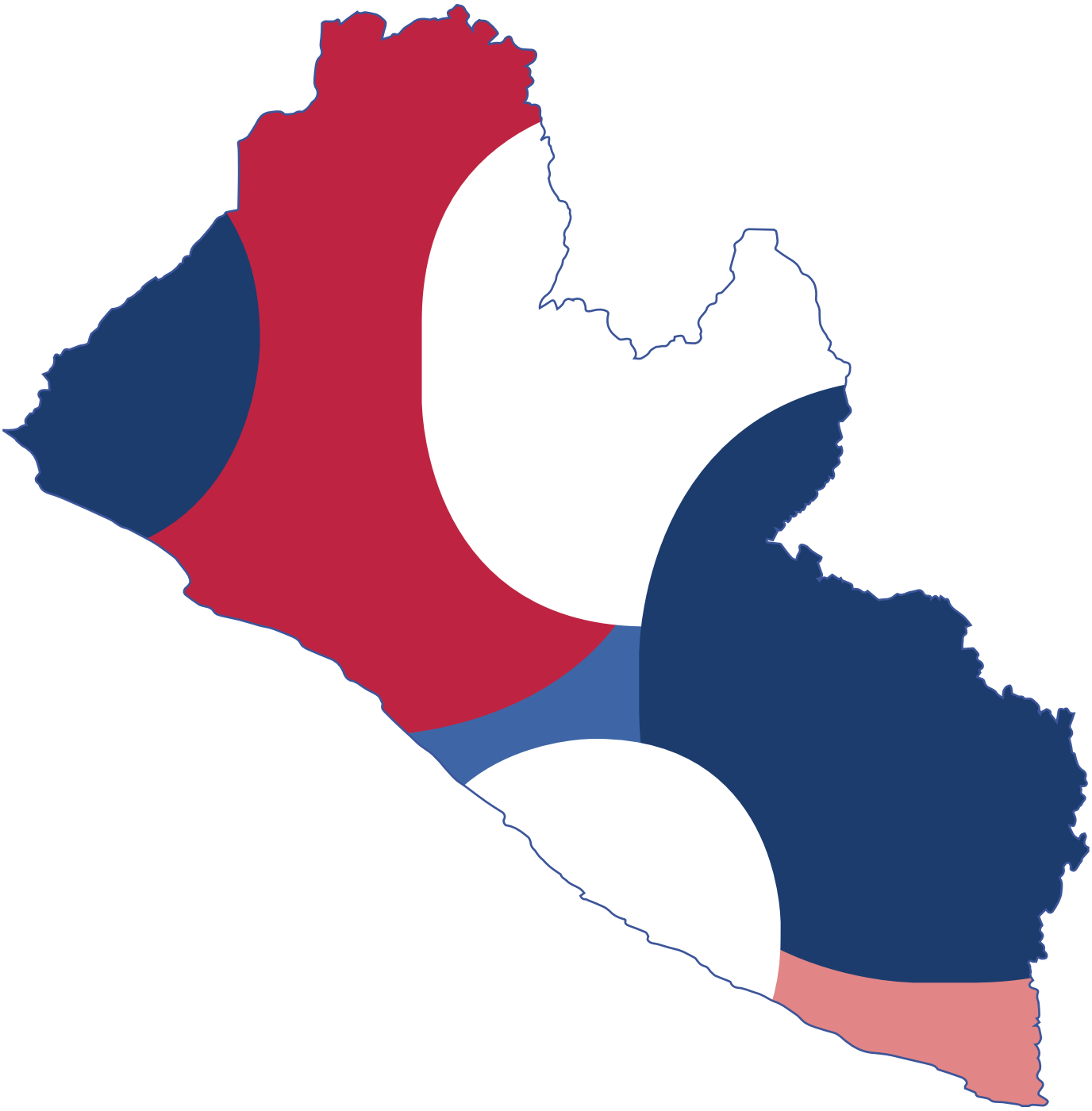
National Infection Prevention and Control Guidelines



MINISTRY OF HEALTH
Republic of Liberia

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Foreword

Liberia suffered immense setbacks due to the debilitating effects of the Ebola Virus Disease (EVD) outbreak of 2014 and 2015. This outbreak was characterized by rapid transmission of the virus from affected persons to healthy people by touching without appropriate handwashing. Our health care workers lacked the basic infection prevention and control (IPC) knowledge and skills, leading to the unfortunate death of thousands of Liberians including several hundred health care workers. Health care facilities became unsafe and a source of transmission.

