and body fluids (secretions or excretions) are likely, for example, when conducting a delivery.

A waterproof apron should be worn on top of the gown if the gown is not waterproof. Waterproof aprons provide a barrier on the front body of the HCW. Launder gowns and aprons appropriately if they are reusable. Do not reuse disposable gowns and aprons.

Disposable apron

Reusable apron

Figure 13-Types of Aprons

Head Covers

Use caps to keep hair and scalp covered during surgery to prevent flakes of skin and hair from shedding into a patient's wound and sterile surfaces. Caps should be large enough to cover all hair. Launder caps appropriately if they are reusable. Do not reuse disposable caps.

Reusable cloth caps *Disposable caps*

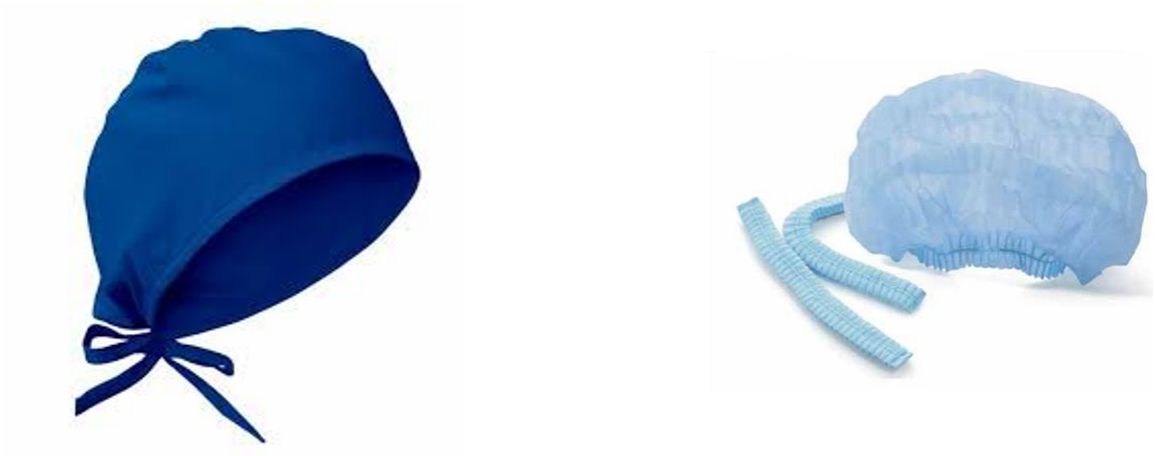


Figure 14-Types of Caps

Footwear

Wear closed shoes to protect your feet from injury by sharps or heavy items or from contact with blood or other body fluids. Boots are preferred in operating theaters, delivery rooms, and mortuaries as well as during cleaning of the environment. Clean and disinfect reusable boots.

Figure 15-Boots

3. Safe Injection Practices

A safe injection is one that does not harm the recipient and does not expose the provider to any avoidable risk.

The World Health Organization (WHO) estimates the burden of diseases associated with unsafe injection practices to be about 1.3 million early deaths, loss of about 26 million lives and an annual burden of 535 million US dollars in direct medical costs[7] and estimates that at least 50% of all injections are unsafe. This poses serious health risks to recipients, HCWs, and the public. In many developing countries, injection overuse and unsafe practices account for a substantial proportion of new infections with hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV). In a national cross-sectional survey on injection-safety practices in Kenya in 2012, 40% of participants preferred an injection over oral medication.

Injections should be administered safely and only when they are medically indicated. Eliminating unnecessary injections is the best way to prevent injection-associated infections.

Sharps (needles, scalpels, etc.) must be handled with extreme caution to avoid injuries during use or disposal.

Note:

» Use a sterile, single-use syringe and needle for each injection.

- Auto-disable syringes and retractable needles are recommended.
- Ensure that the syringe and needle are sealed and inspect the packaging for breaches in barrier integrity.

» Prevent contamination of injection equipment and medication.
  - Reconstitute each unit of medication aseptically and separately using a single-use syringe and needle.
  - Prepare each injection in a clean designated area where blood or body fluid contamination is unlikely.
  - Use single-dose vials instead of multi-dose vials. If multi-dose vials must be used, always pierce the septum with a sterile needle and do not leave the needle in place in the stopper of the vial.
  - Always disinfect the septum with an alcohol swab before piercing.
  - Select pop-open ampoules instead of ampoules that require a metal file to open.
  - Protect fingers with a clean barrier, such as a small gauze pad, when breaking open the ampoules.
  - Inspect and discard medications with visible contamination or breaches of integrity, such as cracks or leaks in the container.
» Follow product-specific recommendations for using, storing, and handling equipment and medication.
» Swabbing new ampoules with an antiseptic or disinfectant is unnecessary.
» Prepare patient's skin by swabbing with cotton wool soaked in alcohol before injection.
» Discard a needle that has touched any non-sterile surface.
» Do not pick up a handful of sharp instruments simultaneously.
» Dispose of used sharps immediately in designated puncture- and leak-proof containers labeled with a biohazard symbol.
» Prevent and limit access to used needles, syringes, and other sharps containers while awaiting transport for final disposal.
» Sharp containers should be placed within arm's reach and be less than three-quarters full.
» Use disposable gloves if exposure to blood is anticipated.
» Alert the patient to stay still if dealing with a conscious patient, to avoid sudden movement that could lead to injury.
» Avoid recapping sharps! If recapping is unavoidable, such as when using dental needles, use the single-hand-scoop method.
» Discard used syringes and needles as a unit (avoid detaching the needle from syringe after use).
» Mount sharps containers to the walls or other surfaces if possible.
» If injured by sharps, follow post-exposure SOP.

Store the sealed sharps containers in a secure area, out of reach of patients and other unauthorized persons, while it awaits transport for final disposal. Dispose of sharps waste in an efficient, safe, and environment-friendly way to protect people from exposure to used sharps.

Figure 16-Safety Box

Note:

- ***For safe final disposal of sharps, refer to the section on management of health care waste in this chapter.***
- ***Prior to injection, wash skin that is visibly soiled or dirty with soap and water.***
- ***When swabbing with an antiseptic, use a clean, single-use swab and ensure the site is dry before puncture.***
- ***Do not use cotton balls that have been stored wet in a multi-use container.***
- ***Avoid giving injections on skin that has compromised integrity.***

4. Reprocessing of Reusable Medical Devices

Contaminated medical and surgical devices may serve as vehicles for the transmission of infection both to patients and HCWs. Therefore, decontamination of medical devices is essential. The term decontamination encompasses the entire process, including cleaning, disinfection, or sterilization.

The risk of transferring infection from instruments and equipment is dependent on the following factors:

- The presence of microorganisms, their load, and their virulence
- The type of procedure that is going to be performed (invasive or non-invasive)
- The body site where the device will be used (penetrating the sterile tissues, mucosal lining, or intact skin)

Risk Category	Definition	Examples of commom Items/Equipment	Method of Decontamination	Required level of Micromicidal Action
High (critical)	Critical objects that enter sterile tissue, cavities or bloodstream.	Surgical instruments and devices, urinary catheters, cadiac catheters, implants, needles and syringes, dressings, sutures, delivery sets, dental instruments, rigid bronchoscopes, cystoscopies, etc.	Sterilization by heat or chemical sterilants. Examples: Steam, ethylene, oxide, gas hydrogen peroxide plasma etc or using ≥ 2.4%, glutaraldehyde-based formulation 7.5% hydrogen peroxide, 0.2% peracetic acid.	All Microoganisms
Intermidiate (Semi-critical)	Semi-critical objects that come in contact with mucous membranes or non-intact skin.	Resparatory therapy & anaesthesia equipment, flexible endoscopes, vaginal specula, larngoscope blades and airways, reusable bedpans and urinals, etc.	High level disinfection by heat or chemicals (see annex 6). Examples: Glutaraldehyde, hydrogen peroxide, orthophthalaldehyde, and peracetic acid with hydrogen peroxide.	All microoganisms, **EXCEPT:** high numbers of bacterial spores.
Low (Non-Critical)	Non-critical objects taht come in contact with intact skin only	Cructhes, beds, ECG leads, bedside tables, walls, floors & furniture, toilet seats, baths, basins, theatre table, blood pressure cuffs, crutches, stethoscopes, etc.	Low level disinfection (cleaning) Examples: Ethyl or Isopropyl alcohol (70-90%): Chlorine (0.01-0.05%): Phenolic and Quanternary Ammonium germicidal detergent solutions.	Vegetative bacterial, fungi and lipid viruses **ONLY**

Table 3-Spaulding Classification of Medical Devices

Cleaning

Cleaning is defined as the removal of all foreign materials both inorganic and organic such as blood, protein, cellular debris, tissue, respiratory secretions, mucus, saliva, feces, etc. from objects. If the instrument is not clean, the organic material can harbor embedded microorganisms and prevent the penetration of the disinfectant or sterilizing agent, rendering the disinfection or sterilization process ineffective. Ensure that all surfaces of instruments and equipment, including channels and bores, are cleaned before further processing.

Cleaning Agents

Enzymatic detergents are recommended for cleaning soiled equipment because they break down large, hard to remove materials into smaller, easy to remove fragments. Some enzymatic detergents currently in the market are Cidenzyme, Endozyme, MetriZyme, and EmPower. Liquid soap with warm water (not hot water) can also be used because it suspends grease, oil, and other foreign matters in solution so that they can be removed easily by the cleaning process. Do not use an abrasive cleaner, such as steel wool, because it can scratch the instruments, which creates potential sites for harboring microorganisms.

If an instrument or piece of equipment cannot be cleaned effectively, then do not sterilize or disinfect it - discard it.

Cleaning Methods

Manual Cleaning

To minimize the risk of contamination to the cleaning personnel and achieve effective cleaning, the following procedure should be followed:

- Wash hands and wear appropriate PPE (e.g., surgical mask, utility gloves, apron, and eye protection). Care should be taken when handling sharp instruments.
- Clean instruments immediately after use; if not possible, immerse them in a bucket with soap and water or enzymatic detergent.
- Leave hinged instruments open and disassemble those with removable parts.
- Place instruments in a container made of metal or perforated plastic.
  - Fully immerse instruments in a container with enzymatic solution for a minimum of 2 minutes. Refer to the manufacturer's instructions on how to make the solutions.
  - Scrub instruments' surfaces with brushes, pipe cleaners, or other cleaning tools, taking special emphasis on the toothed bars and internal spaces of the tweezers, serrated edges, box locks, lumens, and other hard to reach surfaces.
  - Rinse instruments with clean water at least two times to remove all detergent.
- Inspect the instruments to ensure organic material has been completely removed.
- Allow instruments to dry.
- Inspect the instruments again to ensure they are clean.
- Clean and rinse below water level to prevent splashing.

Mechanical Cleaning

Machine cleaning of instruments requires minimal handling of dirty equipment by staff. The equipment is placed in trays ready for washing as follows:

- The washing machine gives a cold rinse followed by a hot wash at 71°C for two minutes. This is followed by a 10-second hot-water rinse at 80–90°C and then drying by an in-built heater or a fan at 50–75°C.
- The washer-disinfector is used for anesthetic equipment. It runs a 45-minute cycle of washing and cleaning, plus a two-minute cycle with water at 80–100°C and a detergent solution.

Note: New instruments may be supplied without lubrication. New instruments should be cleaned, dried, and have moving parts lubricated. Whenever cleaning, regardless of methods, keep ratchets unlocked and box joints open.

Disinfection

Disinfection inactivates disease-causing microorganisms from instruments and equipment, but it does not eliminate bacterial spores and prions. Disinfection is to be carried out for semi critical devices. Disinfection is achieved either by using chemical disinfectants or by pasteurization (thermal).

The two types of chemical disinfection are:

High-level disinfection (HLD):

A process that eliminates vegetative (live) bacteria, enveloped viruses, fungi, mycobacteria (e.g., TB), and non-enveloped viruses. HLD is used for semi critical medical equipment/devices. High-level disinfectants include 2% glutaraldehyde, 6% hydrogen peroxide, 0.2% peracetic acid, 2–7% enhanced-action-formulation hydrogen peroxide, and 0.55% ortho-phthalaldehyde (OPA). Pasteurization also achieves HLD. HLD is performed after the equipment/device is thoroughly cleaned, rinsed, and dried.

Note: semi critical medical equipment/devices require decontamination using, at a minimum, HLD; but sterilization is the preferred method of decontamination for these equipment/devices.

Low-level disinfection (LLD)

A process that eliminates vegetative (live) bacteria, some fungi, and enveloped viruses. LLD is used for noncritical medical equipment/devices and some environmental surfaces. Low-level disinfectants include 3% hydrogen

peroxide, 0.5% enhanced-action- formulation hydrogen peroxide, some quaternary ammonium compounds (QACs), phenolics, and diluted sodium hypochlorite (e.g., bleach) solutions. LLD is performed after the equipment/device is thoroughly cleaned, rinsed, and dried. The container used for disinfection must be washed,

Selecting Chemical Disinfectants for Use in Healthcare Facilities

Different grades of disinfectants are used for different purposes. Only instrument-grade disinfectants are suitable for use on medical devices.

Glutaraldehyde is generally the most commonly used chemical disinfectant for HLD. However, this chemical must be used under strictly controlled conditions and in a safe working environment due to staining of the hands and causing irritation of the mucous membrane.

If the disinfectant is a multi-use solution, it is important to store it correctly and according to the manufacturers' instructions. Be careful not to contaminate the solution when pouring it out for use.

Using Disinfectants

Disinfectants should be supplied, preferably ready for use. However, if supplied undiluted, the HCW should follow the manufacturer's instructions to ensure that the correct dilution formula is used.

HCWs should follow these guidelines when using disinfectants:

» Do not store disinfectant solution in an open container.

» Always thoroughly clean articles before disinfecting them.

Disposing of Used Disinfectant Chemicals and Storing Containers

Pour used and expired chemical disinfectants carefully down a utility-sink drain or into a flushable toilet and thoroughly rinse or flush with water. You can also pour liquid waste into a latrine. Avoid splashing. Disinfectant containers must be thoroughly cleaned, disinfected, and rinsed before refilling between uses. If containers are for disposal, clean with soap and water prior to disposal and do not reuse for domestic purposes.

Chemical disinfectants should be stored in a cool, dark place to avoid degradation of the chemical ingredients.

Notes: Disinfectants should be diluted in manageable quantities, to reduce waste. Only knowledgeable personnel should dilute disinfectants.

Pasteurization (Thermal Disinfection)

Pasteurization, or thermal disinfection, is a process of boiling for at least 30 minutes, which is accomplished through the use of automated pasteurizers or washer disinfectors. This is a HLD process. Semi critical medical equipment/devices suitable for pasteurization include equipment for respiratory therapy and anesthesia. Equipment/devices require cleaning and rinsing prior to pasteurization.

Note: The manufacturer's instructions for installation, operation, and ongoing maintenance of pasteurizing equipment must be followed to ensure that the machine does not become contaminated.

Note: Pasteurization is effective at disinfecting only vegetative microorganisms but not spores. Critical devices should never be pasteurized.

Sterilization

Sterilization is the process that destroys all microorganisms (bacteria, viruses, fungi, and parasites), including bacterial endospores. All medical devices that come in contact with sterile body tissues should be sterilized by either physical or chemical methods, such as:

» High-pressure steam (autoclaving)

» Dry heat (oven)

» Chemical soaking (cold sterilization)

Heat, either steam or dry, is the most effective method of sterilization and is reliable. It is also less expensive than chemical methods. Heat should be considered first for all medical equipment that can withstand it. Where heat cannot be used, chemicals sterilant such as glutaraldehyde, hydrogen peroxide, and ethylene oxide can be used. Before sterilizing any medical devices, ensure that they have been properly cleaned. Records should be kept of the sterilization process and for the traceability of instruments.

Wrapping Items for Sterilization

- All items must be wrapped with lint-free materials before sterilization.
- Wrapping helps prevent recontamination after sterilization and prior to the item's use.
- The properties of the wrapping material should allow it to act as a barrier against dust particles, to repel water, and to provide an adequate seal of the contents.
- The wrapper should completely enclose the instruments or items, resist tears and punctures, be free of holes and toxic ingredients.
- The wrappers should be used sequentially or simultaneously to wrap the contents. Pins, staples, paperclips, and other sharp objects should never be used to secure a wrapped item. All sterile packages should be handled minimally.
- If the wrapper is to be used as a sterile field, it should be double wrapped to provide a field of at least 6 inches beyond the four sides of the table.
- Although cloth material does not meet the above criteria, it is often used in many healthcare facilities to wrap medical devices/instruments for sterilization. The cloth material used should be lint free. Also, it should be properly folded, and edges tacked in the corners to completely enclose the medical devices/ instruments. Double wrapping is also recommended.

Autoclaving

- Autoclaving is the use of steam under high pressure to sterilize medical devices. To ensure effective sterilization, follow these instructions:
- Keep instruments disassembled, opened, and unlocked.
- Do not stack the instruments.
- Do not wrap the packages too tightly.
- Do not arrange the packs in the autoclave too close to each other.
- Position the containers in a way that air can easily be displaced, and steam can have enough contact with all surfaces.
- Ensure that the small drain strainer at the bottom of the autoclave is not clogged.
- Ensure that there is at least 7–8 centimeters (3 inches) of space between the packages and the autoclave chamber walls.
- Place bottles, solid metal, and glass containers on their sides with lids held loosely in place.
- Place instrument trays (mesh or perforated bottom only) flat and do not overload the autoclave or make packs too large.
- Apply autoclaving tape on the pack of instruments.
- Maintain the appropriate temperature, timing, and adequate moisture during any of the autoclaving cycles.
- Observe sterilization contact and monitor the process time, temperature, and pressures as specified by the manufacturer.
- Monitor sterilization process using biological and chemical (test strips) indicators.
- Allow packs to dry completely before removal.
- Allow packs to reach room temperature before storing.

Dry-Heat Sterilization

Dry-heat (hot air) sterilization destroys pathogens by the process of oxidation. Dry-heat sterilization can be achieved with a simple oven as long as a thermometer is used to verify the temperature inside the oven. It has limited value because it is difficult to maintain the same temperature throughout the load. Use dry-heat sterilization only for items that can withstand a temperature of 170°C. The manufacturer's instructions must be followed while sterilizing medical devices.

Chemical Sterilization

Chemical sterilization, often called cold sterilization, is an alternative for heat-labile items that would get damaged by high-pressure steam or dry heat. Glutaraldehyde is commonly used for chemical sterilization. Because glutaraldehyde works best at room temperature, chemical sterilization cannot be assured in cold environments (temperatures less than 20°C or 68°F), even with prolonged soaking. Some other chemicals used are hydrogen peroxide, ethylene oxide, and peracetic acid. Follow manufacturer's recommendations on the required exposure time.

First clean and dry all instruments and items before sterilization. Water from wet instruments and items dilutes the chemical solution, thereby reducing its effectiveness. Follow these steps for the chemical sterilization process:

- Follow the manufacturer's instructions on the required dilutions. After preparing the solution, put it in a clean container with a lid. Always mark the container with the preparation and the expiration dates.
- Open all hinged instruments and other items and disassemble those with sliding or multiple parts. Completely submerge all instruments and other items in the solution. Place any bowls and containers upright, not upside down, and fill with the solutions. The surfaces of all instruments must be in contact with the sterilizing solution to ensure effective sterilization.
- Follow the manufacturer's instructions regarding the exposure time necessary for sterilization.
- Use large, sterile pickups (lifters, chelate forceps) or sterile gloves to remove the instruments and other items from the solution.
- Rinse items three times with sterile water to remove the residue that chemicals leave on instruments and other items. Normal saline can also be used to rinse the instruments. This residue is toxic to skin and tissues.
- Place the instruments and other items on a sterile tray or in a sterile container and allow them to air dry before use. Use the instruments and other items immediately or keep them in a covered and dry sterile container and use them within 1 week.

Note: Sterilizing chemicals should be changed after 14 days and when they become visibly dirty, or according to manufacturer's instructions.

Monitoring Sterilization Procedures

A variety of indicators can be used to monitor the effectiveness of the sterilization process:

- Monitor biological Indicators at regular intervals: *Bacillus stearothermophilus* weekly and as needed for steam sterilizers, and *Bacillus subtilis* weekly and as needed for dry-heat sterilizers. Monitor biological indicators for every load containing implants.
- Use chemical indicators like tape or calibrators that monitor time, temperature, and pressure for steam sterilization and time and temperature for dry-heat sterilization.
- Use external indicators to verify that items have been exposed to the correct conditions of the sterilization process and that the items have been sterilized successfully.
- Place internal indicators inside a pack or container in the area most difficult for the sterilization agent (steam or heat) to reach, for example, in the middle of the packs.
- Mechanical indicators for sterilization provide a visible record of the time, temperature, and pressure for each sterilization cycle.
- After the sterilization process cycle is complete, log the time, temperature, and pressure of the sterilization process manually or with the printout or graph from the sterilizer. This log should be kept by the person responsible for the sterilization process.