Despite lack of effective treatment and vaccines, the Ministry of Health (MOH) in collaboration with its partners introduced evidence-based public health measures to manage the epidemic. IPC was a key response pillar; activities undertaken helped in curtailing and eventually stopping transmission in communities and health facilities.

Consequential to lessons learnt from the outbreak, MOH established an IPC division within the Quality Management Unit. Amongst its mandate is to develop evidence based national IPC guidelines for the purpose of reducing health care-associated infections (HAIs) and antimicrobial resistance (AMR).

These guidelines, which were developed jointly by the Ministry of Health and its strategic partners, will serve as a resource and reference document for all health care facilities, health care workers, regulatory bodies and training institutions where it relates to training, implementation and monitoring of IPC practices.

The Ministry of Health is hopeful that this document, when rolled out to our health care workers across the length and breadth of this country, will lead to establishing a sustainable IPC culture in our country and that the catastrophic effects of the EVD outbreak will not repeat itself.

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Minister of Health
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Acknowledgments

The National IPC Guidelines for Liberia is the result of tremendous and collaborative efforts from many individuals, institutions, organizations and development partners, who were involved in both the conceptualization and development. Cognizant of the fact that any attempt to mention all those who have contributed carries the risk of unknowingly omitting important names, the Ministry of Health wishes to take this opportunity to express special appreciation to the following divisions, institutions and organizations for their tireless effort and involvement throughout the development of the guidelines: National Public Health Institute of Liberia (NPHIL), the United States Centers for Disease Control and Prevention (CDC), University of Massachusetts Medical School-Academic Consortium Combating Ebola in Liberia Project (UMMS-ACCEL), Partners in Health (PIH), UNICEF, and Expertise France. A special gratitude goes to the World Health Organization (WHO) for providing technical, logistical and financial support throughout this process.

The Ministry wishes to specifically acknowledge the Quality Management Unit (QMU) for the commitment and tireless efforts in ensuring that the first National IPC Guidelines were developed in a highly participatory manner and the IPC technical working group that comprised members from the QMU, UMMS-ACCEL, CDC, Expertise France and WHO. This team jointly participated in the coordination and provision of guidance to the whole process through various consultative forums and document reviews.

Abbreviations and Acronyms

ABHR Alcohol based hand rub

AMR Antimicrobial resistance

CAUTI Catheter-associated urinary tract infection

CDC Centers for Disease Control and Prevention

CHO County Health Officer

CHT County Health Team

CQMT County Quality Management Team

DHT District Health Team

DQMT District Quality Management Team

EVD Ebola virus disease

FQMT Health Care Facility Quality Management Team

HAI Health care-associated infection

HBV Hepatitis B virus

HCF Health care facility

HCV Hepatitis C virus

HCW Health care worker

HIV Human immunodeficiency virus

HLD High level disinfection

ICU Intensive care unit

IPC Infection prevention and control

IV Intravenous

JISS Joint Integrated Supportive Supervision

LMDC Liberia Medical and Dental Council

M&E Monitoring and evaluation

MoH Ministry of Health

NGO Non-governmental organizations

PEP Post-exposure prophylaxis

PPE Personal protective equipment

QMU Quality Management Unit

SOP Standard operating procedure

SSI Surgical site infection

TOR Terms of reference

TB Tuberculosis

VHF Viral haemorrhagic fever

WASH Water, sanitation, and hygiene

WHO World Health Organization

Glossary of Select Terms

Alcohol-based hand rub: A liquid, gel or foam formulation of alcohol (e.g. ethanol, isopropanol), which is used to reduce the number of microorganisms on hands when the hands are not visibly soiled. They may contain emollients to reduce skin irritation and are less time-consuming to use compared with hand washing

Antimicrobial resistance (AMR): Develops when microorganisms (bacteria, viruses, fungi and parasites) no longer respond to a drug to which it was originally sensitive to. When the microorganisms become resistant to antimicrobials they are often referred to as "superbugs"

Antiseptics: Antimicrobial substances applied to living tissue or skin to prevent infection. They differ from antibiotics, which destroy bacteria within the body, and from disinfectants, which are used on nonliving objects. Some antiseptics are true germicides, capable of destroying microbes whereas others are bacteriostatic and only prevent or inhibit their growth

Aseptic technique: The manner of conducting procedures to prevent microbial contamination. An aseptic technique alters the method of hand hygiene, PPE worn, the location and physicial characteristics where a procedure is conducted, the use of skin antisepsis and disinfectants in the environment, the manner of opening of packages and the use of sterile supplies

Biohazard (biological hazard): A risk to the health of humans caused by exposure to harmful bacteria, viruses or other dangerous biological agents, or by a material produced by such an organism

Bloodborne pathogens: Pathogenic microorganisms in human blood that are transmitted through exposure to blood or blood products, and cause disease in humans. Common pathogens of occupational concern include hepatitis B virus, hepatitis C virus and human immunodeficiency virus

Cleaning: The step required to physically remove contamination by foreign material (e.g. dust, soil) to prepare a medical device for disinfection or sterilization. Pre-cleaning occurs prior to clean if medical devices are grossly contaminated

Colour coding: Designation of different colours for the storage of different categories of health-care wastes

Contamination: The soiling of inanimate objects or living material with harmful, potential infectious or unwanted matter

Cross-contamination: The act of spreading microbes (bacteria and viruses) from one surface to another. Since bloodborne viruses can live on objects and surfaces for up to a week, and other pathogens for months or more, microbes could be spread when surfaces are not disinfected correctly or equipment is not cleaned and sterilized between patients

Decontamination: Removes soil and pathogenic microorganisms from objects so they are safe to handle, subject to further processing, use or discard

Detergent: compounds that possess a cleaning action e.g. soap

Disinfectant: A chemical agent that is capable of killing most pathogenic microorganisms under defined conditions, but not necessarily bacterial spores. It is a substance that is recommended for application to inanimate surfaces to kill a range of microorganisms. The equivalent agent, which kills microorganisms present on skin and mucous membrane, is called an antiseptic

Disinfection: A process by which most pathogenic microorganisms are killed, except bacterial spores, prions and some virus

Disposal: Intentional burial, deposit, discharge, dumping, placing or release of any waste material into or on any air, land or water. In the context of this document, disposal refers to the storage and subsequent destruction of all medical waste

Fit Test: A "fit test" tests the seal between the respirator's face piece and your face. It takes about fifteen to twenty minutes to complete and is performed at least annually. After passing a fit test with a respirator, you must use the exact same make, model, style, and size respirator on the job

Health care-associated infection (also referred to as "nosocomial or "hospital acquired infection"): An infection occurring in a patient during the process of care in a hospital or other health care facility, which was not present or incubating at the time of admission. Health care-associated infections can also appear after discharge

Hand hygiene: Any type of hand cleansing

Handwashing: Washing hands with soap and water, and drying thoroughly afterwards with single-use towels

High touch surfaces: High-touch surfaces are those that have frequent contact with hands. Examples include doorknobs, bedrails, light switches, wall areas around the toilet and edges of privacy curtains

Improved water source: Defined by WHO/UNICEF Joint Monitoring Programme as a water source that by its nature of construction adequately protects the source from outside contamination, particularly feacal matter

Indicator: Measurable variable used as a representation of an associated (but non-measured or non-measurable) factor or quantity

Infection control: Infection prevention and control (IPC) is a practical, evidence-based approach which prevents patients and health care workers from being harmed by avoidable infections