Storage

Proper storage of sterile instruments and equipment is essential to ensure that the items maintain their sterility or disinfection status. Store sterile items in a clean, dry environment to protect them from any damage to the wrapper or wetness. The storage area should be separate from dirty items, enclosed, and located next to or connected to the area where sterilization occurs in the central sterilization supplies department (CSSD). When

sterile packs are kept in the wards or clinics, HCWs should ensure the storage area is clean (free from dust) and doors to shelves, cabinets, or rooms are closed. The area should be used solely to store sterile packs with limited access.

Instructions for Storing Sterile Items:

- Keep the storage area clean, dry, dust-free, and lint-free.
- Keep the temperature at approximately 24°C and the relative humidity below 70% when possible. Store packs and containers with sterile (or high-level disinfected) items 20–25 centimeters off the floor, 45–50 centimeters from the ceiling, and 15–20 centimeters from an outside wall.
- Do not use cardboard boxes for storage.
- Monitor the sterilization date and rotate the supplies (first in, first out). This process serves as a reminder, but does not guarantee, the sterility of the packs, in case the package gets wet or becomes torn.
- Clean supplies, high-level disinfected items, and sterile supplies should not be stored together; that is, supplies that have been cleaned, but not sterilized or disinfected, should be kept separate.
- When sterile items are unwrapped or removed from the pack, they should be used immediately and should not be stored for use later.
- Before using any sterile item, look at the package to make sure the wrapper is clean, dry, and intact; the seal is unbroken; and no water stains are present.

5. Management of Health Care Waste[8]

Health care waste is a potential reservoir of pathogenic microorganisms and requires appropriate, safe, and reliable handling. Waste management should be conducted in coordination with the infection control team.

Waste from HCFs can be broadly classified into two categories: hazardous and nonhazardous.

- The hazardous category includes domestic infectious, radioactive, cytotoxic, and genotoxic waste, as well as chemical and pharmaceutical waste.
- Nonhazardous waste comprises general waste that is not mixed with any hazardous material.

General or noncontaminated waste poses no risk of infection to persons who handle it. Examples include paper, trash, boxes, unbroken bottles, and plastic containers that contain products delivered to the HCF. It is estimated that approximately 85% of the waste generated in HCFs is nonhazardous.

General Guidelines for Healthcare Waste Management

- Develop a waste management plan.
- Segregate healthcare waste according to its categories using dedicated color-coded containers with appropriate bin liners.
- If color-coded bins and liners are not available, label the containers used.
- Transport waste in a dedicated covered cart or trolley.
- Carts or trolleys used for the transport of segregated waste are not used for any other.
- Transport different categories of waste separately.
- Store waste in specified areas with restricted access and mark the storage areas with a biohazard symbol.
- Storage time must not exceed 48 hours.
- Infectious waste should be treated appropriately, as described to detail later in this section, before being released for final disposal.
- Waste handlers should use appropriate PPE and practice HH during handling of waste.

Steps in Healthcare Waste Management

Waste minimization

Segregation (separation)

Collection

8 Ministry of Health, Government of Kenya. Guidelines for Safe Management for Healthcare Waste, January 2011

Transportation

Storage

Treatment

Disposal

Waste Minimization

Waste minimization is a waste management approach that focuses on reducing the amount of waste generated. This can be achieved through source reduction, reuse, and recycling.

Waste Segregation

- Segregate waste at point of generation.
- Use appropriate color-coded separate containers for non-hazardous and hazardous waste.
- Use color-coded bins and bin liners or label the waste containers.
- Fill the waste containers not more than three-quarters full.
- Never sort through wastes already placed in the waste containers

Figure 17-Waste Segregation

Waste Collection and Storage

Once waste is segregated, it should be collected in appropriate containers. These containers should be color-coded and labeled to indicate the type of waste they contain. Infectious waste, for example, is often stored in red bags or containers, while sharps are placed in puncture-resistant containers. Storage areas should be secure to prevent unauthorized access.

Waste Treatment

Depending on the type of waste, it may undergo various treatment processes to reduce its hazardous nature. Treatment methods include:

- Incineration: High temperature burning of waste to destroy pathogens and reduce its volume.
- Autoclaving: Steam sterilization to kill microorganisms in infectious waste.
- Chemical disinfection: Using chemicals to disinfect infectious waste.
- Mechanical and biological treatment: Shredding and composting for some types of waste.

» Radioactive waste management: Specialized processes like encapsulation or long-term storage for radioactive materials.

Waste Disposal

After treatment, waste is disposed of in a manner that minimizes environmental and public health risks. General waste may be sent to landfill, while hazardous waste requires specialized disposal methods. Radioactive waste must be managed according to regulatory requirements, often involving long-term storage or disposal in a dedicated facility.

Disposal of Sharps

» Place sharps in safety boxes that are resistant to punctures and leakage at the point of use.

» Close safety boxes when three-quarters full.

» Incinerate or microwave/shred full safety boxes.

» Bury residues of incineration.

» Do not, under any circumstances, dispose of used syringes, needles, or safety boxes in normal garbage or dump them without prior treatment.

Note

Facilities without a waste treatment plan should have an off-site arrangement to treat their waste.

Sharps are one of the most hazardous health care wastes in an HCF. They pose great danger to HCWs, waste-management operators, and individuals who scavenge in waste disposal sites.

Disposal of Liquid-Contaminated Waste

Wastewater from HCFs may contain various potentially hazardous components, such as microbiological pathogens, hazardous chemicals, pharmaceuticals, and radioactive isotopes. The following basic precautionary practices can reduce the public health risk that is associated with liquid waste and wastewater.

» Most liquid waste can be disposed of in the normal sewer except for chemical/cytotoxic or radioactive waste.

» Neutralize effluents from laboratories in a buffer tank before draining them off into the sewer.

» Sterilize all infectious agents from the laboratory such as blood culture and culture media in an autoclave.

» Discharge radioactive effluents of isolation wards into the sewer or into a septic tank only after they have decayed to background level in adequate retention tanks.

» Wear appropriate PPE while handling waste.

» Decontaminate waste containers.

» Perform HH while handling waste.

Disposal of Solid Waste

» Handle hazardous and nonhazardous waste separately.

» Wear appropriate PPE when handling and transporting solid waste.

» Ensure that there are a sufficient number of waste containers placed in convenient locations.

» Collect the waste containers on a regular basis and transport the burnable ones to the incinerator or area for burning.

» Perform HH while handling waste.

Infectious Waste and Pathological Waste

Infectious waste refers to all biomedical and health care waste known or clinically assessed to have the potential of transmitting infectious agents to humans or animals. Pathological waste includes body parts, blood, and blood products.

» They should be handled according to the national health waste management guidelines that state:

- » Place infectious waste in a yellow bin with yellow bin liners marked "Biohazard Medical Waste.
- » Place all pathological waste in a red or yellow bin.
- » When a bag is no more than three-quarters full, seal it with appropriate adhesive tape, remove it, and replace it immediately with a new bag.
- » Incinerate infectious waste and pathological waste in an incinerator and dispose of ashes in a protected ash pit, or autoclave/microwave and shred infectious waste and dispose of into the county landfill.

Hazardous Pharmaceutical Waste and Cytotoxic Waste

Hazardous pharmaceutical waste and cytotoxic waste refers to expired pharmaceuticals or pharmaceuticals that are unusable for other reasons (for example, a call-back campaign). Pharmaceutical waste can be hazardous (cytotoxic). Cytotoxic bags should be placed in double bags to ensure the chemical has no contact when handling and to reduce leakages.

The waste should be incinerated using high temperatures (1,100°C) or transported for off-site incineration.

For further details, refer to the current Kenya National Healthcare Waste Guidelines.

6. Respiratory Hygiene and Cough Etiquette

Among source control measures, respiratory hygiene/cough etiquette, developed during the severe acute respiratory syndrome (SARS) outbreak, is now considered as part of standard precautions[9]. Respiratory hygiene and cough etiquette are infection prevention measures designed to limit the transmission of respiratory pathogens spread by droplet or airborne routes. To prevent the spread of microorganisms dispersed as respiratory secretions into the air, all persons with respiratory symptoms should cover their nose and mouth when coughing or sneezing or wiping and blowing noses with a tissue or mask. Discard used tissues and masks and perform HH after contact with respiratory secretions. If no tissues are available, cough or sneeze into the inner elbow, then perform HH. For aerosol-generating procedures, medical respirators should be used.

Healthcare facilities should:

- » Ensure education of HCWs, patients, and visitors on respiratory hygiene and cough etiquette.
- » Place acute febrile respiratory symptomatic patients at least 1 meter (3 feet) away from others in common waiting areas, if possible. If that is not possible, then the patients should sit as far away from others as possible. If possible, HCFs should place these patients in a separate area while waiting for care.
- » Post visual alerts at the entrance to HCFs instructing persons with respiratory symptoms to practice respiratory hygiene/cough etiquette.
- » Provide HH facilities, tissues, and masks in common areas and areas used for the evaluation of patients with respiratory illnesses.
- » Implement droplet precautions in addition to standard precautions when examining a patient with symptoms of a respiratory infection.

7. Environment Cleaning

Housekeeping refers to the general cleaning of hospitals and clinics, including the floors, walls, certain types of equipment, furniture, and other surfaces. Cleaning entails removing dust, soil, and contaminants on environmental surfaces. Cleaning helps eliminate microorganisms that could come in contact with patients, visitors, staff, and the community, and it ensures a clean and healthy hospital environment for patients and staff.

Administrative and office areas with no patient contact require normal domestic cleaning. Most patient-care areas should be cleaned by wet mopping using water and a pH-neutral detergent solution.

Bacteriological testing of the environment is not recommended unless seeking a potential source of an outbreak.

Cleaning of Healthcare Facilities

General Principles of Cleaning Health Care Facilities:

The following guidelines should be strictly adhered to:

9 Rashmi P et al, Respiratory hygiene in Covid 19. International Journal of Advances in Nursing Management. 2020;8(4):345–6

- Cleaning is required prior to any disinfection process to remove dirt, debris, and other materials that can decrease the effectiveness of many chemical disinfectants. Scrubbing (frictional cleaning) is the best way to physically remove dirt, debris, and microorganisms.
- Begin cleaning the least soiled areas first and progress to the most soiled areas. Clean high areas first and proceed from highest to lowest areas, so that the dirtiest areas and debris that falls on the floor will be cleaned last.
- Avoid dry sweeping, mopping, and dusting to prevent dust, debris, and microorganisms from getting into the air and landing on clean surfaces.
- Follow the manufacturer's instructions when mixing (diluting) disinfectants.
- Base the cleaning methods and written cleaning schedules on the type of surface, amount and type of soil present, and the activity in the area.
- Schedules and procedures should be consistent and posted.
- Clean the surfaces with detergent and water. Disinfect any areas that are visibly contaminated with blood or other body fluids for 10 minutes with a disinfectant, such as 0.5% chlorine, and rinse.
- Clean isolation rooms and other areas that have patients with known transmissible infectious diseases with a detergent and disinfectant solution at least daily.
- Clean all horizontal surfaces at least once daily and as needed.
- Clean toilet areas four times daily and as needed.
- Clean floors twice daily and as needed.
- Train housekeeping staff members to perform their assigned tasks and supervise them on a regular basis.

The functional design of HCFs should allow efficient routine cleaning.

Floors and Surfaces

Floors should be non-slip, smooth, impervious, and seamless for easy cleaning. Carpets should not be used. Surfaces, including walls and ceilings, must be smooth, easy to clean, impervious, and protected from damage. This is particularly important in areas where contact with blood, other body fluids, and other potentially infectious materials could be present, such as delivery rooms, operating theaters, and laboratories. Horizontal, textured, and moisture-retaining surfaces are not recommended.

Cupboards

Cupboards, which prevent the accumulation of dust, are recommended over shelves. Cupboards must be placed in such a way that all surfaces are easily accessible for cleaning. Furnishings and fittings must be able to withstand appropriate disinfectants.

Furniture and Blinds

Materials that are impervious, easy to clean, and durable should be used on furniture. Fabrics should not be used, because of the great risk of soiling them with blood and other body fluids.

Blinds and curtains must be easy to clean. Use vertical instead of horizontal blinds to avoid dust accumulation.

Selecting a Cleaning and Disinfecting Product

Different types of cleaning products are available: liquid soap and detergents, disinfectants, combinations (detergent and disinfectant), and sanitizers. Each type has different properties. When selecting a disinfectant or other cleaning product, consider factors such as its intended use, efficacy, acceptability, safety, and cost.

An ideal cleaning product should accomplish the following:

- Suspend fat in water.
- Make fats water-soluble (saponification)
- Decrease surface tension of water and allow greater penetration of the agent into the dirt (surfaction)
- Break up soil into small particles (dispersion)

» Break up protein (protein destruction)

» Remove calcium and magnesium (soften the water)

Although chlorine-containing solutions are excellent and inexpensive disinfectants, they should not be mixed with cleaning solutions containing acid, ammonia, or ammonium chloride, because doing so will release chlorine gas and other by-products that can be toxic. A 0.5% chlorine solution is ideal for cleaning purposes. A 5% carbolic acid solution is an acceptable alternative.

Cleaning Methods and Frequency

Cleaning should start with the least soiled area and move to the most soiled area and from high to low surfaces. Common methods of cleaning are briefly described below.

Dusting

» Dusting is most commonly used for cleaning walls, ceiling, doors, windows, furniture, and other environmental surfaces.

» Clean clothes or mops are wetted with a cleaning solution that is contained in a bucket. The double-bucket system minimizes the contamination of the cleaning solution.

» Dry dusting should be avoided, and dust cloths and mops should never be shaken-shaking spreads microorganisms.

» Dusting should be performed in a systematic way, using a starting point as a reference to ensure that all surfaces have been reached.

» When dusting ceiling tiles and walls, check for stains that may indicate possible leaks. Leaks should be repaired as soon as possible, because moist ceiling tiles provide a reservoir for fungal growth.

Wet Mopping

Wet mopping is the most common and preferred method to clean floors. Three techniques can be used:

» Single bucket technique: With this practice, the fresh cleaning solution is placed in a single bucket, and the mop wringer is positioned to drain into this same bucket. In use, the mop is saturated with the solution ("recharged") by immersion into the single bucket, wrung out into the same bucket, and used to mop an area of the floor.

» Double-bucket technique: Use two different buckets, one containing a cleaning solution and the other containing a rinsing solution. Rinse the mop with the rinsing solution in the second bucket before dipping back into the cleaning solution. The double-bucket technique extends the life of the cleaning solution (fewer changes are required).

» Triple-bucket technique: Use a third bucket for wringing out the mop before rinsing, which extends the life of the rinse water.

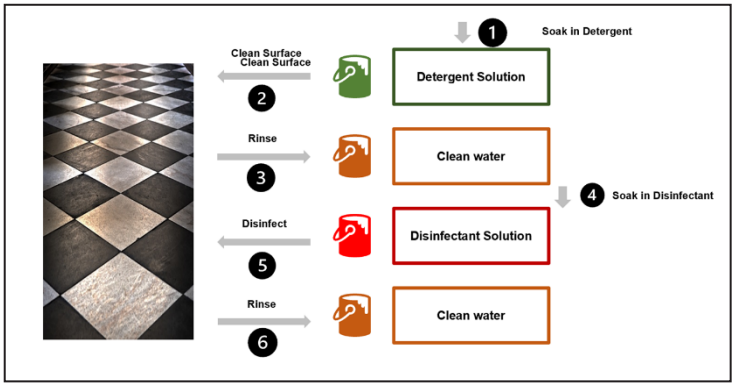


Figure 18-3 Bucket Technique

Flooding

Flooding, which is the purposeful overflow of water in a room is followed by wet vacuuming or scrubbing is recommended in the surgical areas. This process eliminates mopping, thus minimizing the spread of microorganisms. Flood and leave the cleaning agent for a time indicated by the manufacturer, then wet vacuum or scrub clean.

Note: Appropriate PPE, such as utility gloves, protective shoes, plastic aprons, masks, and protective eyewear, should be used at all times during cleaning.

Guidelines for Cleaning Specific Areas

Housekeeping schedules should be planned, written out, and closely followed. Cleaning schedules should be developed according to the needs of each area.

Walls, windows, ceilings, and doors: Spot clean when visibly dirty with a damp cloth, detergent, and water. Routine damp dusting is adequate for these areas, and disinfection is unnecessary.

Chairs, lamps, tables, tabletops, beds, handrails, door handles, grab bars, lights, tops of doors, and counters. Wipe daily and whenever visibly soiled with a cloth that is dampened with cleaning solution, then disinfect if contaminated.

Noncritical equipment (for example, stethoscopes and blood pressure cuffs). Wipe daily and whenever visibly soiled with a damp cloth, detergent, and water. If the equipment is visibly soiled with blood or other body fluids, or if the patient is under contact precautions, clean and disinfect the equipment before it is reused.

Floors: Clean floors at least twice daily and as needed with a wet mop, detergent, and water. Use a disinfectant when the floor is contaminated with blood or other body fluids.

Sinks. Clean frequently (daily or more often as needed) with a cloth or brush.

Toilets and latrines. Clean at least four times daily and as needed with a separate dedicated mop, cloth, or brush, and then disinfect.

Patient rooms. Clean at least three times daily and after patient discharge. The same cleaning process applies to rooms of patients who are under isolation precautions. Clean and disinfect any cleaning equipment that has been used in the rooms of patients under isolation precautions before the equipment is used in another room.

Procedure rooms. Wipe horizontal surfaces and furniture that are used for procedures with a cleaning solution and disinfect after each procedure when necessary.

Examination rooms. Wipe horizontal surfaces with a cleaning solution after each procedure and whenever they are visibly soiled. Change the linen or paper on the examination table after each patient. Disinfect when necessary.

Laboratory. Wipe countertops with a cleaning solution after each shift, then disinfect.

Curtains. Change and clean curtains weekly and when soiled.

Linen. Collect used soiled linen three times daily (or more often as needed) in closed, leak-proof containers.

Waste. Collect waste from all areas at least three times a day (or more frequently as needed). Do not allow waste to overflow. Transport waste in a covered cart or wheelbarrow.

Waste containers. Clean and disinfect waste containers periodically.

Schedule and Procedures for Cleaning the Operating Room

At the beginning of each day, all flat surfaces should be wiped with a clean, lint-free moist cloth to remove dust and lint.

Total cleaning of the operating room (OR) should be done at the end of each day.

All areas of the OR, scrub sinks, scrub or utility areas, hallways, and equipment should be totally cleaned, regardless of whether they were used during the past 24 hours.

Clean the theater between procedures.

Total Cleaning

- This is cleaning of the OR done at the end of each day and after every procedure.
- Use freshly prepared 0.5% chlorine solution for disinfection (appendix 19).
- Remove all contaminated waste containers and replace them with clean containers.
- Close and remove sharps containers if they are three-quarters full.
- Remove used linen in closed leak-proof containers.
- Wipe all surfaces from top to bottom using a detergent and disinfectant.
- Wipe any surface that might have come in contact with patients' blood or other body fluids with a detergent and disinfect with 0.5% chlorine solution for 10 minutes, rinse, and let it dry.

Biological Spill Management

Management depends on the size of the spill.

Classification of biological Spills:

- Spot -
- Small – up to 10cm
- Large – greater than 10cm

Managing Spots

- Put on non-sterile gloves.
- Wipe with damp cloth, tissue or paper towel. An alcohol wipe may be used.
- Discard contaminated material in a yellow bin.
- Perform hand hygiene.

Managing Small Spills

- Don appropriate PPE
- Cover the spill completely with an absorbent material.
- Remove absorbent material.
- Clean area with soap and detergent
- Flood area with 0.5% chlorine solution and leave for 10-20 minutes.
- Wipe off disinfectant.
- Dispose of materials used appropriately.

Managing Large Spills

- Cordon the area,
- Done appropriate PPE.
- Wipe off the spill using absorbent material as well as limiting the spread.
- Clean with soap and detergent
- Disinfect the surface solution) – Use at least 0.5% chlorine solution.
- Allow contact time (as per requirement) before mopping off, then rinse with clean plain water and allow to dry.
- Remove assemble cleaning equipment disinfect them rinse and leave them to dry.
- Discard waste appropriately

8. Linen Management

Clean linen instills confidence in patients and visitors and enhances their faith in the safe care and services rendered by the hospital. Used linen is a potential source of infection transmission if standard precautions are not observed by HCWs.

In processing linen, staff should be appropriately trained and regularly supervised to help reduce the risk of exposure to infectious materials.

Laundry workers, like other HCWs, should be offered immunization against HBV.

Classification of Linen

From the laundering point of view, hospital linen is classified into the following categories:

- Dirty linen: used linen without any stains.
- Soiled linen: linen soiled with blood or other body fluids.
- Infected linen: any linen used by a patient with a known infectious disease, regardless of whether it is soiled.

This classification is beneficial in segregation at the point of generation and transportation to the laundry.

General Practices and Precautions

- Housekeeping and laundry personnel should follow these general guidelines when processing linen:
- Wear PPE (utility, gloves, gowns, aprons, face masks, and gumboots) as indicated when collecting, handling, transporting, sorting, and washing used linen.
- Handle used linen with minimum agitation to avoid aerosolization of pathogenic microorganisms.
- Do not shake linen.
- When collecting and transporting used linen, minimize contact to avoid self-contamination and environment contamination.
- Consider all cloth items, such as surgical drapes, gowns, and wrappers, which have been used during a surgical procedure as contaminated and infectious. Even if there is no visible contamination, the item must be laundered.
- Never place used linen on the floor or any clean surfaces
- Watch out for sharps, instruments, or broken glass that might be folded into linen or in the laundry bags.
- Do not sort or rinse linen in patient-care areas.
- Hand-washing facilities should be readily available in the laundry.
- HH should be performed whenever gloves are changed.
- Wash reusable utility gloves after use, allow them to air dry, and discard if punctured or torn.
- The laundry should have distinct areas for unlaundered and clean linen.

Transportation of Linen

- Separate well-labeled carts should be used for transporting clean and used linen.
- Used linen should be collected in impervious bags and transported while covered.
- Transport clean linen while covered.
- Clean and disinfect carts that are used to transport used linen after each use.

Processing of Hospital Linen Steps of Processing Linen Segregation of Linen

- Linen must be handled and segregated as follows in different color-coded bags at source.
- Place used linen in an impervious bag or a regular plastic trash bag (to prevent leakage) before depositing it in a cloth bag for used linen.
- Bags should be tied securely when three-quarters full.
- There should be minimal handling of infected linen, and if it is to be handled, PPE should be used by the handlers.
- Used linen should not be placed on the floor or any clean surfaces.

Collection of Linen

- Every morning, the laundry attendants/support staff should go to different areas and collect the used linen bags in transport trolleys.
- Whenever the attendant collects the linen, the number of different types of linen items received is entered in the record by the ward in charge of the area. Each ward/department should maintain a register for linen.

Cleaning

Once the linen is received in the laundry, it should be weighed and sorted. Staff handing the linen must wear appropriate PPE.

Dirty Linen

- Dirty linen (non-infected linen) should be washed in the first batch.
- Weigh linen before loading it into the machine to ensure it is less than or equal to the instructions of the washing machine.
- Adjust the temperature and time cycle of the machine according to manufacturer's instruction and the type of soap or other washing product being used.
- Both cold and hot water washing cycles reduce bacterial load in the linen.
- If using a cold-water wash, chemicals such as 0.05% bleach must be added (2 milliliters [mL] of household bleach for every liter of water) with detergent to facilitate disinfection.
- Add an agent to the rinse cycle to reduce alkalinity and prevent yellowing.

Soiled and Infected Linen

- Sluicing should be carried out to remove heavy soil in the sluicing machine.
- If a sluicing machine is not available, then it can be done manually using proper PPE.
- After rinsing, the sluiced linen is washed as normal with a detergent, followed by disinfection then rinsing.
- Heavily soiled linen may need two cycles if not found visibly clean at the end of the first cycle.

Drying and Extracting

The purpose is to remove the excess water from the washed linen. Linen can be machine dried or air dried in direct sunlight; if possible, keep the fabric off the ground and away from dust and moisture.

Food Safety

Keep Clean

- Wash hands before handling food and often during food preparation.
- Wash hands after going to the toilet.
- Clean and disinfect surfaces and equipment used for food preparation.
- Protect kitchen areas and food from insects, pests, and other animals.
- Separate Raw and Cooked Food to Prevent Cross-Contamination and Transfer of Microorganisms
- Separate raw meat, poultry, and fish from other food.
- Use separate (preferably different color) equipment like knives and chopping boards for raw food.
- Store food in containers to avoid contact between raw and cooked food.

Cook Thoroughly

- Cook food thoroughly, especially eggs, poultry, seafood, and meat.
- Reheat cooked food thoroughly.

Keep Food at Safe Temperatures

- Do not leave cooked food at room temperature for more than 2 hours.

» Refrigerate promptly all cooked and perishable food.

» Keep cooked food hot (more than 63°C) prior to serving.

» Do not thaw frozen food at room temperature.

» Do not re-freeze food once thawed.

Other Considerations

» Use safe and clean water for food preparation.

» Select fresh and wholesome foods and meats.

» Choose safe foods like pasteurized milk over raw milk.

» Do not use food beyond the expiry date.

Food Handler Requirements

» Food handlers should:

» Be trained in food management.

» Undergo the required medical checkups, vaccinations and certification.

» Wear appropriate clothing when handling or preparing food.

» Read labels on food packaging, make an informed choice, and be familiar with common food hazards.

» Handle and prepare food safely.

» Wear face masks if they are coughing or sneezing while handling food.

» Wear gloves that can be used to cover any cuts or lesions and that should be changed frequently.

» Wear hair and beard restraints.

» Avoid use of jewelry.

Food Premises and Ward Kitchens

» Food premises and kitchens should be kept clean, be maintained in good repair, and be well ventilated.

» The layout and design, site, and size must allow adequate working space to allow for the hygienic performance of all food handlers and to avoid airborne contamination.

» Drainage should be designed to prevent waste from a contaminated area draining toward a clean area.

» Toilets should not open directly into any room where food is handled.

» Hand basins should be located conveniently and used for hand washing only.

» Separate sinks for washing food should be available.

» All cleaning and disinfection should follow guidelines.

» Separate color-coded equipment and clothes should be used for cleaning the ward kitchen.

Transportation of Food

Porters involved in the delivery and collection of food trolleys are deemed to be "Food Handlers." All porters must be made aware of these guidelines, and they should be incorporated into the induction of all new employees.

Delivery and Collection of Food

» Food should be transported in covered containers using food trolleys.

» Food should be kept hot and served as soon as possible.

» Store food in the kitchen for patients who are not available at the time of serving.

Isolation Precautions

Isolation is the practice of separating individuals who are infected with a contagious disease or suspected of being infected from those who are not infected with a goal of preventing the transmission of infectious agents

and protect both the affected individuals and the general population from further spread.

Isolation measures are implemented based on the mode of transmission of the infectious agent.

Isolation Categories

Isolation for control of infections is used to prevent infected patients from infecting others and is based on the route of transmission of the infection.

Protective Isolation

Protective isolation protects vulnerable patients with poor immune systems from contracting disease from the environment; for example, patients who may be receiving chemotherapy or organ transplants.

Source Isolation

Source isolation is used for patients identified as carrying microorganisms that could cause other patients to become ill if it was passed onto them. For example, patients with transmissible infections through contact and air. Isolation precaution categories include:

» Airborne isolation precautions

» Droplet isolation precautions

» Contact isolation precautions

Additional or transmission-based precautions are used for patients who are known or suspected to be infected or colonized with transmissible or epidemiologically important pathogens. Transmission-based precautions are based on the modes of transmission, such as air, droplet, and contact, and are designed to reduce the spread of related infections in HCFs.

Requirements for Isolation

Make the following provisions for patients in isolation:

» Provide accommodation for the susceptible patient or confirmed infected patient in a room or area designated for isolation diseases.

» Ensure that adequate personnel are assigned to the area.

» Ensure that appropriate equipment and supplies are on hand.

» Establish a schedule for the daily routine cleaning and maintenance of the isolation area.

» Educate HCWs, patients, and family members regarding the patient's illness and the precautionary measures required.

» Keep the patient's chart and records outside of the patient's room.

General Isolation guidelines

Maintenance of a Clean Environment

» Wear appropriate PPE.

» Clean all surfaces daily with detergent and water and then disinfect using 0.5% sodium hypochlorite.

» Use 70% alcohol for equipment and surfaces that cannot withstand sodium hypochlorite.

Terminal Cleaning

» Remove bed linen and privacy/interbed curtains and place in yellow bag and send to the laundry.

» Upon patient discharge, clean and disinfect all equipment in the room or sluice before taking it to the storage area.

» Clean all surfaces, including walls to hand height, with soap and water and then disinfect using 0.5% sodium hypochlorite.

» Remove PPE and perform HH after completion of the task.

Patient Care Equipment

» Dedicated equipment is preferred.

» Using equipment between patients poses a risk of transmission of infections.

» Clean shared equipment (thermometer, etc.) using 70% alcohol between patients.

Correct Management of Used Linen

» Treat all linen as contaminated and infectious.

» Place in yellow plastic bag inside room, seal and place in linen bag dedicated for contaminated/ infected linen in the sluice.

» Ensure prompt removal.

» Double bag if leakage hazard exists and ensure safe transportation.

» Attach list of contents to outside of bag.

Catering

Ensure that catering staff wear adequate PPE when entering an isolation room.

Meal orders, delivery, and removal of trays must be performed by dedicated personnel.

Crockery and cutlery should be cleaned with Clean in hot water (greater than 55°C) and detergent and leave to air dry.

Patient Transport

» Limit patient movement outside of room.

» Patients should wear surgical masks when leaving the room for another department.

» Inform receiving department in advance of the infectious status of the patient and maintain precautions.

» Inform the theater if the patient is scheduled for surgery.

» The patient must be last on the theater list to ensure adequate cleaning/disinfection and ventilation of the environment.

» Theater staff must wear medical respirators if a patient has an infection such as influenza, SARS, or TB.

Visitors

» Visitors should:

» Always announce themselves to the person in charge of the unit.

» Be informed of the reason for isolation.

» Visitors should be restricted. Preferably no children, immune-compromised visitors, or those not previously exposed as close contact of the patient.

» Adhere to the prescribed PPE.

» Wear a surgical mask before entering the patient's room.

» Perform HH before and after leaving the patient's room.

Airborne Precautions

In addition to standard precautions, use airborne precautions for patients known or suspected to be infected with microorganisms transmitted by tiny airborne particles (less than or equal to 5 µm in size) that can remain suspended in the air for several hours and be widely dispersed. Aerosols are generated during coughing, sneezing, or talking or during certain procedures (aerosol-generating procedures).

These precautions are effective in preventing many infections such as TB, measles, and varicella (chickenpox).

Guidelines for Airborne Precautions

Patient Placement

Put up an airborne precautions' isolation sign.

Place patient in single room with en suite bathroom

Accommodate patients in well-ventilated rooms (open windows and closed doors), preferably with negative pressure ventilation.

Cohort patients with same diagnosis or microorganism but use single room for multidrug-resistant tuberculosis (MDR-TB) and extensively drug-resistant pulmonary TB (XDR-PTB) cases.

Place clean, unused PPE outside patient room

Clinical notes should stay outside patient area.

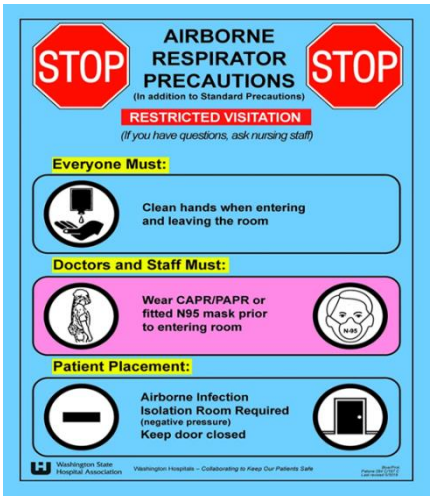


Figure 19-Aiborne Precautions Poster

Hand Hygiene

- Perform HH according to the WHO's 5 Moments for Hand Hygiene (discussed previously in the Hand Hygiene section of this chapter).
- Perform HH before donning and after doffing PPE.

Personal Protective Equipment

- All staff wearing medical respirators (e.g., N95 respirators) must have undergone a fit test to ensure that the correct size respirator is used to provide optimal protection.
- Medical respirators are to be donned before entering the patient's room.
- Always perform a facial seal check after donning the respirator, prior to entering a patient's room.
- Never share medical respirators.
- Medical respirators can be used for the duration of one shift or within 4-6 hours or until damp, contaminated, or deformed.
- Replace damp, soiled, contaminated or damaged respirators immediately.
- Remove respirator after exiting the patient room and either store individual respirators in a marked paper bag outside the isolation room or discard in health care risk waste container.
- Perform HH after removal.
- If a medical respirator does not fit properly, it is unsafe, even though it may provide a false sense of security.
- An N95 respirator should not be worn by a patient while in isolation or during transportation outside the room. A surgical mask is adequate.
- Wear gloves when in contact with the patient's secretions.

Note: "Airborne Precautions" sign should be placed on the door to remind staff of the precautions they need to apply.

Droplet Precautions

In addition to standard precautions, use droplet precautions for patients who are known or suspected to have illnesses that are transmitted by large particle droplets (greater than 5 µm in size). These large droplets are generated by patients during coughing, sneezing, or talking or during certain procedures (e.g., suctioning). Transmission of droplet-transmissible infections requires close contact between source and susceptible host because droplets get propagated during cough or sneezing to short distances (1 meter) through the air.

These precautions are effective in preventing infections such as adenovirus influenza, COVID-19, mumps, parvovirus B19, and rubella.

Guidelines for Droplet Precautions

Patient Placement

Place patient in single room with en suite bathroom.

Preferably keep the door closed.

Cohort patients with same diagnosis or microorganism.

If no isolation facility is available, place the patient at least 1.5 meters apart from the next patient, ideally near an open window.

Place clean, unused PPE outside patient room.

Clinical notes should stay outside patient area.

Put up a droplet precautions isolation sign.

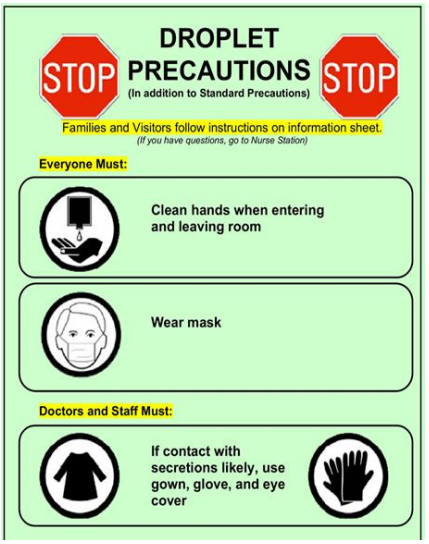


Figure 20-Droplet Precautions Poster

Hand Hygiene

- » Perform HH according to WHO's 5 Moments for Hand Hygiene (discussed previously in the Hand Hygiene section of this chapter).
- » Perform HH before donning and after removal of PPE. Personal Protective Equipment
- » Don a surgical mask before entering the patient room.
- » Discard surgical masks, which are single-use items, in the healthcare risk waste container after removal, just before leaving the isolation area.
- » Replace damp, soiled, or contaminated masks immediately.
- » Perform HH before donning and after removal of PPE.

Contact Precautions

In addition to standard precautions, use contact precautions for patients who are known or suspected to have infections that are easily transmitted by direct contact with patients or indirectly through items in the patients' environment and patient-care equipment.

Contact precautions are effective in preventing transmission of infections such as:

- » Gastrointestinal, respiratory, or wound infections or colonization with MDR bacteria of clinical and epidemiological significance
- » Enteric infections such as *Clostridioides difficile,* enterohemorrhagic *Escherichia coli* 0157:H7, *Shigella,* hepatitis A, or rotavirus for patients with fecal incontinence; respiratory syncytial virus; or parainfluenza virus
- » Skin infections that are highly contagious such as cutaneous diphtheria, herpes simplex virus (neonatal or mucocutaneous), impetigo, major (non-contained) abscess, cellulitis, decubitus ulcer, pediculosis, or herpes zoster (disseminated or in the immunocompromised host)
- » Viral hemorrhagic conjunctivitis and viral hemorrhagic fevers (Ebola, Lassa, Marburg)

Guidelines for Contact Precautions

Patient Placement

Put up a contact precautions isolation sign.

Place patient preferably in single room with en suite facilities, or cohort patients with the same microorganisms/diseases.

If no isolation facility is available, initiate bed space isolation: place patient approximately 2 meters apart from next patient.

If dedicated toileting facilities are not possible, consider assigning one or use of bedpan/commode.

Place clean, unused PPE outside patient room/isolation area.

Clinical notes should stay outside the patient room/zone.

Minimize PPE stock placed in isolation rooms to prevent contamination and wastage.

Keep the door to the unit closed.

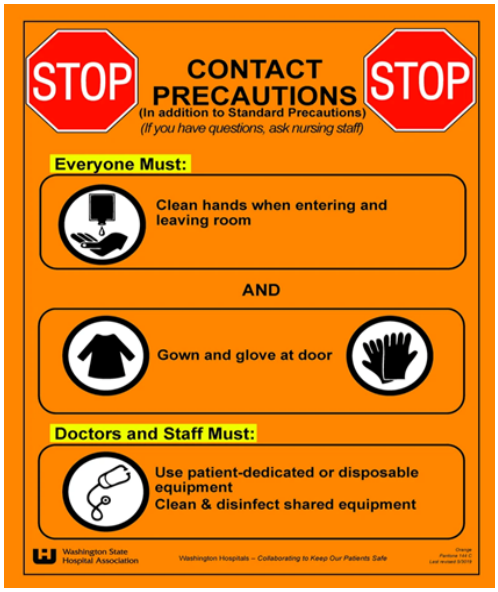


Figure 21-Contact Precautions Poster

Hand Hygiene

» Perform HH according to WHO's 5 Moments for Hand Hygiene (discussed previously in the Hand Hygiene section of this chapter).

» Perform HH before donning and after removal of PPE.

Personal Protective Equipment

» Aprons are worn to reduce contact exposure from the patient and patient environment.

» Do not leave the room (or patient zone) while wearing the apron.

» Discard into waste container in the isolation area after each use.

» Never reuse aprons.

» Keep a box of gloves inside the isolation room; discard the box when the patient is discharged.

» Don gloves before entering the isolation room.

» Wear a fresh pair of gloves when in contact with the patient.

» Change gloves where applicable based on the indications to perform HH.

» Always perform HH before donning and after removal of gloves.

Discontinuation of Isolation Precautions (Airborne, Droplet, Contact)

Discontinue isolation precautions according to diagnosis and infectious period for the condition, immune status, clinical improvement of patient, and/or confirmed negative test results.

CHAPTER 5 | TRAFFIC FLOW IN HEALTHCARE SETTINGS

Introduction

Regulating the flow of visitors, patients, clients, and staff plays a central role in preventing disease transmission in HCFs. The number of microorganisms in a designated area tends to be related to the number of people present and their activities.

An important objective of infection prevention is to minimize the level of microbial contamination in areas where patient care and instrument processing take place. Such areas include:

- Operating room
- Central Sterile Supply Department (CSSD)
- Newborn unit
- Intensive care unit (ICU)

It is important to direct activity patterns and traffic flow in these areas to keep contaminated areas separate from areas where procedures take place. Activities such as waste disposal, instrument processing, and cleaning procedure areas should be carefully planned and organized to minimize the risk of infection to patients and HCWs.

Traffic flow also includes separating people who have, or are likely to have, communicable diseases from those who are at risk (susceptible). These people pose a great risk to susceptible patients and HCWs simply by being present in the same room; therefore, they need to be identified and quickly relocated.

Minimizing Microbial Contamination

Procedure Area

The following guidelines apply to areas where HCWs perform procedures on patients:

- Permit entry by only the patient and the staff performing and assisting with procedures.
- The number of trainees should be kept to a minimum.
- Patients can wear their own clean clothing or facility-provided clothing for procedures that are not considered major surgery, but patients undergoing major surgical procedures must wear facility- provided hospital clothes.
- Staff should wear attire and PPE appropriate for the procedure they are performing.
- A leak-proof, covered waste container should be available for the disposal of contaminated waste items.
- A puncture-resistant container should be available for the safe disposal of sharps at the point of generation.
- Clean, high-level disinfected and sterile supplies should be stored and available in procedure rooms.