Injection: Percutaneous introduction of a medicinal substance, fluid or nutrient into the body. This may be accomplished most commonly by a needle and syringe, but also by jet injectors, transdermal patches, micro-needles and other newer devices. The injections are commonly classifed by the target tissue (e. g. intradermal, subcutaneous, intramuscular, intravenous, intraosseous, intra- arterial, peritoneal)

Low touch surfaces: Surfaces that have minimal contact with hands (e.g. walls, ceilings, mirrors and windowsills)

Mode of transmission: How an infectious agent spreads or travel

Medical device: Any instrument, apparatus, appliance, material or other article, where used alone or in combination, intended by the manufacturer to be used in humans for the purpose of the diagnosis, prevention, monitoring, treatment or alleviation of – or compensation for – an injury or handicap

Multimodal strategy: A multimodal strategy comprises several elements or components (three or more; usually five) implemented in an integrated way with the aim of improving an outcome and changing behaviour. It includes tools, such as bundles and checklists, developed by multidisciplinary teams that consider local conditions. The five most common components include: (i) system change; (ii) education and training of health care workers and key players; (iii) monitoring infrastructures, practices, processes, outcomes and providing data feedback; (iv) reminders in the workplace/communications; and (v) culture change within the establishment or the strengthening of a safety climate

Needle-stick injury: Penetrating stab wound caused by a needle

Occupational exposure: Exposure to materials that results from the performance of an employee's duties

Pathogen: A microorganism which can cause infection Personal protective equipment (PPE): Specialized equipment worn by an employee to protect against a hazard. PPE includes gloves, lab coats, gowns, aprons, shoe covers, goggles, glasses with side shields, masks and coveralls. The purpose of PPE is to prevent blood and body fluids from reaching the workers' skin, mucous membranes, or personal clothing. It must create an effective barrier between the exposed worker and any blood or other body fluids

Point of care: The place where three elements come together: the patient, the HCW, and care or treatment involving contact with the patient or his/her surroundings. Point-of-care products should be accessible without having to leave the patient surroundings

Portal of entry: The point where the infectious agent enters a new host

Portal of exit: The point where the infectious agent leaves the reservoir

Post-exposure prophylaxis (PEP): Medical treatment given to prevent the transmission of bloodborne pathogens after potential exposure. It is available for HIV and hepatitis B.

Pre-cleaning: this is cleaning at the point of use; rinsing gross organic material (e.g. blood clot, vomitus, stool) off and placing in a container.

Recapping: The act of replacing a protective sheath on a needle. Recapping needles using two-handed methods increases the risk of needle-stick injuries and is not recommended

Reprocessing: All steps that are necessary to make a contaminated reusable medical device ready for its intended use. These steps may include cleaning, functional testing, packaging, labelling, disinfection and sterilization

Reservoir: a place where microorganisms can multiply or at least survive for a period of time (e.g. in or on humans and animals or on objects such as sinks)

Safe injection: An injection that does no harm to the recipient, does not expose the health care worker to any risk and does not result in waste that puts the community at risk

Safety needle: A "safe needle" device incorporates engineering controls to prevent needlestick injuries before, during or after use through built-in safety features

Sharp: Any object that can penetrate the skin; sharps include needles, scalpels, broken glass, broken capillary tubes and exposed ends of dental wires

Sharps container: A puncture-resistant, rigid, leak-resistant container designed to hold used sharps safely during collection, disposal and destruction (sometimes referred to as a "sharps box" or "safety box")

Sharps injury: An exposure event occurring when any sharp penetrates the skin

Single-use device: A device intended for one use only or on a single patient during a single procedure

Solid sharp: A sharp that does not have a lumen through which material can flow; for example, a suture needle, scalpel or lancet

Standard precautions: A set of practices designed to prevent the spread of infection between health care workers and patients from contact with infectious agents in recognized and unrecognized sources of infection. Such precautions are recommended for use with all patients, regardless of patient diagnoses or presumed infectious status. Key elements include hand hygiene, cleaning of the environment, reprocessing of equipment between patients, use of personal protective equipment, placement of patients with known infection or colonization into isolation, laundry management, injection safety, preventing exposure to bloodborne pathogens, waste management and respiratory hygiene

Sterile: Free from living microorganisms

Surveillance: Ongoing, systematic collection, analysis, interpretation, and dissemination of data regarding a health-related event for use in public health action to reduce morbidity and mortality and to improve health

Susceptible host: Person at risk of becoming infected

Visibly soiled hands: hands on which dirt or body fluids are readily visible.