Surgical Unit

The surgical unit is often divided into four designated areas, which are defined by the activities performed in each i.e. unrestricted area, transition zone, semi restricted area, and restricted area. Environmental controls and the use of surgical attire increase as one moves from unrestricted to restricted areas. Moreover, staff with respiratory or skin infections and uncovered open sores should not be allowed in the surgical unit.

Unrestricted Area

Post signs in each area to clearly indicate the appropriate environmental control and surgical attire required. This area is the entrance from the main corridor and is isolated from other areas of the surgical unit. This is the point through which staff, patients, and materials enter the surgical unit.

Transition Zone

This area consists primarily of dressing rooms and lockers. It is where staff put on surgical attire that allows them to move from unrestricted to semi restricted or restricted areas in the surgical unit. Only authorized staff should enter this area.

Semi-restricted Area

This is the peripheral support area of the surgical unit and includes preoperative and recovery rooms, storage space for sterile and high-level disinfected items, and corridors leading to the restricted area. Support activities (e.g., instrument processing and storage) for the OR occur here.

- Limit traffic to authorized staff and patients at all times.
- Have a work area for processing clean instruments.
- Have storage space for clean and sterile or high-level disinfected supplies with enclosed shelves to minimize dust and debris collecting on stored items.
- Have doors limiting access to the restricted area of the surgical unit.
- Staff who work in this area should wear surgical attire and a cap.
- Staff should wear clean, closed shoes that will protect their feet from fluids and dropped items.

Restricted Area

- This area consists of the OR(s) and scrub sink areas.
- Limit traffic to authorized staff and patients at all times.
- Keep the door closed at all times, except during movement of staff, patients, supplies, and equipment.
- Scrubbed staff must wear full surgical attire and cover head and facial hair with a cap and mask.
- Staff should wear clean, closed shoes that will protect their feet from fluids and dropped items.
- Masks are required when sterile supplies are open and scrubbed staff are operating.
- Patients entering the surgical unit should wear appropriate PPE.
- Patients do not need to wear masks during transport (unless they require airborne precautions).

Central Sterile Supply Department

According to the size and type of the HCF, the CSSD may be part of or connected to the surgical unit, or it may be an independent area.

This is the area where instruments and equipment are processed and where staff should be specially trained in handling, processing, and storing instruments, equipment, and other clean, sterile, or high- level disinfected items. The CSSD is considered a semi-restricted area, so all the recommendations for traffic patterns and proper attire described for semi-restricted areas above should be followed.

The CSSD should consist of four work areas: the dirty receiving cleanup, clean work area, the clean equipment storage area, and the sterile/high-level disinfected storage area.

Dirty Receiving and Clean-Up Area

In this area, soiled items are received, disassembled, washed, rinsed, and dried. The dirty" receiving/ cleanup area should have:

- A receiving counter
- Two sinks, if possible, with a clean water supply
- A clean equipment counter for drying.

Clean Work Area

In the clean work area, cleaned items are inspected for flaws or damage, packaged (if indicated), either sterilized or high-level disinfected, and sent for storage as packaged or air dried and placed in a sterile or high-level disinfected container. The clean work area should have:

- A large work table.
- Shelves for holding clean and packaged items.
- A high-pressure autoclave, a dry-heat oven, and a steamer or boiler

Clean Equipment Storage Area

Store clean equipment in this area. CSSD staff also should enter the CSSD through this area. Equip the area with:

- Shelves for storing clean equipment.
- An office or desk for record keeping.

Sterile or High-Level Disinfected Storage Area

- Store sterilized packs and covered sterile or high-level disinfected containers in this area. This area should be separated from the central sterile supply area.
- Limit access to the storage area and/or store items in closed cabinets or shelves.
- Keep the storage area clean, dry, dust-free, and lint-free by following a regular housekeeping schedule.
- Packs and containers with sterile or high-level disinfected items should be stored 20 to 25 cm (8 to 10 inches) off the floor, 45 to 50 cm (18 to 20 inches) from the ceiling, and 15 to 20 cm (6 to 8 inches) from an outside wall.
- Do not use cardboard boxes for storage. (Cardboard boxes shed dust and debris and may harbor insects.)
- Date and rotate the supplies (first in, first out). This process serves as a reminder that the package is susceptible to contamination and conserves storage space, but it does not guarantee sterility.
- Packs will remain sterile as long as the integrity of the package is maintained.
- Sterile or high-level disinfected containers remain so until they are opened.
- Dispense sterile and high-level disinfected articles from this area.
- An expired pack should be re-sterilized before use.

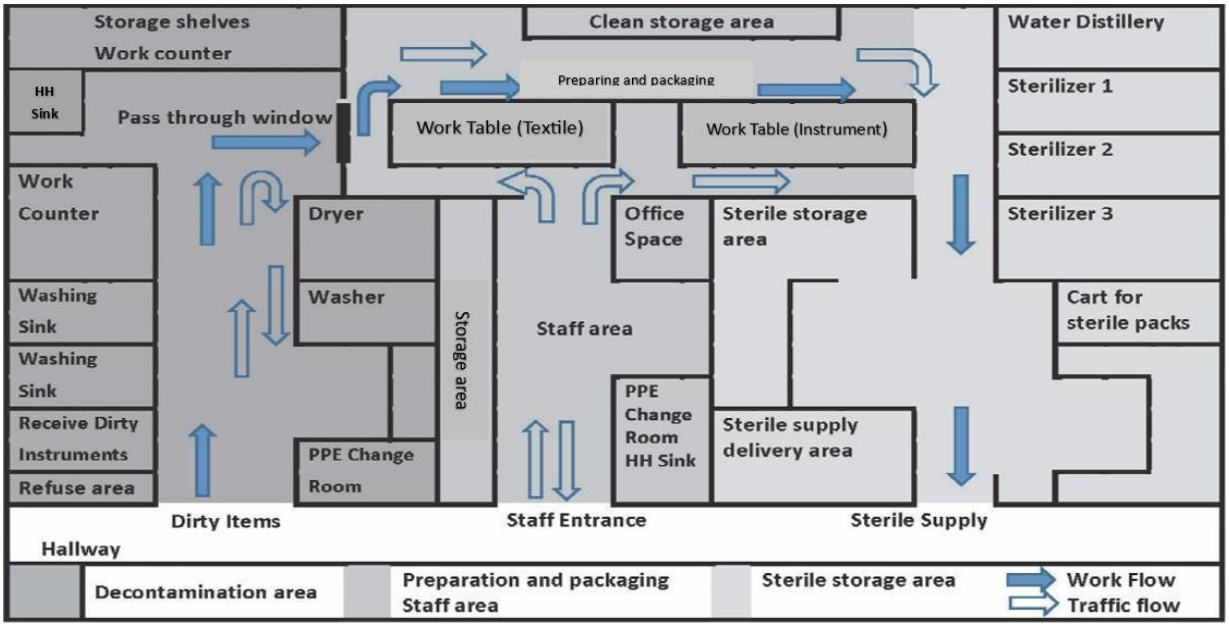


Figure 22-CSSD Layout

CHAPTER 6 | OCCUPATIONAL SAFETY AND HEALTH

Introduction[10]

OSH protects the safety, health, and welfare of people engaged in work or employment by preventing and controlling occupational diseases and incidents with an aim of fostering a safe and healthy work environment.

HCWs are exposed to blood and other body fluids in the course of their work. Consequently, they are at risk of infections. The risk of infection for HCWs depends on the prevalence of disease in the patient population, the nature and duration of exposure, and their vulnerability.

To minimize the risk of infection, HCFs should institute health and safety measures and ensure that all HCWs adhere to them. These measures include the following:

Establishing an effective occupational health and safety program that includes identification and mitigation of hazards, immunization, management of occupational exposures, reporting, and medical surveillance.

Training HCWs in IPC and OSH

Providing appropriate IPC commodities including PPE to HCWs

Categories for Occupational Hazards in Healthcare Settings

A hazard refers to any agent, situation, or condition that can cause an occupational illness or injury. It may produce serious and immediate (acute) effects or long-term (chronic) problems that affect all or only parts of the body. There are six types of health hazards:

Biological

Examples of biological hazards include bacteria, viruses, parasites and molds or fungi that can pose a threat to human health when they are inhaled, eaten or come in contact with skin. HCWs can come into contact with blood and other body fluids exposing them to biological hazards.

Chemical

Examples of chemical hazards may include formaldehyde, used for preservation of specimens for pathology; ethylene oxide, glutaraldehyde, and peracetic acid used for sterilization; and anesthetics gases, laboratory reagents, and numerous other chemicals used in healthcare. Even some drugs administered to patients can be harmful to staff if not properly handled (e.g., cytotoxic drugs).

Physical

Physical hazards comprise extremes of temperatures, pressures, noise, and vibration. Other physical agents such as ionizing and non-ionizing radiation or other forms of radiation used on patients can be harmful to workers if not properly controlled.

Ergonomic

Healthcare personnel are exposed to many ergonomics risk factors due to the nature of their work. Common examples of ergonomic risk factors are found in jobs requiring repetitive, forceful, or prolonged exertions of the hands; frequent or heavy lifting, pushing, pulling, or carrying of heavy objects; and prolonged awkward postures.

Mechanical

Anything inorganic that moves or is stationary that can injure someone, including equipment used in HCFs, may pose mechanical hazards if not properly installed and maintained. Mechanical hazards also include situations that can result in slips, trips, and falls such as wet floors or slippery finish to floors, as well as other hazards such as handling of needles and other sharps that may result in needle-stick and sharps injuries.

Psychosocial Hazards

These include violence, shift work, working with severely ill patients, qualitative and quantitative overload/ underload. Violence or aggression from patients, visitors, residents, staff and clients could take the form of physical, emotional and/or mental abuse.

10 Ministry of Health, Government of Kenya. Occupational Safety and Health Policy Guidelines for Health Sector in Kenya, July 2014

Hierarchy of Occupational Hazards Control

Controlling exposures to occupational hazards is the fundamental method of protecting workers. Traditionally, a hierarchy of controls has been used as a means of determining how to implement feasible and effective control solutions.

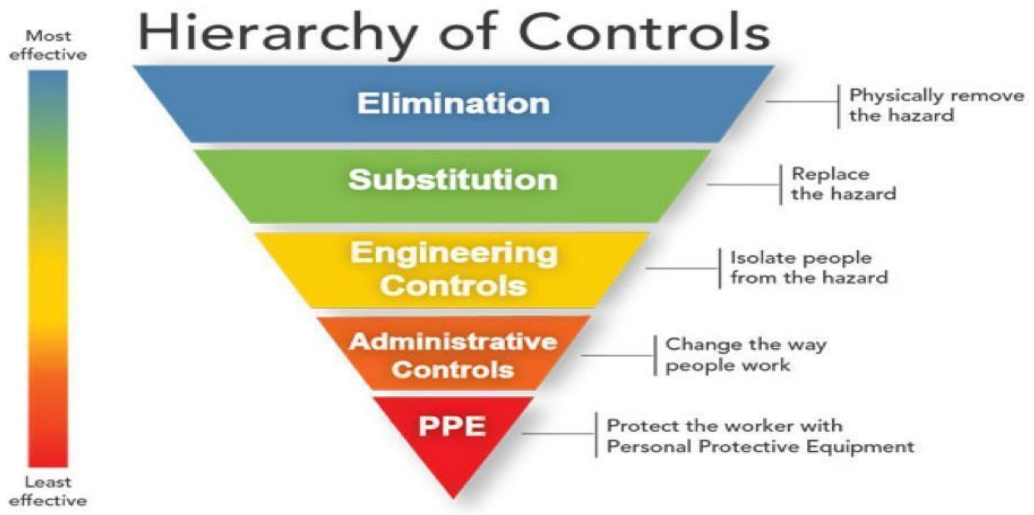


Figure 23-Hiearachy of Controls

HIERARCHY	AIM	EXAMPLE
Elimination	Physically remove the hazard	Do not put sharp boxes on the floor.
		If adequate facilities are unavailable, the service can be outsourced to a reliable and preferably accredited contractor (e.g., sterile supply department, laundry).
Substitution	Replace the hazard	If possible, utilize single-use disposable safety-engineered "SMART" syringes (i.e., Re-Use Prevention [RUP] and Sharp Injury Protection mechanisms).
		If possible use oral medication instead of injections when it would meet the needs of the patient, procedure,
		Replace disinfectants that are more harmful to human health with relatively safer disinfectants.
Engineering Control	Isolate people from the hazard	Early identification of infectious cases by effective implementation of the triage system in HCFs (especially in Accident and Emergency, outpatient department, and general practitioner surgery) to identify and isolate patients as soon as possible to prevent/ minimize exposure to other patients.
		Isolate patients in a dedicated room, preferably with an en suite toilet.
		Isolate patients in a negative pressure room for patients with drug-resistant TB and other airborne communicable diseases spread by airborne routes.
		Provide a well-ventilated area in the endoscopy decontamination unit.
Administrative Control	Change the way people work	Develop and implement IPC policies and procedures.
		Allow staff time to attend the IPC training sessions, which should include a practical aspect where appropriate.
		Place signs to deter unauthorized persons from entering isolation areas.
		Limit staff access to patients with suspected or known infectious diseases (e.g., COVID-19). Identify staff to look after patients who are immune to diseases via previous exposure (e.g., chickenpox) or who are vaccinated against immunizable, preventable diseases.
		Limit and control visitors to the HCF, especially those with potential to have or acquire infectious diseases.

HIERARCHY	AIM	EXAMPLE
Personal Protective Equipment	Protect the HCW from hazard	After risk assessment, properly use PPE (e.g., gloves, gown, mask, and eye protection) based on the type of hazard.
		After use, safely remove and dispose of the PPE to protect other HCWs and patients.

Table 4-Hierachy of Controls

Occupational Exposure in a Healthcare Setting

This refers to a specific eye, mouth, other mucous membrane, non-intact skin, or parenteral contact with blood or other potentially infectious materials resulting from the performance of an employee's activities.

HCWs in areas such as operating, delivery, and emergency rooms and laboratories have a higher risk of exposure. Cleaners, health care waste handlers, and others whose duties involve handling blood- contaminated items are also at risk.

Occupational exposure of biological hazards can result from:

» Percutaneous injury (needle-stick or other sharps injury, i.e., HIV, HBV, HCV)

» Mucocutaneous splashing of blood or other body fluids into the eyes, nose, or mouth or blood contact with non-intact skin (i.e., HIV, EVD)

» Inhalation of droplets or droplet nuclei (TB, influenza, COVID-19).

Post-Exposure Management

Percutaneous Injuries

Percutaneous exposure incidents for HCWs are a major concern, because they expose employees to the risk of infectious diseases.

Immediately after an injury, the HCW should follow these procedures:

» Wash sharps injury sites and cuts with water.

» Do not squeeze the injury site.

» Treat and dress wound as needed.

» Report exposure to supervisor.

» Visit the designated clinician for initial assessment and counseling for follow-up testing and appropriate treatment.

» Obtain post-exposure prophylaxis (PEP) within 72 hours based on HCWs' HIV and HBV status.

» The clinician will fill in the PEP register.

Mucocutaneous Splashing

Mucocutaneous transmission occurs through non-intact skin or from mucous-membrane exposure of the eyes, nose, or mouth.

Following a splash of a blood/blood product, saliva/sputum, urine, feces, amniotic fluid, or vomitus/ gastric fluid, the HCW should:

» Wash the areas exposed to potentially infectious fluids with running water.

» Flush exposed mucous membranes of eyes and mouth with saline or water.

» Do not use caustic agents, including antiseptics or disinfectants.

» Report exposure to supervisor.

» Visit the designated clinician for initial assessment and counseling for follow-up testing and appropriate treatment.

» Where necessary, obtain PEP within 72 hours based on the HCW's HIV and HBV status.

» The clinician will fill in the PEP register.

» Obtain full vaccination against HBV.

Inhalation of Droplets or Droplet Nuclei

HCWs have varying risks for exposure to respiratory infections such as TB, influenza, and SARS. To prevent and limit respiratory illnesses in health care settings, a universal respiratory-hygiene strategy should be adopted in all HCFs:

In the event of an exposure, the HCWs should:

» Report exposure to supervisor.

Visit the designated clinician for exposure risk assessment and counseling for follow-up testing and appropriate management.

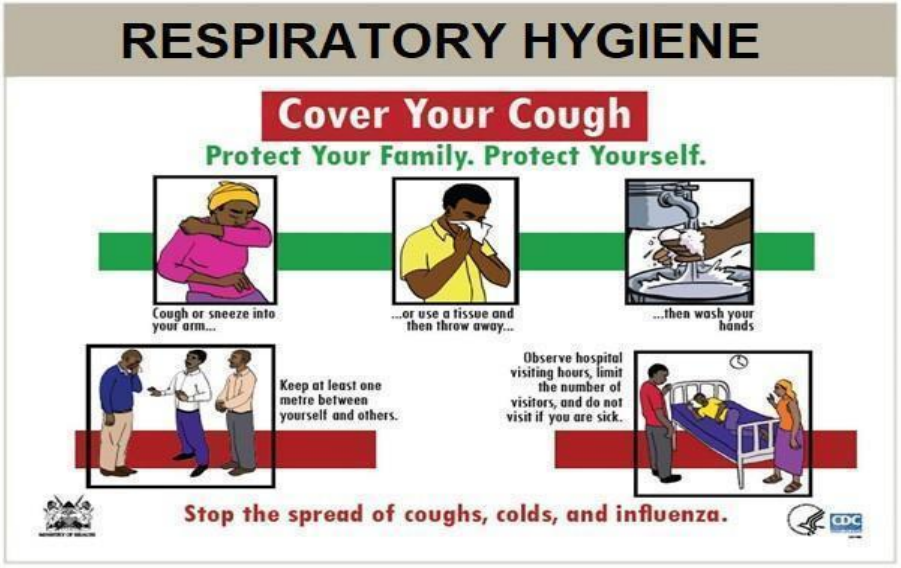


Figure 24-Respiratory Hygiene

Medical Surveillance for Health Care Workers

Medical surveillance is a program of periodic examination, which may include clinical examinations, biological monitoring, biological effect monitoring, or medical tests of persons employed by a designated health practitioner or by an occupational medical practitioner (OSHA 2007, section 2).

Medical surveillance is conducted to:

» Ascertain the health status of the employee before, during, and after employment.

» Determine job placement within a facility.

» Predict the occurrences of occupational injuries and diseases and their distributions in working populations, to determine the specific focus for prevention.

» Ensure that those who have had occupational medical conditions or exposures are attended to early enough to prevent any complication.

» Provide information that would help in determining and justifying worker compensation.

Components of Medical Surveillance

Pre-Employment and Pre-Placement Medical Examination

This examination is to ensure that the employee is fit to undertake the job without risk to themself or their colleagues. The baseline medical examination conducted at the start of employment will define the initial health

status: subsequent examinations will be used to evaluate the evident health effects of the work environment and other working conditions.

Periodic Occupational Health Surveillance

Examinations are conducted periodically to identify vulnerable groups among staff, which can be of immense value to prevention. The frequency and types of examinations will be determined for each group based on nature of work, ages, and sex of the group members.

Return to Work/Post-Sickness Absence Examination

This examination ensures that an employee who has been absent with a medical condition for a considerable length of time is fit to undertake their usual job, or to facilitate the rehabilitation or temporary or permanent resettlement of those who are not fit to return to their usual occupations.

Exit Medical Examination

This examination provides data on employees at the point of exit from a particular occupation or workplace. It provides the opportunity for employees with ailments that have a causal relationship to any factor in the work environment to continue to receive assistance for managing it after they have left employment or moved on to another schedule.

Health Education and Training

OSH training is key to implementation of an effective health and safety system, and this should include identification, risk assessment, and documentation of occupational hazards and risks to inform programs promoting health and safety and managing occupational exposure.

All HCFs should develop and implement appropriate orientation and in-service training programs for new employees and existing employees.

Reporting

Systems for monitoring the morbidity and mortality of occupational injuries and diseases are generally established by national authorities within the framework of occupational disease and injury prevention, compensation, or benefit programs.

The data is useful for monitoring trends in the occurrence of selected occupational injuries and diseases.

An HCW has a responsibility of identifying and reporting suspected or existing hazards, and the OSH professional will conduct on-site surveys, voluntary inspection programs, and audits.

- The HCW should inform their supervisor of the occupational injury or disease within 24 hours.
- The supervisor should fill the Directorate of Occupational Safety and Health (DOSH) General Register (DOSH 27).
- The HCW should be evaluated by a medical practitioner who should also fill DOSH WIBA1 form in quadruplet within 1 year of the occupational injury or illness.
- The employer should submit the completed DOSH WIBA1 form to DOSH for further action.

CHAPTER 7 | LABORATORY PRACTICES

Introduction

Laboratory workers are at risk of exposure to potentially infectious materials. Adherence to standard precautions is necessary to minimize the risk of laboratory-acquired infections and to promote a safe environment for all workers in the laboratory and community. A well-designed laboratory properly maintained equipment, and well-trained personnel all contribute to the protection of laboratory workers.

Laboratory infections from pathogenic organisms occur through: Inhalation.

- Ingestion
- Puncture wounds
- Contamination of skin and mucous membranes
- Infected laboratory animals

Biosafety Practices

- Treat all specimens from all patients as potentially infectious.
- All laboratories should provide hand hygiene facilities in each procedure room.
- All laboratory staff should observe the WHO's 5 Moments of Hand Hygiene (discussed previously in chapter 4) when collecting and processing specimens.
- Collect specimens in well-constructed disposable containers with a secure lid to prevent leakage during transport.
- When collecting blood specimens, disinfect the collection site on the patient using 70% alcohol for 30 seconds and allow it to dry completely. Use a spiral motion from in to out to avoid recontaminating the site.
- Disinfect the torniquet with 70% alcohol between patients.
- Collect and process all specimens using standard precautions.
- Transport specimens to the laboratory in a manner that prevents breakage or spillage. All specimens should be triple packaged and transported under conditions that preserve specimen integrity.
- All laboratory staff should adhere to appropriate SOPs.
- Minimize splashing, spattering, and generating droplets while performing laboratory procedures.
- Clean and disinfect work surfaces daily or when they become contaminated, such as after spills.
- Contaminated equipment that requires servicing or repair should be cleaned and disinfected.
- Do not eat, drink, or smoke in the laboratory.
- Do not store food or drinks in refrigerators that are used for clinical or research specimens.
- Use proper mechanical devices, such as suction bulbs, for manipulating all liquids in the laboratory.
- Do not mouth pipette.
- Centrifuge all materials in sealed tubes inside a sealed centrifuge. Do not open a centrifuge while it is in motion.
- Always cover the end of blood-collection tubes with a cloth or paper towel or point them away from anyone's face when opening.
- Wear heavy-duty or utility gloves when cleaning laboratory glassware.
- Handle sharps with care and dispose of them immediately after use in puncture-resistant, leak- proof sharps containers, which should be located at arm`s length.
- Segregate waste at the point of generation.

» Do not perform procedures that produce aerosols, such as mixing or washing, in the open laboratory.

» Report immediately any HCW safety-related incidents for appropriate management.

» All laboratory staff members should be vaccinated against HBV.

» Autoclave cultures before disposal.

Personal Protective Equipment

To avoid contamination and limit the spread of infectious materials that may be carried on home clothes from the laboratory, staff shall wear scrubs and don appropriate PPE for all the procedures performed.

Gowns

Gowns must be worn while working and must be removed when leaving the laboratory.

Disposable Gloves

Wear clean disposable gloves when there is a risk of hands coming into contact with potentially infectious materials, contaminated surfaces, or equipment. The following should be observed:

» Remove gloves after completing laboratory tasks, before using a telephone, or when performing any office work.

» Gloves must be changed for every task.

» Dispose of gloves after each procedure or when they become overtly contaminated, after completion of work with infectious materials, or when their integrity is compromised.

» Do not wash, sanitize, or reuse disposable gloves.

» Do not touch "clean" surfaces (telephones, door handles, office desks, stationery, computer keyboards, etc.) with gloved hands.

» Do not wear gloves outside the lab.

» Face protection must be worn for anticipated splashes or sprays of infectious or other hazardous materials when microorganisms are manipulated outside the biological safety cabinet (BSC).

Spill Cleanup Procedures

Laboratories must develop procedures for dealing with spills and should have appropriate equipment and materials. A basic spill kit should include a concentrated disinfectant (chlorine), a spray bottle for making 0.5% chlorine solution, a package of paper towels, sponges, heavy-duty utility gloves, autoclavable broom and dustpan or other mechanical device for handling sharps, face protection (eyewear and mask, or full-face shield), and biohazard autoclave bags for the collection of contaminated spill cleanup items.

Biological spills should be treated with either sodium hypochlorite or sodium dichloroisocyanurate (NaDCC). For blood or other material with a high organic content and low concentration of infectious microorganisms:

1. Wear a gown, gloves, and eye protection.
2. Absorb spill with absorbent material and place in a biohazard bag. Collect any sharp objects with forceps or other mechanical devices and place them in a sharps' container.
3. Using a detergent solution, clean the spill site of all biological material.
4. Disinfect spill site with 0.5% chlorine.
5. After the 10-minute contact time, rinse the chlorine.
6. Discard all disposable materials used and PPE into a biohazard bag.
7. Perform HH.

Blood Safety

Blood safety refers to all the procedures that are undertaken to render blood safe for use on a patient, avoid accidental infection of staff, and limit environmental contamination by pathogens through blood and blood

products. Prior to transfusion, at a minimum, all donated blood should be screened for HIV-1 and 2, HBV, HCV, and syphilis. Only screened and compatible blood or blood products are to be transfused to patients depending on their clinical need. Equally, personnel who work in blood-transfusion service are at risk of exposure to blood or blood products, and therefore, standard precautions should be maintained at all times.

Standard Precautions in Blood Handling

All blood products should be considered potentially infectious and should be handled with appropriate PPE which may include gloves, impermeable gowns, plastic aprons, masks, face shields and eye protection.

- If you have cuts or abrasions on the skin of your hands, cover them with adhesive dressing.
- Use needles and lancets only once and dispose of them in a "sharps" container for decontamination.
- Medicines should not be added to the intravenous line through which the blood or blood product is being transfused.

The following considerations ensure safety for donors, recipients, and HCWs:

- Screen blood donors appropriately.
- Perform HH, wear gloves while collecting blood, testing, and administering blood.
- Apply aseptic technique when collecting blood from donors and or administering blood.
- Choose a site on an upper extremity that will minimize patient discomfort and restriction of movement. Avoid the groin, lower extremities, and bony prominences because these sites have high risk of infection.
- Perform all steps of blood collection and processing within a closed system to minimize contamination.
- Test blood and blood components for antibodies and infectious diseases.
- Ensure blood cold chain is maintained.
- Inspect blood units for date of expiry, clots, change of color, and leaks before transfusion.
- Ensure that the right blood component is given to the right patient at the right time.
- Record date and time of onset of transfusion.
- Start transfusion within 30 minutes of removing blood from refrigeration and complete it within 4 hours.
- Monitor the patient's vital signs during transfusion.
- Stop transfusion immediately if an adverse reaction occurs; this may be signs of septicemic shock.
- Collect patient's blood and urine samples for laboratory investigation in case the patient experiences an adverse reaction during blood transfusion.
- After completion of blood transfusion, tightly secure the used blood bags and intravenous giving set and put them inside the yellow bin. Store these for a minimum of 24 hours to allow for investigation of delayed transfusion reactions. (Use hospital guidelines for storage).
- DO NOT reuse an intravenous giving set for the next fluid transfusion.

CHAPTER 8 | HEALTHCARE-ASSOCIATED INFECTIONS (HAIs)

Introduction

HAIs are infections that first appear 48 hours or more after hospitalization or within 30 days after having received health care[11]. Surgical site infection appears within 30 days of the procedure or within 90 days if there is an implant or foreign body[12].

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[13].

Classification of HAIs

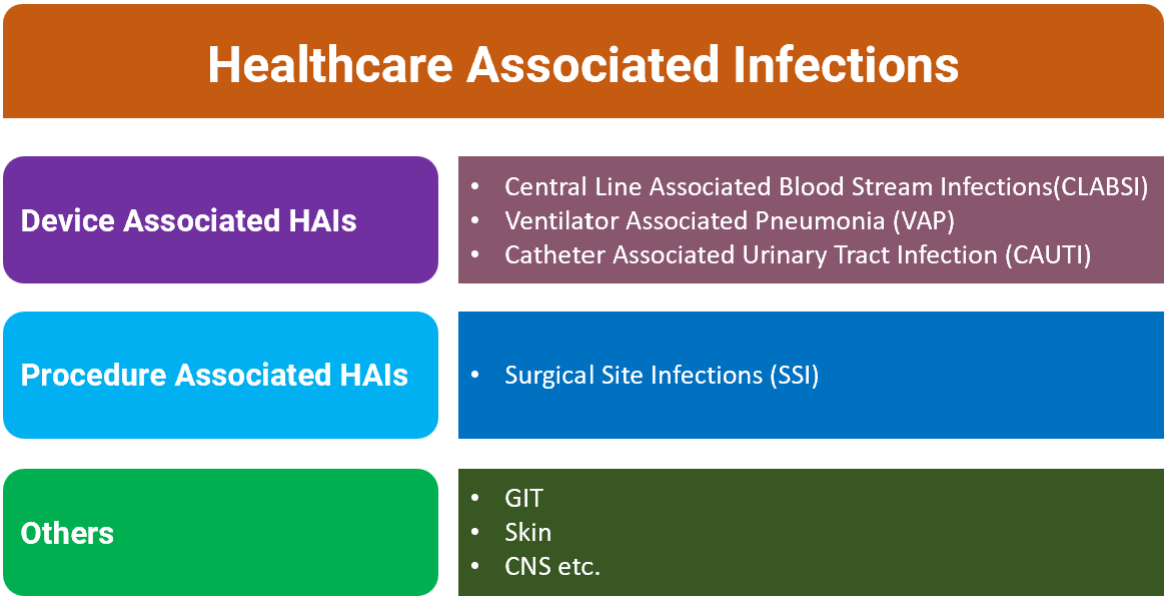


Figure 25-Classification of HAIs

Central Line-Associated Bloodstream Infection (CLABSI)

» A CLABSI is a primary (not related to an infection at another site) bloodstream infection that develops within 48 hours of a central line or umbilical catheter placement.

» The central line is defined as 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.

» An umbilical catheter is defined as a central vascular device inserted through the umbilical artery or vein in a neonate.

Ventilator-Associated Pneumonia (VAP)

» A VAP is pneumonia that is identified using a combination of radiologic, clinical, and laboratory criteria and occurs in a patient who was intubated and ventilated at the time of or within 48 hours before the onset of pneumonia.

» A ventilator is defined as a device that continuously assists or controls respiration, inclusive of the weaning period, through a tracheostomy or by endotracheal intubation.

» Healthcare-associated pneumonia can be characterized by its onset: early or late. Early onset pneumonia occurs during the first four days of hospitalization.

Catheter-Associated Urinary Tract Infection

» A CAUTI is a UTI that occurs in a patient who had an indwelling urethral urinary catheter in place within the 48-hour period.

» If a CAUTI develops within 48 hours of discharge from a location, then the CAUTI is associated with the discharging location.

Surgical Site Infection

An SSI is an infection that occurs after surgery in the part of the body where the surgery took place and occurs within 30 days where there is no implant and 90 days where there is an implant in place.

An operative procedure is defined as a single trip to the 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 the OR.

An implant is 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.

Care Bundles in Preventing HAI Transmission

Care bundles are defined as a small, straightforward set of evidence-based practices, generally which when performed collectively and reliably, have been proven to improve patient outcomes. Care bundles are sometimes known as "high impact interventions."

The care bundle approach works when every element of the bundle is implemented for every appropriate patient, every time. The changes in a bundle are clear-cut and straightforward; they involve all-or- nothing measurement. Successfully completing each step is a simple and straightforward process. It is a "yes" or "no" answer: "Yes, I did this step and that one; no, I did not yet do this last one." Successfully implementing a bundle is clear-cut: "Yes, I completed the ENTIRE bundle," or "No, I did not complete the ENTIRE bundle." There is no in-between, no partial "credit" for doing some of the steps some of the time. Care bundles are aimed at minimizing HAIs in hospitals.

CLABSI Bundles

Insertion Bundle

» Perform HH

» Provide maximal sterile barrier precautions (surgical mask, sterile gloves, cap, sterile gown, and large sterile drape)

» Clean patient skin with alcohol-based chlorhexidine (rather than iodine)

» Avoid the femoral vein for central venous access in adult patients; use subclavian rather than jugular veins.

» Dedicate staff for central line insertion, and complete competency training/assessment.

» Standardize insertion packs.

» Make insertion guidelines available (including indications for central line use) and use of checklists with trained observers.

» Use ultrasound guidance for insertion of internal jugular lines.

Maintenance Bundle

» Perform HH

» Review central line necessity daily.

» Remove unnecessary lines promptly.

» Disinfect prior to manipulation of the line.

» Complete daily chlorhexidine washes (in ICU, patients > 2 months)

» Disinfect catheter hubs, ports, connectors, etc. before using the catheter.

» Change dressings and disinfect site with alcohol-based chlorhexidine every 5–7 days (change earlier if soiled)

» Replace administration sets within 96 hours (immediately if used for blood products or lipids)

» Ensure appropriate nurse-to-patient ratio in ICU (1:2 or 1:1)

VAP Bundles

» Perform HH

» Elevate the head of the bed to between 30 and 45 degrees.

» Perform daily "sedation interruption" and daily assessment of readiness to extubate.

» Perform daily oral care with chlorhexidine.

» Provide prophylaxis for peptic ulcer disease.

» Provide prophylaxis for deep venous thrombosis.

CAUTI Bundles

Insertion Bundle

» Hand hygiene - the most important factor in preventing nosocomial infections.

» Aseptic catheter insertion procedure

» Correct Catheter Size

Maintenance Bundle

» Daily Review and Removal

» Maintaining a Closed System

» Proper Catheter Care:

- Routine perineal care to prevent contamination.
- Regularly emptying the catheter drainage bag to maintain a closed system.
- Maintaining unobstructed urine flow.

» Minimizing Catheter-Related Trauma:

» Securing the catheter to prevent tension or pulling on the catheter.

» Positioning the catheter and tubing to minimize kinks or twists.

Indications for urinary catheterization include:

» Urinary retention (mechanical obstruction or neuropathic)

» Need to closely monitor urine output in unstable patients.

» To assist perineal wound care

Alternatives to urinary catheterization

» Intermittent ("in and out") catheterization for incomplete bladder emptying.

» External condom catheter for men with urinary incontinence

» Absorbent pads and products for men and women with urinary incontinence

SSI Bundles

- Wash patients with soap or an antiseptic agent within a night prior to surgery
- Administer parenteral antibiotic prophylaxis within 60 minutes prior to incision, including for Cesarean section.
- Re-dose as recommended for prolonged procedures and in patients with major blood loss or excessive burns.
- Avoid hair removal: use electric clippers if necessary.
- Perform surgical hand scrub.
- Use alcohol-based disinfectant for skin preparation in the OR
- Maintain intraoperative glycemic control with target blood glucose levels less than 11.1 millimoles per liter (mmol/L, in patients with and without diabetes)
- Maintain perioperative normothermia.
- Administer increased fraction of inspired oxygen during surgery and after extubating in the immediate postoperative period in patients with normal pulmonary function.

HAI Surveillance

Surveillance is the systematic collection, management, analysis, interpretation, and reporting of data for use in the planning, implementation, and evaluation of the provision of healthcare. The purpose of undertaking HAI surveillance is to monitor and support improvement in the quality and safety of patient care within an HCF[14].

Components of Surveillance Cycle

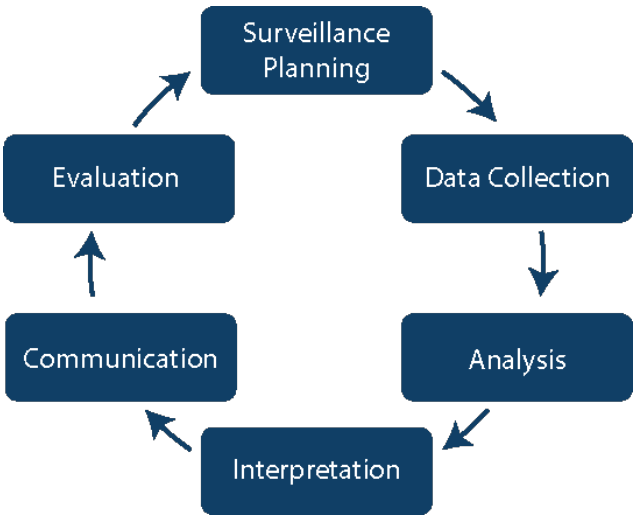


Figure 26-Surveillance Cycle

Types of HAI surveillance

Because it is not practical to conduct facility-wide surveillance for all HAIs, surveillance is often targeted, with a focus on specific sites of infection, populations, organisms, or locations within the HCF.

- There are two main methods of surveillance: outcome and process. Outcome Surveillance
- Outcome surveillance involves measuring adverse healthcare events, a proportion of which are preventable.
- Data may be expressed as:
  - Rates: time-series of HAI counts or proportions
  - Point prevalence: the proportion of patients with HAIs at the time of the prevalence survey.

- Incidence over time: the number of patients who develop a new HAI.
- Examples of outcome surveillance include capturing the incidence of CAUTIs or SSIs. Process Surveillance

» Process surveillance involves auditing actual practice against evidence-informed infection prevention strategies that are linked to improved outcomes.

- Process surveillance audits care bundles (e.g., compliance of antibiotic surgical prophylaxis for SSI or site selection for CLABSI).

CHAPTER 9 | ANTIMICROBIAL RESISTANCE IN HEALTH CARE SETTINGS

Introduction

Antimicrobial resistance is a complex phenomenon rooted in an evolutionary reality and accelerated by human behavior on many levels. Therefore, policies to control antimicrobial resistance include many strategies, ranging from new drug development to judicious use of the still available stock of effective antibiotics, and preventing the spread of already resistant microorganisms into healthcare related settings—where they can reach those patients who are most vulnerable to infection[15].

Improved infection prevention and control is an essential component of a national action plan on resistance. This is also highlighted in the Global Action Plan on Antimicrobial Resistance, where one of the five strategic objectives is to reduce the incidence of infection through effective sanitation, hygiene and infection prevention measures[16].

By causing the emergence of AROs, misuse of antimicrobials increases the cost of healthcare delivery at the HCF and community levels. A reservoir of patients colonized with AROs becomes a source of cross transmission to other susceptible patients in a HCF. When infections with AROs occur, there is increased mortality, especially among those with underlying diseases or multi-organ failure.

Antimicrobial stewardship (AMS) refers to coordinated interventions designed to improve and measure the appropriate use of antimicrobials by promoting the selection of the optimal antimicrobial drug regimen, dose, duration of therapy, and route of administration. Antimicrobial stewards seek to achieve optimal clinical outcomes related to antimicrobial use, minimize toxicity and other adverse events, reduce the costs of healthcare for infections, and limit the selection for antimicrobial-resistant strains.

Strategies for Reducing the Transmission of Antimicrobial-Resistant Organisms

The following strategies are essential to reduce the transmission of AROs:

- Good IPC practices and adherence to IPC policies and guidelines
- Surveillance data to target specific areas at high risk for AROs.
- Establishing Antimicrobial Stewardship (AMS) programs
- Education and training
- Research and Development

Strategies for Antimicrobial Stewardship

- Create policies and guidelines for antimicrobials and educate clinicians on appropriate use.
- Restrict dispensing of targeted antimicrobials to approved indications (Access, Watch & Reserve [AWaRE] categorization)
- Review prescribed antimicrobials for appropriatenessand contact prescribers with recommendations for alternative therapy.
- Use information technology including computerized order entry and decision support systems to implement AMS strategies.
- Conduct antimicrobial use surveillance and local/national benchmarking Formulate antimicrobial policies and guidelines.

15 Rump B, Timen A, Hulscher M, Verweij M. Infection control measures in times of antimicrobial resistance: a matter of solidarity. Monash Bioeth Rev. 2020 Dec;38(Suppl 1):47-55. doi: 10.1007/s40592-020-00119-9. Epub 2020 Nov 7. PMID: 33159651; PMCID: PMC7648233.

16 https://www.reactgroup.org/toolbox/policy/implement-the-national-action-plan/infection-prevention-and-control/

Good Practices on Antimicrobial Use

- Appropriate investigations are recommended for all infections. These are necessary for diagnosis, treatment, and follow-up.
- Microbiological samples should be collected before initiating antimicrobial therapy. If this is not possible, use the hospital formulary/local treatment guidelines while choosing appropriate antimicrobial therapy.
- Check for factors that will affect drug choice and dose such as renal and hepatic dysfunction, drug interactions, and hypersensitivity reactions.
- Ensure that the appropriate dose is prescribed; if uncertain, consult the clinical pharmacist or check in the hospital formulary.
- The need for antimicrobial therapy should be reviewed regularly (every 72 hours).
- For most infections, 5 to 7 days of antimicrobial therapy is sufficient.
- Once culture reports are available, the physician shall step down to the narrowest spectrum, most efficacious, and most cost-effective option. If there is no step down chosen, the reason shall be documented for clinical audit.
- Clinical review of antibiotic prescribing and providing direct prescriber feedback
- Restricted availability of antimicrobials and pre-authorization with reference to AWaRe categorization of antibiotics.
- Diagnostic stewardship.

Antimicrobial Prophylaxis

Antimicrobial Prophylaxis in Surgery, for Children and Adults

The prophylactic administration of antibiotics is beneficial, but it does not replace good clinical judgment, measures of asepsis and antisepsis, or good surgical technique. Thus, for example, in elective colon surgery, mechanical intestinal cleansing is fundamental.

For antimicrobial prophylaxis in surgery to be effective:

- The antibiotic must be administered during preoperative preparation not more than 30 to 60 minutes before the incision. Usually giving a single preoperative dose is sufficient.
- If the surgery lasts more than 4 hours or if there is significant blood loss, the dose should be repeated 6 hours later.
- When vancomycin or aminoglycoside are used for prophylaxis, repeating the dose is not necessary.
- It is important to rule out any hidden infection during the preoperative preparation, particularly when urologic surgery or prosthetic implantation (for example, valve or hip) is involved.
- If a hidden infection is detected, it should be treated prior to the procedure.

Antimicrobial Stewardship Surveillance Methods

AMR surveillance data help monitor susceptibility patterns of microorganisms to antimicrobial agents. Regular dissemination of data can help policymakers revise the recommendations for case management in HCFs and contribute to systematically combating AMR. In addition, such information can be used for sensitizing clinicians, regulators, pharmacists, and the general public. Refer to the National AMR surveillance strategy 2020.

Clinical Areas/Hospital Pharmacy

There are two main methods of antibiotic data collection in HCFs: patient-level surveillance and population surveillance.

- Patient-level surveillance involves collecting data about the dose, dosage interval, and duration of therapy for individual patients.
- Population surveillance involves aggregating antibiotic use data, mostly supplied through pharmacy reports and summarized at the level of a hospital or unit.

Aggregate data from issues to wards combined with individual patient-dispensing records are used.

Pharmacy purchase data may also be used; however, this is less representative than aggregation of ward issues and individual inpatient supplies.

Community Surveillance

Measurement of community antibiotic use is generally based on prescription data outside the HCFs. This could be obtained from wholesale or retail medicine distribution points or pharmacies.

Laboratory Surveillance

Laboratory-based surveillance, one of the pillars of monitoring infectious disease trends, relies on data produced in clinical and/or public health laboratories. Currently, diagnostic laboratories worldwide submit strains or samples to a relatively small number of reference laboratories for characterization and typing.

CHAPTER 10 | HANDLING HUMAN REMAINS

Introduction

All dead bodies are potentially infectious and "STANDARD PRECAUTIONS" should be implemented for every case. Although most organisms in the dead body are unlikely to infect healthy persons, some infectious agents may be transmitted when persons are in contact with blood, body fluids or tissues of dead body of person with infectious diseases. To minimize the risks of transmission of known and also unsuspected infectious diseases, dead bodies should be handled in such a way that workers' exposure to blood, body fluids and tissues is reduced. A rational approach should include staff training and education, safe working environment, appropriate safe work practices, the use of recommended safety devices and vaccination against hepatitis B.

Note: A safety approach should include:

- ***Staff training and education***
- ***Safe working environment Appropriate safe work practices Provision of appropriate PPE***
- ***Adherence to standard and additional precautions Use of recommended safety devices***
- ***Vaccination against tetanus, HBV, and COVID-19***

It is unusual for organisms in a dead body to infect healthy people with intact skin, but there are other ways that infection may be spread:

- Needle-stick injuries from a contaminated instrument or sharp fragment of bone (refer to Sharps and Inoculation Management, Appendix 10 in the Infection and Prevention Policy) (IPC policy 2021)
- Intestinal pathogens from anal and oral orifices
- Leaking body fluids
- Through abrasions, wounds, and sores on the skin
- Contaminated aerosols from body openings or wounds (e.g., tubercle bacilli, Ebola virus)
- When condensation could possibly be forced out of the mouth
- Splashes and/or aerosols onto the eyes

The risks of infection are usually prevented by the use of standard precautions. Occasionally additional precautions are required as in the handling of a known or possible case of Ebola.

Categorization of Dead Bodies

Based on the mode of transmission and the risk of infection of different diseases, the following categories of precautions for handling and disposal of dead bodies are advised.

Category 1	Signified by a BLUE label. Standard precautions are recommended for all dead bodies other than those with infectious diseases as listed under Categories 2 and 3.
Category 2	Signified by a YELLOW label. In addition to standard precautions, additional precautions are recommended for dead bodies with known:
	HIV, HCV, Creutzfeldt-Jacob disease (CJD) without necropsy SARS (e.g., SARS-CoV-2), Avian influenza, MERS-CoV Other infectious diseases as advised by the physician in charge, the infection control officer, or microbiologist.
Category 3	Signified by a RED label: In addition to standard precautions, stringent precautions are recommended for dead bodies with known:
	Anthrax, Plague, Rabies Viral hemorrhagic fevers CJD with necropsy Other infectious diseases as advised by the physician in charge, the infection control officer, or microbiologist.
Please refer to the summary table below specific precautionary measures required under each category.	

Table 5-Categorization of Dead Bodies

Risk category	Bagging	Viewing in Funeral Parlor	Embalming	Hygienic Preparation in Funeral Parlor	Disposal of Dead Body
Category 1 Other than those specified in Category 2 and Category 3 below	NOT necessary	Allowed	Allowed with PPE	Allowed with PPE	Coffin burial or cremation is optional
Category 2 HIV HCV CJD without necropsy SARS Avian influenza MERS-CoV COVID-19 Others	MUST	Allowed	NOT allowed	Allowed with PPE	Cremation is advisable
Category 3 Anthrax Plague Rabies Viral hemorrhagic fevers CJD with necropsy Others	MUST	NOT allowed	NOT allowed	NOT allowed	Cremation is strongly advisable

Table 6-Risk Categorization of Dead Bodies

CHAPTER 11 | EPIDEMIC AND PANDEMIC PREPAREDNESS AND RESPONSE

Introduction

The terms, "outbreak," "epidemic," and "pandemic" are used in these guidelines. All three terms refer to the spread of an infectious disease. An outbreak is a sudden increase in the number of people with the same infection. An epidemic is an outbreak that becomes widespread in a large area. A pandemic is an epidemic that spreads across a large region, like multiple countries or more than one continent.

Epidemic and pandemic preparedness and response are critical aspects of public health and healthcare systems, aimed at mitigating the impact of infectious disease outbreaks on individuals and communities.

The impact of an infectious disease outbreak may be very devastating to patients and clients, as well as the healthcare workers in healthcare settings. Patients and clients often have medical conditions that make them vulnerable to infection. This vulnerability, combined with a shared living environment, increases the risk of transmission. Public health believes that a pandemic more serious than COVID-19 could occur within the next decade.

Infection prevention and control (IPC) practices help prevent and reduce the spread of infectious disease in healthcare settings and communities. Therefore, epidemic and pandemic preparedness and response are critical to an overall emergency preparedness and response plan.

Key Components of Pandemic Preparedness and Response

1. **Standard case definition** : A standard case definition during epidemics, pandemics and outbreaks is a crucial tool for public health officers and healthcare professionals to identify and categorize cases of the disease accurately. It helps ensure consistency in reporting and data collection, making it easier to track and respond to the outbreak.
2. **Surveillance and Early Detection**:
    - Robust surveillance systems are crucial for early detection of potential outbreaks.
    - Timely reporting of unusual patterns of disease can help with quick response.
    - Risk Assessment and Communication
    - Assessing the risk posed by a potential outbreak helps allocate resources efficiently.
    - Clear and consistent communication between the patients, health workers and the public are essential to maintain trust and ensure compliance with preventive measures.
3. **Healthcare System Capacity**
    - Strengthening healthcare infrastructure, including the availability of healthcare workers, equipment, and medical supplies, is essential for an effective response.
4. **Infection Prevention and Control (IPC) Strategies:** The specific strategies and measures employed may vary depending on the nature of the pathogen and its mode of transmission, but there are common principles that can be applied in most situations. Here are some key strategies for infection prevention and control during pandemics and outbreaks:

» Hand Hygiene

- Promoting regular hand hygiene is a simple yet highly effective measure in reduction of infection transmission.

» Personal Protective Equipment (PPE):

- Healthcare workers and essential personnel should have access to appropriate PPE, including masks, gloves, gowns, and eye protection.
- Proper training on PPE usage is crucial to prevent cross-contamination.

» Respiratory Hygiene and Mask-wearing:
  - Encouraging the practice of respiratory etiquette (covering coughs and sneezes) reduces airborne and droplet transmission.
  - Widespread mask-wearing in public places can help reduce respiratory droplet spread.

» Environmental Cleaning and Disinfection
  - Regular cleaning and disinfection of frequently touched surfaces and areas can reduce indirect contact or fomite transmission.

» Isolation and Quarantine:
  - Isolating infected individuals and quarantining those exposed can prevent further transmission.
  - Effective management of isolation and quarantine facilities is essential.

» Physical Distancing and Crowd Control
  - Implementing measures such as physical distancing and restrictions on large gatherings can slow the spread of the virus.
  - Telecommuting and remote learning can reduce physical interactions.

» Travel Restrictions:
  - Implementing travel restrictions and advisories to limit the movement of people across regions and countries.
  - Screen travelers for symptoms and exposures at points of entry.

» Vaccination
  - Widespread vaccination campaigns (where applicable) are a cornerstone of pandemic response.
  - Promoting vaccine awareness, distribution, and equitable access are vital for community immunity.

Outbreak Management in Healthcare Facilities

Health care settings, while providing a safe environment for patient care, are complex settings and can produce conditions that facilitate the transmission of organisms and outbreaks.

Outbreaks can be expensive and time-consuming and can cause significant disruptions in health care operations in addition to impacting patient morbidity and mortality. Many of the precautions that should be put in place in a healthcare facility to prevent healthcare acquired infections (HAI) or reduce antimicrobial resistance (AMR) are critical to protect patients, health care workers (HCWs) and visitors from epidemic spread of pathogens. When an outbreak occurs within the facility, it is the responsibility of the infection prevention and control (IPC) team to help identify and investigate the source of that outbreak, reduce its effects and, with the support of the broader outbreak team, prevent its recurrence.

The IPC team should also be able to assess when there is a risk of spread of a pathogen brought into the facility from the community and should put in place measures to prevent or contain health care-associated transmission. Healthcare facilities must have robust plans and protocols in place to manage outbreaks effectively.

Common causes of outbreaks in healthcare facilities

» Gastrointestinal illnesses e.g., norovirus, rotavirus

» Acute respiratory illnesses e.g., influenza, respiratory syncytial virus (RSV

» Multidrug-resistant organisms (MROs) e.g., Klebsiella sp, E. coli, *Enterobacter* sp, Candida auris, and Carbapenem resistant organisms

Sources of outbreak alerts

» An outbreak alert may originate from any of the following:

» An effective surveillance system

» Doctor

» Nurse

» Microbiologist

» Epidemiologist

» Patient(s)

» Media

Guiding Principles

These guidelines provide key elements of outbreak preparedness in healthcare facilities as below:

1. Leadership and Coordination
   - Appoint a designated outbreak response team, including IPC practitioners to ensure efficient decision-making and communication.
   - Collaborate with local public health office and other healthcare facilities to share information and resources.
2. Surveillance and Monitoring
   - Establish an efficient surveillance system to monitor unusual trends in illnesses and antimicrobial resistance (AMR).
   - Use electronic and other health records and laboratory data to detect potential outbreaks early.
3. Infection Prevention and Control (IPC)
   - Implement strict standard and additional IPC measures to minimize the risk of disease transmission within the facility.
   - Ensure adequate procurement of necessary IPC supplies.
   - Ensure healthcare workers are trained in the proper use of personal protective equipment (PPE).
4. Isolation and Quarantine
   - Identify and isolate infected patients to prevent further transmission.
   - Implement quarantine procedures for potentially exposed individuals.
5. Patient Management
   - Develop clear admission and triage procedures for suspected cases.
   - Provide appropriate care and treatment for infected patients while minimizing the risk to healthcare workers and other patients.
6. Resource Management
   - Maintain an adequate supply of medical equipment, IPC Supplies, and pharmaceuticals.
   - Establish surge capacity plans to accommodate increased patient volumes.
7. Communication
   - Ensure clear and timely communication with healthcare workers, patients, and the public.
   - Maintain transparency while respecting patient privacy.
8. Training and Drills
   - Regularly train healthcare workers on outbreak response protocols.
   - Conduct outbreak simulation exercises to test preparedness and identify areas for improvement.
9. Community Engagement
   - Collaborate with community partners to share information, resources, and support.
   - Continuous communication with the public about the outbreak and preventive measures.

10. Data Collection and Analysis
    - Collect and analyze data to monitor the outbreak's progression and assess the effectiveness of response measures.
    - Use data to inform decisions and resource allocation and re-allocation.
11. Post-Outbreak Evaluation
    - Conduct a thorough evaluation of the outbreak response to identify strengths and weaknesses.
    - Use the findings to update and improve the facility's outbreak preparedness plan.

Steps of Outbreak Response

Step 1. Identify an Outbreak Management Team (OMT):

» A multidisciplinary team
» Oversee all aspects of an outbreak.
» Should meet at the beginning of each outbreak and on an ongoing basis as necessary.
» Members should have defined roles and responsibilities.

The OMT may include expertise from the groups listed below:

» Infection Prevention and Control
» Microbiology/Virology
» Laboratory
» Infectious diseases
» Hospital management
» Epidemiology
» Public Health Unit
» Communications
» Antimicrobial stewardship
» Environmental cleaning management
» Staff health
» Directors/managers of relevant clinical units – including nursing, medical and allied health staff where applicable.

The OMT tasks include but are not limited to:

» Literature search
» Control measures
» Case Definition
» Specimen collection
» Availability of resources
» Review of line list
» Staff education
» Outbreak monitoring
» Communication
» Report compilation

A lead should be identified from the OMT, who is responsible for ensuring that:

» The OMT acts effectively, with all activities well-coordinated and managed.

» Sufficient resources are allocated to the OMT.

» Regular updates are provided to the healthcare management team, healthcare workers and other relevant stakeholders.

» Decisions made by the OMT are communicated and recorded appropriately.

» An OMT report is prepared when the outbreak is over.

» A debrief is held with the OMT and relevant clinical teams when the outbreak is over.

Step 2. Verify diagnosis and determine if an outbreak truly exist:

» OMT conducts investigations to detect and identify the outbreak.

» The team visits the service area affected (ward/unit)

» Rule out other reasons for increased numbers

- Change in reporting.
- Change in diagnostic test.
- Change in case definition.
- Increased awareness
- Change in population size.

» Use clinical and/or laboratory information.

» Epidemiological information is also useful.

- Interview patients/staff in a specific unit
- Assess patients who participated in a specific activity or had a specific procedure.

» If the outbreak is true and not pseudo, declare the outbreak.

Step 3. Establish case definition and initiate case finding:

Case Definition is standard set of criteria used to decide if a person should be classified as suffering from a disease under investigation:

» Describe cases in terms of ***person, place and time.***

» Cases are established based on symptoms.

» A good case definition should include most, if not all cases

» Use case definition to find other cases in the source population.

» Develop a line list.

» Draw an epidemiologic (Epi) curve.

Note: Start broad and refine the case definition as the outbreak progresses to identify definite, probable and suspect cases

Step 4. Implement control measures:

» May be initiated from the start of the outbreak investigation process:

- Measures are based on.
- Causative agent e.g., prophylaxis, vaccines
- Source/reservoir e.g., disinfection, isolation, recall of equipment.
- Mode of transmission e.g., additional or transmission-based precautions.

» Reinforce standard precaution measures.

» Aimed at breaking the chain of infection.

Step 5. Describe findings based on person, place and time:

» Perform descriptive epidemiology.

Step 6. Generate hypothesis:

» **Hypothesis:** A specific and testable statement

» Record, tabulate and review all collected data and summarize commonalities.

» Based on data analysis, develop a "best guess"

» Hypothesis on most likely:

- Reservoir/source
- Mode of transmission
- Exposure

» Hypothesis should explain majority of cases (there will be some unexplainable cases)

» Conduct hypothesis generating interviews.

» Review descriptive data.

» If you have no idea, stop and rethink.

Step 7. Test Hypothesis:

» Conducted when infections are associated with:

- Significant morbidity/mortality
- Multiple services involved.
- Outbreak related to commercial products.
- Seek assistance from your epidemiologist or public health unit for this endeavor.

» Most common outbreaks start to resolve before you get to this step.

» Microbiological investigation of suspected sources or vehicles of transmission

Step 8: Implement more and evaluate control measures:

» Isolation precautions

» Cohort residents and staff

» Prophylaxis of contacts

» Decolonization of carriers

» Limiting visitors

DO NOT!

» Conduct generalized microbiological screening.

» Give antimicrobial prophylaxis.

» Allow visitors or relatives to enter if not exceptionally necessary.

Step 9. Debrief team(s), compile a report, disseminate findings and recommendations:

» Conduct a debrief with key participants and discuss what went well and identify areas of improvement.

» Focus on strategies to prevent future outbreaks.

» Written report should include:

- Background
- Investigations conducted.
- Results (facts, tables and graphs)

- Discussion / recommendation

Step 10. Disseminate findings and recommendations:

» Outbreaks provide a unique opportunity to educate health workers, patients and the public.

» Oral or written communication

» Share information with policy makers, and other relevant key stakeholders.

Outbreak Response Algorithm

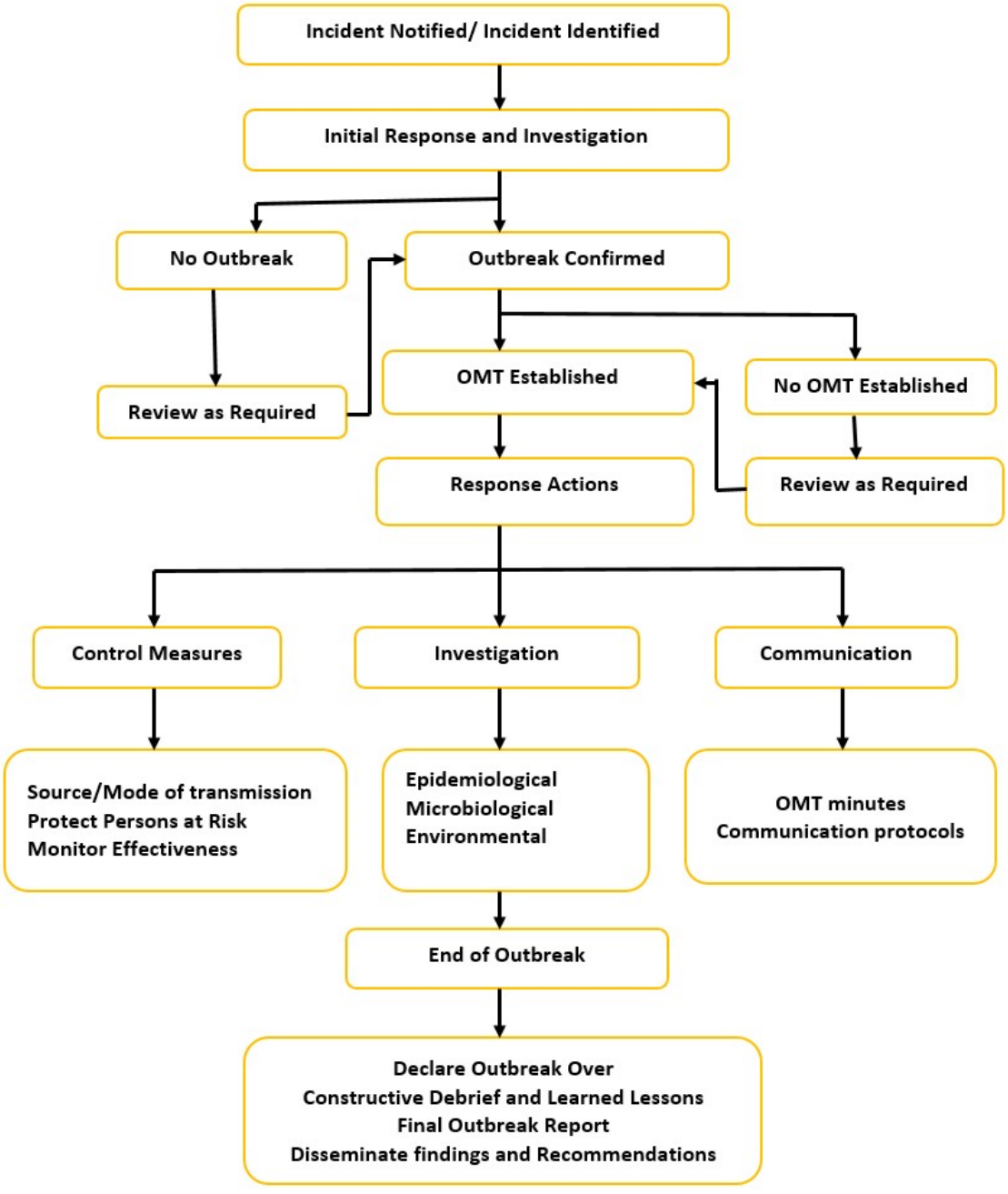


Figure 27-Outbreak Response Algorithm

APPENDICES

Appendix 1 | List of Contributors

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Veronica Kamau	Ministry of Health
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Appendix 2 | Procedures for Cleaning and Disinfecting Health Care Facilities

Items, Equipment	Procedure and Frequency	Agent and Supplies	Remarks
Cleaning clothes	Daily after use	Liquid detergent and water. Sodium hypochlorite 0.5% Peroxygen and organic acid surfactant blend (POASB) 1% Clean water Buckets	Rinse in soapy water. In high-risk areas, disinfect after each use and at night. Store clothes dry. Incinerate cloths if heavily contaminated.
Floor mops, brooms, and brushes	Clean and disinfect after use	Liquid detergent and water Sodium hypochlorite 0.5% POASB 1%	Wash items thoroughly with detergent after each use. Rinse in water. Immerse in disinfectant for 30 minutes and then dry. Always color-code and confine use of each mop to its designated room (e.g., kitchen, toilet, ward, etc.). DO NOT MIX MOPS. Store mops dry and upright with head up.
Plastic buckets for use during cleaning	Clean daily after use or as required	Abrasive materials for cleaning Liquid detergent and water Disinfectants in Isolation areas: Sodium hypochlorite 1.0% POASB 1% Disinfectants in TB areas: Sodium hypochlorite 0.5% Phenolic disinfectant 2%	Each area should have its own bucket. Clean general wards daily or as required with detergent and water. In isolation areas: Soak items in sodium hypochlorite or POASB for 10 minutes. Rinse items with tap water. In TB areas: Soak items for 20 minutes in sodium hypochlorite or phenolic disinfectant 2%. Rinse items with tap water.

Appendix 3 | Procedure for Cleaning Ablution Facilities

Area	Procedure and Frequency	Agent and Supplies	Remarks
Ablution blocks: Toilets Toilet seats Toilet cistern and urinal Used toilet brushes	Thoroughly clean items daily. Clean items when soiled. Clean items between patients and after discharge. Disinfect seats. Soak items in disinfectant. Soak brushes in disinfectant for one hour, wash in warm soapy water, rinse, and hang to dry.	Liquid detergent and water Sodium Hypochlorite 0.01% POASB 1% Deodorizer	Use a low-level disinfectant. Use a deodorizer, if necessary, as per manufacturer's instructions.
Bedpans and urinals Sputum mugs	Scrub with detergent, and water daily. Regardless of patient's status of infection: Empty bedpan/urinal/washing bowl down sewer. Clean items with soapy water and use scouring powder for stains. In case of diarrheal disease: Sprinkle dry disinfectant (NaDCC powder, if available) into receptacle and then empty. OR Fill items with prepared disinfectant solution. Leave 30 minutes and then empty and wash again in freshly prepared solution. Rinse with clean water and dry. Pour full strength disinfectant in sputum mugs after washing and before dispatching them to patients.	Detergent, water, In case of diarrheal disease: Sodium hypochlorite 0.25% (2,500 ppm) NaDCC powder OR POASB 1%	Store extra bedpans/ urinals/sputum mugs in cupboards when not in use. Do not use cleaning equipment for toilets (e.g., mops, rags) anywhere else.
Sluice rooms	Pour contents of urinals and bedpans GENTLY down the sluice. Clean once a day and as required. Disinfect surfaces after use and after contamination	Liquid detergent and warm water for spills: Sodium hypochlorite 0.5% POASB 1%	Avoid splashing and spilling walls and surrounding area.
Bathrooms: Enamel baths and basins (bathtubs and sinks) Washing bowls: Autoclavable Polypropylene	Clean and disinfect items between patients	Liquid detergent to clean bath and sink Sodium hypochlorite 0.5% POASB 1% Autoclaves	Do not use ammonia detergent and chlorine-based compound together because of the release of toxic compounds. Rinse thoroughly to remove disinfectant. Do not use abrasive material to clean bath. and sink because it will damage the surface.

Appendix 4 | Procedures for Cleaning Furniture, Fittings, and Equipment

Equipment	Procedure and Frequency	Agent and Supplies	Remarks
Beds (including frames)	Daily damp clean. Scrub the bedframe with detergent and water. Disinfect after each patient use, and after spills.	Liquid detergent and water	When possible, in between patients, take the mattress and the pillows from the bed and place in the sun for at least 1 hour. Never admit a patient into a bed that has not been disinfected.
Bedside lockers (General ward)	Damp clean daily. Thoroughly clean once per week after spills, and after discharge of patient. If splashed with blood or other body fluids, wipe with disinfectant	Liquid detergent and water Sodium hypochlorite 0.5%	Check lockers for pest control requirements.

Appendix 5| Procedures for Special Clinical Surfaces

Area	Procedure and Frequency	Agent and Supplies	Remarks
High-level decontamination of surfaces	Pre-clean with detergent solution then wipe or mop with disinfectant.	Liquid detergent and water Methylated spirit POASB 1% Sodium hypochlorite 0.5%	POASB does not require pre- cleaning of items.
Kitchen: Pots and pans Utensils, crockery, trays, and feeding and medicine cups Refrigerators. Freezers	After each use, wash, rinse, and dry on a rack. Disinfect as necessary. Damp wipe and disinfect as necessary. Defrost freezers every 2 weeks.	Dishwasher Liquid detergent and hot soapy water Heat disinfect OR Sodium hypochlorite 0.5% Liquid detergent and warm water	Cover food to prevent contamination by flies, ants, and cockroaches. Dish towels (if used) should be used once for every dish washing. Hand or machine wash thoroughly at minimum temperature of 60°C with final rinse at 80°C. Store kitchen items dry. In case of infection, if dishwashers are not available, soak in sodium hypochlorite 0.5% for 10–15 minutes
Cupboards	Wash once weekly and rinse with clean water	Liquid detergent and warm water	Perform vector control if necessary.
Stoves	Clean three times a week with detergent and water or as necessary	Liquid detergent and warm water	Use grease cutter to remove stubborn stains.

Appendix 6 | Common IPC Commodities

Activities	Item
Hand care	Neutral pH hand washing liquid antimicrobial soap/skin cleanser ABHR. Alcoholic chlorhexidine Hand cream Waterproof dressing Soft brushes – fingernail, steam sterilizable
PPE – for staff	Gloves, non-sterile
	Gloves, sterile
	Gloves, utility
	Gowns
	Aprons, waterproof
	Eyewear
	Footwear
	Face shield
	Caps
	Masks, splash proof (surgical and respirators)
	Masks, laser
	Masks, respirators
PPE- for patients	Patient wraps (gowns or aprons)
	Protective eyewear
	Masks
	Rubber dam (dental)
Decontamination of skin or mucous membrane	Mucosal disinfectant
	Skin antiseptics
Equipment	Suitable detergent for instrument cleaning (enzymatic solution, non-foaming detergent for suction, etc.)
	Disinfectants
	Sterilizing solutions
	Suction unit detergent
	Sterilizer bags
	Sterilizer wrap
	Sterilizing indicator tape
	Biological indicators
Linen	Linen bags
	Sanitary laundry detergent
	Disinfectant detergent
	Sodium hypochlorite
	PPE
	Impervious container

Activities	Item
Surfaces	Detergents
	Absorbent chlorine granules
	Sodium hypochlorite
	Absorbent disposable paper/materials
	Alcohol
	Lint-free cloth
	Mops

Appendix 7 | First Aid for Occupational Exposure to Blood or Other Body Fluids

FIRST AID FOR OCCUPATIONAL EXPOSURE TO BLOOD OR BODY FLUIDS

IF THE SKIN IS BROKEN FOLLOWING AN INJURY WITH A USED NEEDLE STICK OR SHARP INSTRUMENT.

Wash the site immediately using soap and running water and allow it to bleed freely and do not squeeze it.

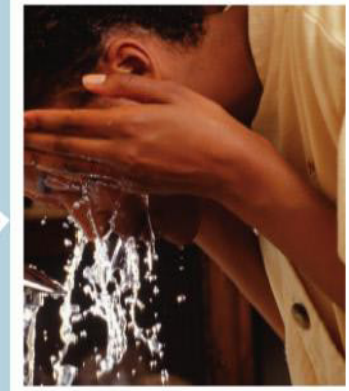
CAUTION- DO NOT USE ANY STRONG SOLUTIONS SUCH AS ALCOHOL, BLEACH OR IODINE AS THESE IRRITATE THE WOUND AND MAKE THE WOUND WORSE.

AFTER SPLASH OF BLOOD OR BODY FLUIDS TO BROKEN OR NON - INTACT SKIN

Wash the area immediately with soap and running water.

TO THE EYE

Wash the exposed eye immediately with water. If you are wearing contact lenses, leave them in place while washing the eye as they form a barrier over the eye and will help protect it. Once the eye has been cleaned remove the contact lenses and clean them in the usual way. This will make them safe to use again.

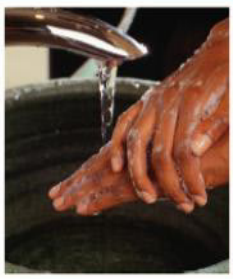


CAUTION- DO NOT USE SOAP OR DISINFECTANT IN THE EYE

TO THE MOUTH

- Rinse the mouth thoroughly with water and spit out.
- Repeat this process several times.

CAUTION-DO NOT USE SOAP OR DISINFECTANT IN THE MOUTH



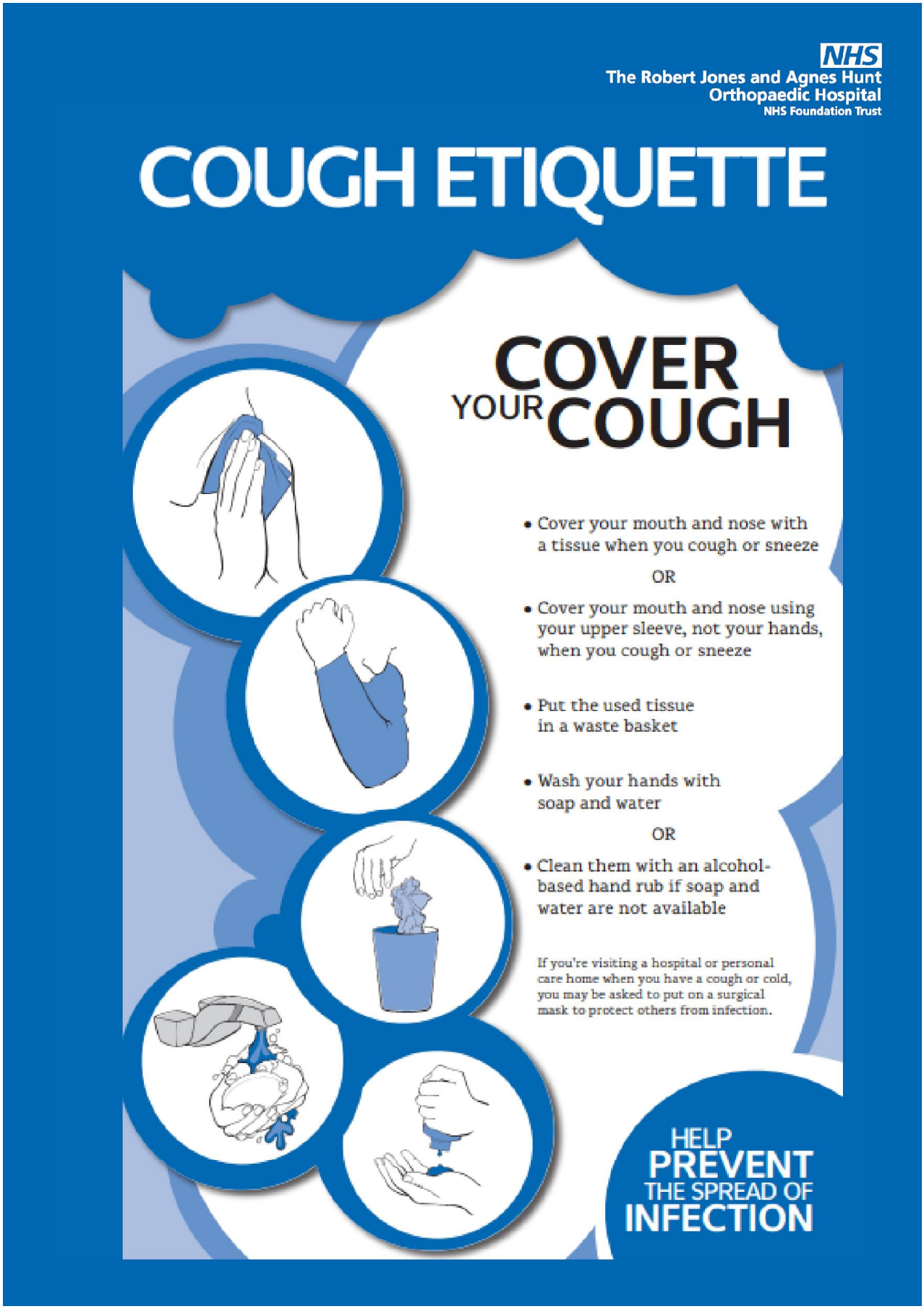
REPORT EXPOSURE TO YOUR SUPERVISOR, HAND OVER YOUR DUTIES AND IMMEDIATELY GO TO THE INSTITUTION STAFF PROVIDING PEP TO ACCESS YOUR START PEP DOSE AND FURTHER CARE

MINISTRY OF PUBLIC HEALTH AND SANITATION
MINISTRY OF MEDICAL SERVICES

Appendix 8 | Risk Classification and IPC Precautions at the Mortuary

Very High Risk	High Risk
Conditions Body bags must be used. Viewing and touching prohibited No embalming. Hygienic preparation banned. Airborne precautions. Cover the face of cadaver with facemask and cover other portals for secretions. ***Applies to:*** Anthrax, Lassa, Ebola, Marburg, and other viral hemorrhagic fevers Yellow fever Plague Rabies SARS Septicemia due to invasive Group A streptococcal infection, if the patient had less than 24 hours of appropriate antibiotic therapy Smallpox	***Conditions*** Body bag must be used for CJD and other transmissible spongiform encephalopathies (TSEs). Advised that embalming should not be done. The bereaved should be warned of the potential infection risk. Contact with the remains should be done under supervision with guidance on use of standard precautions. Droplet precautions. Cover the face of cadaver with facemask and cover other portals for secretions. ***Applies to:*** CJD and other TSEs Typhus And for the following diseases only if there is seepage of body fluids: Hepatitis B Hepatitis C Hepatitis D HIV/AIDS Note: Bodies infected with HIV may be infected with other diseases, such as TB, which may be potentially more infectious than the HIV infection itself.
Medium Risk	**Low Risk**
Conditions Body bag is advised to prevent leakage of body fluids. Hygienic preparation of the body is permitted with appropriate precautions. Viewing and touching is allowed with appropriate precautions. Embalming may be carried out. Contact precautions still need to be taken; if there are excess secretions, adopt droplet precautions. Cover the face of cadaver with facemask and cover other portals for secretions. *Applies to:* Cholera, Diphtheria Dysentery (amoebic or bacillary) Meningococcal disease (untreated) MRSA, Typhoid and paratyphoid fever Relapsing fever Scarlet fever, Tuberculosis Brucellosis, Salmonellosis	***Conditions*** Body bag not required. Hygienic preparation of the body is permitted. Body can be handled; viewing and touching is allowed. Embalming may be carried out.

Appendix 9 | Cough Etiquette Poster



Appendix 10 | Quantification of Hospital Linen

The hospital should have 6 sets of linen per bed. It is calculated as per following:

- One already in use (on bed)
- One ready to use (in sub store)
- One en route to laundry
- One in washing cycle in laundry
- Two in stock (in central store)

The detailed requirement of linen is as follows:

- Bed sheets: 6 Per bed
- Draw sheet: 6 per bed.
- Pillow cover: 4 per bed
- Blanket: 4 per bed
- Pillow: 2 per bed
- Mortuary sheet: 6 per bed
- Patient dress: 4 pairs per patient
- Towel: 2 per bed
- Doctor's coat: 3 per doctor
- Labor room and procedure room linen is determined based on anticipated workload.

Appendix 11 | Reconstitution of Chlorine

From Liquid Bleach

(% chlorine in liquid bleach / % chlorine desired) – 1 = Total parts of water for each part bleach

1. Example: To make a 0.5% chlorine solution from 3.5% bleach:

2. [3.5% / 0.5%] – 1 = 7 – 1 = 6 parts water for each part bleach

From Powder Bleach

[% chlorine desired / % chlorine in bleach powder] × 1 000 = Grams of bleach powder for each liter of water

Example: To make a 0.5% chlorine solution from calcium hypochlorite (bleach) powder containing 70% active chlorine

[0.5% / 70%] × 1 000 = 0.00714 × 1 000 = 7.14

Therefore, you must dissolve 7.14 grams of calcium hypochlorite (bleach) powder in each liter of water used to make a 0.5% chlorine solution.

Appendix 12 | Hand Hygiene Observation Tool

World Health Organization | Patient Safety — A World Alliance for Safer Health Care | SAVE LIVES — Clean Your Hands

Observation Form

Facility:		Period Number*:		Session Number*:	
Service:		Date: (dd/mm/yy)	/ /	Observer: (initials)	
Ward:		Start/End time: (hh:mm)	: / :	Page N°:	
Department:		Session duration: (mm)		City**:	
Country**:					

Prof.cat			Prof.cat			Prof.cat			Prof.cat		
Code			Code			Code			Code		
N°			N°			N°			N°		
Opp.	Indication	HH Action	Opp.	Indication	HH Action	Opp.	Indication	HH Action	Opp.	Indication	HH Action
1	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	1	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	1	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	1	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves
2	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	2	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	2	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	2	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves
3	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	3	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	3	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	3	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves
4	☐ bef-pat. ☐ bef-asept.	☐ HR	4	☐ bef-pat. ☐ bef-asept.	☐ HR	4	☐ bef-pat. ☐ bef-asept.	☐ HR	4	☐ bef-pat. ☐ bef-asept.	☐ HR

GLOSSARY OF TERMS

Airborne transmission: Transfer of particles 5 µm or less in size into the air, either as airborne droplets or dust particles containing an infectious microorganism. These small particles can be produced by coughing, sneezing, talking, or procedures such as bronchoscopy or suctioning. They can remain in the air for several hours and can be spread widely within a room or over longer distances. Special air handling and ventilation are needed to prevent airborne transmission.

Appropriate PPE: Personal protective equipment (PPE) worn to minimize exposure to hazards that cause serious workplace injuries and illnesses. These injuries and illnesses may result from contact with chemical, radiological, physical, electrical, mechanical, or other workplace hazards. In this case, the use and choice are depended to the type of exposure and procedure being undertaken.

Animate: Property of having life or being alive (for example, human tissue or organs).

Antisepsis: Destruction or inhibition of microorganisms to reduce their number on living tissues (skin, mucous membranes, or other body tissue) by applying an antimicrobial (antiseptic) agent.

Antiseptic or antimicrobial agent (used interchangeably): Chemicals that are applied to the skin or other living tissue to inhibit or kill microorganisms (both transient and resident), thereby reducing the total microbial counts.

Antiseptic hand rub or waterless, alcohol-based antiseptic hand rub (used interchangeably): Fast-acting antiseptic hand rubs that do not require use of water to remove transient flora, reduce resident microorganisms, and protect the skin. Most contain 60% to 90% alcohol, an emollient, and often an additional antiseptic, such as 2% to 4% chlorhexidine gluconate that has residual action.

Asepsis and the aseptic technique: Combination of efforts made to prevent entry of microorganisms into any area of the body where they are likely to cause infection. The goal of asepsis is to reduce to a safe level or eliminate the number of microorganisms on both animate (living) surfaces (skin and tissue) and inanimate objects (surgical instruments and other items).

Autoclave: A process that destroys or removes all microorganisms (bacteria, viruses, fungi, and parasites, including bacterial endospores) from inanimate objects by high-pressure steam. Also refers to the device that sterilizes equipment and items through high-pressure, saturated steam.

Bactericide: Agent that kills bacteria.

Biosafety level (BSL) guidelines: Combination of primary and secondary containment and safety guidelines that are designed for use in microbiology laboratories and bacteriology research units functioning at four levels of increasing risk (BSL-1 to BSL-4).

Biological safety cabinet (BSC): Device that provides protection for personnel, the agent being processed, and the environment. BSCs range in complexity from level 1 (general research cabinets for use with low- to moderate-risk microorganisms) to level 3 (totally enclosed cabinets with gas- tight construction that provide maximum protection to HCWs and the environment).

Clean water: At a minimum, clean water should be free of microorganisms and have low turbidity (is clear, not cloudy). For instrument cleaning distilled, reverse osmosis or deionized water is recommended for use dilution with all concentrated instrument cleaners and approved disinfectants.

Cleaning: Process that physically removes all visible dust, soil, blood, or other body fluids from inanimate objects as well as removing enough microorganisms to reduce risks for those who touch the skin or handle the object.

Cleaning solution: Any combination of soap (or detergent) and water used to wash or wipe down environmental surfaces such as floors, walls, ceilings, and furniture.

Clinical area: A department or service area that is directly related to the diagnosis, treatment, or rehabilitation of persons receiving services from the health care facility (HCF). A clinical area's physical space must have the components required under the facility's licensure and facility documentation regarding requirements for appropriate clinical practice.

Clinically significant antibody: Antibody capable of producing an adverse reaction to transfused blood or

blood product that is obtained from a donor (allogenic antibody) or recipient (autologous antibody).

Closed system for obtaining blood: System in which the blood is not exposed to air or outside elements during collection, processing—including separation of components, such as platelets, if required prior to transfusion—and storage. It is the safest way to collect, process, and store blood.

Colonization: Pathogenic (illness- or disease-causing) organisms are present in a person (they can be detected by cultures or other tests), but they are not causing symptoms or clinical findings (no cellular changes or damage).

Contact time: Amount of time a disinfectant is in direct contact with the surface or item to be disinfected. For surface disinfection, this time period is framed by the application of the disinfectant to the surface until the disinfectant has completely dried.

Contact transmission: Infectious agent (bacteria, virus, or parasite) transmitted directly or indirectly from one infected or colonized person to a susceptible host (patient), often on the contaminated hands of an HCW.

Contaminated: State of having been actually or potentially in contact with microorganisms. As used in health care, the term generally refers to the presence of microorganisms that could be capable of producing disease or infection.

Corrosion: Action of chemical solutions, such as those containing salt (sodium chloride) or commercial bleach (sodium hypochlorite at concentrations above 0.5%) that causes metal instruments to be gradually eaten away (rusted) with prolonged contact (more than 1 hour).

Critical medical device (or item): Device that penetrates skin or invades normally sterile parts of the body (such as a central venous catheter). These items contact blood and require sterilization.

Culture: Growth of microorganisms in or on a nutrient medium; to grow microorganisms in or on such a medium.

Decontamination: Cleansing an object or substance to remove contaminants such as microorganisms or hazardous materials (this term constitutes cleaning, disinfection, and sterilization).

Detergent or soap (used interchangeably): Cleaning product (bar, liquid, leaflet, or powder) that lowers the surface tension of water and thereby helps remove dirt and debris and transient microorganisms from hands. Plain soaps require friction (scrubbing) to mechanically remove microorganisms, whereas antiseptic (antimicrobial) soaps also kill or inhibit the growth of most microorganisms.

Disinfectant: Chemical that destroys or inactivates microorganisms. Disinfectants are classified as low, intermediate, or high level depending on their ability to kill or immobilize some (low or intermediate level) or all (high level) microorganisms (but not all spores). Phenols, chlorine, or chlorine-containing compounds and quaternary ammonium compounds (QUATs) are classes of disinfectants that are frequently used to clean noncritical surfaces such as floors, walls, and furniture.

Disinfectant cleaning solution: Product that is a combination of detergent (soap) and chemical disinfectant. Not all detergents and disinfectants are compatible. Several combinations are available commercially or can be prepared, such as alkaline detergents with chlorine compounds, alkaline detergents with QUATs or other nonionic surfactants, and acid detergents with iodophors.

Disinfection: A process of reducing microbial load without complete sterilization. Disinfection refers to the use of a physical process or chemical agent to destroy vegetative pathogens, but not bacterial spores.

Droplet transmission: Contact of the mucous membranes of the nose, mouth, or conjunctivae of the eye with infectious particles that are larger than 5 μm and are produced by coughing, sneezing, talking, or procedures that produce aerosols such as bronchoscopy or suctioning. Droplet transmission requires close contact between the source and a susceptible person, because particles remain airborne briefly and travel only about 3 feet (1 meter) or less.

Dry-heat sterilization: Sterilization procedure in an oven to sterilize metal instruments, glass syringes and bottles, and other items by dry heat. Plastic and rubber items cannot be dry-heat sterilized, because the temperatures that are used (160–170°C) are too high for these materials.

Encapsulation: Filling a sharps container when it is three-quarters full, with cement or clay. After the clay or cement hardens, the container can be safely disposed of in a landfill.

Endemic illness or disease: Infectious diseases, such as cholera or AIDS, which are continuously present at some level (prevalence) in a particular country or region.

Endometritis: Acute postpartum infection of the lining (endometrium) of the uterus with extension into the smooth muscle wall (myometrium). Clinical features include fever (usually developing on the first or second postpartum day), uterine tenderness, lower abdominal pain, foul-smelling vaginal discharge (lochia), and signs of peritonitis in women who have had a Caesarean section.

Endospore or spore (used interchangeably): Relatively water-poor, round or elliptical resting cell that consists of condensed cytoplasm and nucleus surrounded by an impervious cell wall or coat. Spores are relatively resistant to disinfectants and sterilant, specifically species within the *Bacillus* and *clostridioides*.

Environmental controls: Standards specifying procedures for the routine care, cleaning, and disinfection of environmental surfaces, beds, bed rails, bedside equipment, and other frequently touched surfaces.

Epidemic: Rapid spread of an infectious disease, such as cholera, among many individuals in an HCF or community at the same time.

Episiotomy: Surgical cut made in the perineum (usually at the 6 o'clock position) just prior to delivery. The purpose is to facilitate delivery of the presenting part of the baby and minimize the risk of injury to the perineal area. Episiotomies are, however, associated with increased bleeding and might result in increased tearing (3rd- or 4th-degree perineal laceration). They frequently become infected and, more importantly, are usually not necessary.

Exposure time: Period of time in a sterilization process during which items are exposed to the sterilant at the specified sterilization parameters. In a steam-sterilization process, exposure time is the period during which items are exposed to saturated steam at the specified temperature.

Hand washing: Process of mechanically removing soil and debris from hands using plain soap and water.

Hazard: Any agent, equipment, material, or process that has the intrinsic potential or ability to cause harm.

Health care-associated infection (HAI) or nosocomial infection: An infection that was acquired in an HCF by a health care user, HCW, or a visitor—that is, the infection was neither present nor incubating at the time the person made initial contact with the facility. (Nosocomial refers to the association between care and the subsequent onset of infection. It is a time-related criterion that does not imply a cause-and-effect relationship.) HAIs include infections that were acquired in the hospital but did not appear until after discharge, including any infection in a surgical site up to 13 weeks postoperatively. Occupational infections among staff of the HCF are also considered HAIs.

Health care worker (HCW): Any person whose main activities are intended to enhance the health of patients. HCWs include the people who provide health services (doctors, nurses, pharmacists, laboratory technicians, etc.) and workers in management and support services (financial officers, cooks, drivers, cleaners, etc.)

Health care facility (HCF): In general, any location where healthcare is provided. HCFs range from small clinics and doctor's offices to urgent care centers and large hospitals with elaborate emergency rooms and trauma centers.

High-level disinfection (HLD): Process that eliminates all microorganisms except some bacterial endospores from inanimate objects by boiling, steaming, or using chemical disinfectants.

Incineration: Controlled burning of solid, liquid, or gaseous combustible (burnable) wastes to produce gases and residues that contain little or no burnable material.

Infection Prevention and Control: A practical, evidence-based approach that prevents patients and HCWs from being harmed by avoidable infections, and as a result, by antimicrobial resistance (AMR).

Infection prevention and control committee (IPCC): A multidisciplinary committee that deals with IPC issues. Each member of the committee contributes according to his or her discipline and fosters cooperation among all disciplines. The IPCC is made up of medical microbiologists, clinicians, pharmacists, public health officers, representatives from hospital administration, and other HCWs who represent sterilizing services, housekeeping, laundry, and training services.

Infection prevention and control program: A comprehensive program that encompasses all aspects of IPC: education and training; surveillance; environmental management; waste management; investigating outbreaks;

developing and updating IPC policies, guidelines, and protocols; cleaning, disinfection, and sterilization; employee health; and quality management in infection control.

Infection prevention and control team: The team of HCWs that are involved in the day-to-day IPC program activities.

Infectious agent: A bacterial, mycoplasmal, fungal, parasitic, or viral agent identified as causing illness in humans, human fetuses, or both.

Infectious microorganisms: Microorganisms that are capable of producing disease in appropriate hosts.

Infectious waste: Medical waste that is capable of causing infectious diseases.

Intermediate-level disinfectant: Agent that destroys all vegetative bacteria, including tubercle bacilli, lipid and some non-lipid viruses, and fungus spores, but not bacterial spores.

Intra-amniotic infection syndrome (IAIS) (also referred to as amnionitis or chorioamnionitis): Acute, clinically detectable infection in the uterus and its contents (fetus, placenta, and amniotic fluid) during pregnancy.

Invasive group B streptococcal sepsis: Newborn infection characterized by bacteremia, pneumonia, meningitis, and death in up to 25% of infants with the infection. It occurs most commonly following IAIS. Other sites of the infection include the newborn's skin (cellulitis) and bones (osteomyelitis).

Laboratory-acquired infection: Any nosocomial infection in staff that results from performing laboratory activities.

Linens: Cloth items that are used in HCFs: bedding and towels handled by housekeeping staff; cleaning cloths, gowns, and caps used by cleaning staff; caps, masks, scrub suits, surgical gowns, drapes, and wrappers used by surgical personnel; and items used by staff who are working in specialty units such as ICUs and other units and performing invasive medical procedures such as anesthesiology, radiology, or cardiology.

Low-level disinfectant: Agent that destroys all vegetative bacteria (except tubercle bacilli), lipid and some non-lipid viruses, and some fungus, but not bacterial spores.

Mechanical indicator: Automated device that monitors the sterilization process (graphs, gauges, printouts, etc.).

Medical devices: All equipment, instruments, and tools that are used in health care settings for diagnosis, prevention, monitoring, treatment, or rehabilitation. These devices include products such as contact lenses, condoms, heart valves, hospital beds, resuscitators, radiotherapy machines, surgical instruments and syringes, wheelchairs and walking frames, etc.

Microorganisms: Causative agents of infection, such as bacteria, viruses, fungi, and parasites. For infection prevention purposes, bacteria can be further divided into three categories: vegetative (e.g., *Staphylococcus*), mycobacteria (e.g., TB), and endospores (e.g., tetanus). Of all the common infectious agents, endospores are the most difficult to kill because of their protective coating.

Municipal waste: General waste for collection by municipalities (local city or town authorities) generated mainly by households, commercial activities, and street sweeping.

Mycobacteria: Bacteria with a thick, waxy coat that makes them more resistant to chemical disinfectants than other types of vegetative bacteria.

Noncritical medical device (or item): Device that normally makes contact with the patient's intact skin, such as a blood-pressure cuff or oxygen mask. These devices require low- to intermediate-level disinfection and reusing them carries little risk.

Nonionic: Neutral (neither positively nor negatively charged) particle or substance.

Non-lipid viruses: non-lipid viruses (also referred to as non-enveloped or hydrophilic [water- seeking] viruses) are viruses whose core is not surrounded by a coat of protein. Non-lipid viruses are generally viewed as more resilient to inactivation than lipid viruses.

Nosocomial diarrhea: At least 2 consecutive days of at least three loose or watery stools, with the onset more than 72 hours after the patient was admitted to the HCF (or more days than the incubation period if the agent is known).

Nosocomial infection in newborns: Infection occurring after birth, but excluding those infections known to have been transmitted across the placenta such as congenital syphilis, cytomegalovirus, rubella, varicella (chickenpox), and the protozoan parasite *Toxoplasmosis gondii.*

Nosocomial infection in obstetrical patients: Infection that is neither present nor incubating at the time the patient is admitted to the HCF. Most UTIs and endometritis are nosocomial, even though the causative organism might be endogenous (that is, it is present in the maternal lower genital tract prior to delivery).

Occupational injury or infection: Injury or infection that is acquired by HCWs while they are performing their normal duties.

Operating room (OR): Area or space where surgical procedures are performed.

Organ/space SSI: This type of infection can be in any area of the body other than skin, muscle, and surrounding tissue that was involved in the surgery. This includes a body organ or a space between organs.

Parts per million (ppm): Concentrations of trace contaminant gases in the air (or chemicals in a liquid) are commonly measured in ppm by volume. To convert percent concentration to ppm and vice versa, use this formula: ppm = percent (%) x 10,000.

Personal protective equipment (PPE): Specialized clothing or equipment, such as gloves, facemask, protective eyewear, gowns, caps, and plastic aprons, that HCWs wear to protect themselves from exposure to body substances, such as blood or other body fluids, airborne droplet organisms, or other hazards. Uniforms, pants, shoes, and shirts that are not designed to function as protection against a hazard are not considered to be PPE.

Phlebitis: Area of swelling, redness, warmth, and tenderness of the skin around the site where the intravascular catheter comes out of the skin (the exit site). If phlebitis is associated with other signs of infection, such as fever and pus coming from the exit site, it is classified as a clinical exit-site infection.

Protective barrier: Physical or mechanical barrier, or a chemical process that helps prevent the spread of infectious microorganisms from person to person (patient, health care client, or HCW) and from equipment, instruments, and environmental surfaces to people.

Quaternary ammonium compound (QUAT): A surface-active, water-soluble, low-level disinfecting substance that has four carbon atoms linked to a nitrogen atom through chemical (covalent) bonds.

Reprocessing: Decontaminating, disassembling (if necessary), cleaning, inspecting, testing, packaging, relabeling, and sterilizing or high-level disinfection single-use devices (SUDs) after they have been used on a patient for their intended purpose. Reprocessing is also performed on SUDs that were removed from the package (or container) but not used on a patient, or whose expiration date has passed.

Resident flora: Microorganisms that live in the deeper layers of the skin, as well as within hair follicles, and cannot be completely removed, even by vigorous washing and rinsing with plain soap and clean water.

Re-sterilization: Repeat application of a terminal process that removes or destroys all viable forms of microbial life, including bacterial spores, to an acceptable level of sterility assurance. This process is performed on devices whose expiration date has passed or that have been opened and might or might not have been used.

Risk management: All of the processes that are involved in identifying, assessing, and judging risks; assigning ownership; taking actions to mitigate or anticipate risks; and monitoring and reviewing progress.

Safe zone (also Neutral zone): Device or designated area of the sterile field in which sharps are placed, accessed, returned, and retrieved to avoid hand-to-hand transfer of sharps between personnel.

Sanitary landfill: Engineered method of disposing of solid waste on land in a manner that protects the environment (for example, spreading the waste in thin layers, compacting it to the smallest practical volume, and then covering it with soil at the end of each working day).

Scavenging: Manually sorting solid waste at landfills and removing usable material.

Segregation: Systematic separation of solid waste into designated categories.

semi critical medical device (or item): Device or item that comes in contact with mucous membranes or nonintact skin during use, such as an endoscope or respiratory equipment. These devices require HLD if sterilization is not practical, and reuse carries a greater risk for cross-contamination than noncritical items.

Septic pelvic thrombophlebitis: Thrombosis (blockage) of deep pelvic veins resulting from inflammation and blood clots. It is uncommon (occurs in approximately 1 in 2,000 deliveries). Predisposing factors include Cesarean section after long labor (more than 24 hours), premature rupture of membranes, difficult delivery (forceps or vaginal extraction), anemia, and malnutrition.

Sharps: Suture needles, scalpel blades, scissors, wire sutures, broken glass, or any objects that can cause a puncture or cut.

Soap and detergent (used interchangeably): Cleaning product (bar, liquid, leaflet, or powder) that lowers surface tension and thereby helps remove dirt, debris, and transient microorganisms from hands. Plain soaps require friction (scrubbing) to mechanically remove microorganisms, whereas antiseptic (antimicrobial) soaps remove and kill or inhibit the growth of most microorganisms.

Soiled or contaminated linen: Linen from multiple sources within the HCF that has been collected and brought to the laundry for processing.

Sorting: Process of inspecting and removing foreign and, in some cases dangerous, objects such as sharps or broken glass from used linen before washing. This step is extremely important, because soiled linen from the OR the clinic occasionally contains sharps (scalpels, sharp-tipped scissors, hypodermic and suture needles, towel clips, etc.). Sorting takes place in the laundry room.

Spaulding classification: Strategy for reprocessing contaminated medical devices. The system classifies medical devices as critical, semi critical, or noncritical based on the contamination risk to a patient.

Steam sterilization: Sterilization process that uses saturated steam under pressure for a specified exposure time and at a specific temperature as the sterilizing agent.

Sterilant: Chemical that is used to destroy all forms of microorganisms, including endospores. Most sterilants are also high-level disinfectants when used for a shorter period of time. Sterilants are used only on inanimate objects (e.g., surgical instruments) that are used in semi critical and critical areas (e.g., surgery). Sterilants are not meant to be used for cleaning environmental surfaces.

Sterile or sterility: State of being free from all living microorganisms, usually described in practice as a probability function (the probability of a microorganism surviving sterilization as being one in a million).

Sterilization: A process that destroys or removes all microorganisms (bacteria, viruses, fungi, and parasites, including bacterial endospores) from inanimate objects by high-pressure steam (autoclave), dry heat (oven), chemical sterilants, or radiation.

Sterilizer: Apparatus used to sterilize medical instruments, surgical gloves, equipment, or supplies by direct exposure to the sterilizing agent (autoclave or dry-heat oven).

Surfactant: Agent that reduces the surface tension of water or the tension at the interface between water and another liquid—a wetting agent found in many sterilants and disinfectants.

Surgical asepsis: Preparation and maintenance of a reduced (safe) level of microorganisms during an operation by controlling four main sources of infectious organisms: the patient, personnel, equipment, and the environment.

Surgical-site infection (SSI): Either an incisional or organ/space infection occurring within 30 days after an operation or within 90 days if an implant is present. Incisional SSIs are further divided into superficial incisional (involves only skin and subcutaneous tissue) and deep incisional (involves deeper soft tissue, including fascia and muscle layers).

Surgical unit: The whole surgical area: lockers and dressing rooms; preoperative and recovery rooms; peripheral support areas, including storage space for sterile and high-level disinfected items and other consumable supplies; corridors leading to restricted areas; the OR(s); scrub-sink areas; and the nursing station.

Surveillance: Systematic collection of relevant data on patient care, the orderly analysis of the data, and prompt reporting of the data to those who need it. Surveillance can be either active or passive: active surveillance refers to collecting information directly from patients or HCWs; passive surveillance refers to examining reports, laboratory information, and data from other sources.

Transfusion service: HCF unit that provides storage, pretransfusion testing and cross-matching, and infusion of blood or blood products to intended patients (recipients).

Transient flora: Microorganisms acquired through contact with patients; other HCWs; or contaminated surfaces such as examination tables, floors, or toilets during the course of the normal workday. These organisms live in the upper layers of the skin and are partially removed by washing with plain soap and clean water.

Unit of blood: Sterile plastic bag in which a fixed volume of blood is collected in a suitable amount of anticoagulant.

Urticarial reaction: Allergic reaction that occurs during or following a transfusion of blood or blood products. The reaction can be one of or a combination of the following: itching (pruritis), hives, skin rash, or a similar allergic condition.

Vegetative bacteria: Bacteria that are devoid of spores and usually can be readily inactivated by many types of antimicrobials.

Visibly soiled hands: Hands showing visible dirt or that are visibly contaminated with blood or other body fluids (urine, feces, sputum, or vomit).

Waste management: All activities—administrative, operational, and transportation—involved in handling, treating, conditioning, storing, and disposing of waste.