Background

The 2014-16 Ebola virus disease (EVD) outbreak in Liberia highlighted critical gaps in the health system and clearly demonstrated a lack of infection prevention and control (IPC) practices, resulting in EVD transmission to both health care workers (HCW) and patients.

A key lesson learnt was that to prevent future outbreaks, a culture of IPC needed to be established in the routine health care system; an IPC structure and programme that would provide leadership and guidance for IPC practices within Liberia.

As has been documented, health care-associated infections (HAI) are a major patient safety problem, resulting in increased morbidity and mortality, prolongation of hospital admission, and significant economic burden to health systems worldwide. A systematic review indicated that HAI prevalence is significantly higher in developing (15%) compared to developed countries (10%); poor infrastructure, insufficient equipment, and HCW knowledge gap on HAI/IPC prevention were cited as reasons for the differences[1]. Nonetheless, a large proportion of HAIs are preventable through effective IPC measures[2]; establishing an IPC programme can considerably reduce HAI rates[3]. In Liberia, quality of care and patient safety are key public health strategic drivers in which preventing HAIs is a priority. This mandate is reflected in several policies and plans:

- National Health Quality Strategic Plan 2017
- Ministry of Health Consolidated Operational Plan 2016-17
- Investment Plan for Building a Resilient Health System 2015-2021
- Standards for Health Infrastructure 2013
- National Health and Social Welfare Policy and Plan 2011-2021
- Essential Package of Health Services, Secondary and Tertiary: The District, County, and National Health Systems, November 2011
- Essential Package of Health Services, Primary Care: The Community Health System, 2011

It is with this aim that the Ministry of Health (MoH) has established a national IPC programme within the Quality Management Unit (QMU). The national IPC programme is responsible for coordinating IPC activities in the country at levels of the health system (national, county, district and facility). The QMU's objective is to improve the quality of care provided in the service delivery sector.

The MoH Quality Management Unit (QMU) is led by the QMU Director (Figure 1).

Patient Safety, one of the QMU mandates, consists of 12 key patient safety action areas:

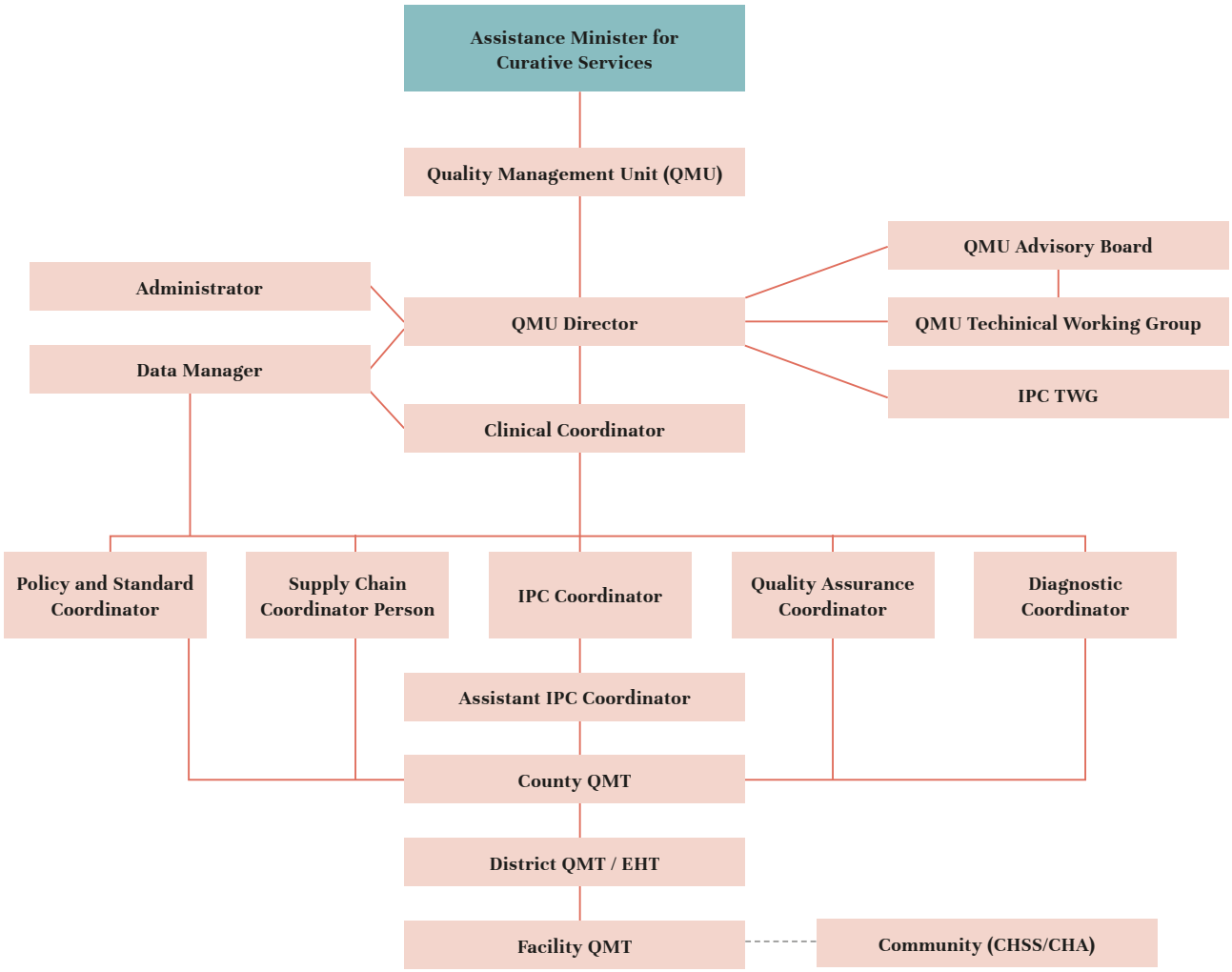
1. Patient safety, health services and systems development;
2. National patient safety policy;
3. Knowledge and learning in patient safety;
4. Patient safety awareness raising;
5. Health care-associated infections (HAIs);
6. Health care worker (HCW) protection;
7. Health care waste management (HCWM);
8. Safe surgical care;
9. Medication safety;
10. Patient safety partnerships;
11. Patient safety funding;
12. Patient safety surveillance and research.
13. IPC is a key component of Patient Safety (action areas 5- 8 above). Aligning with this concept, the National IPC team is embedded within the MoH QMU.

1 Allegranzi, Benedetta, et al. "Burden of endemic health-care-associated infection in developing countries: systematic review and meta-analysis." The Lancet 377.9761 (2011): 228-241.

2 Storr et al. (2017). Core components for effective infection prevention and control programmes : a new WHO evidence-based recommnedations. Aric.journal. BioMed Central 6.6 DOI 10.1186/s13756-016-0149-9

3 Haley, Robert W., et al. "The efficacy of infection surveillance and control programs in preventing nosocomial infections in us hospitals." American journal of epidemiology 121.2 (1985): 182-205.

Figure 1. Quality Management Unit organogramme



IPC Core Components

The national IPC programme will oversee the following core functions (Figure 2):

1. IPC programme
2. Development, dissemination and implementation of evidence-based guidelines;
3. IPC education and training;
4. HAI Surveillance;
5. Multimodal strategies for implementing IPC activities;
6. Monitoring, audit, and feedback of IPC practices;
7. Workload, staffing and bed occupancy;
8. Promotion of water, sanitation, and hygiene (WASH) infrastructure, equipment and services;

1. IPC programme

The overall objective of the national IPC programme is to establish and maintain a "culture of IPC" so to improve quality of care provided. The programme's specific objectives include:

1. Developing IPC best practices and guidance for preventing the spread of health care-associated infections (HAI) and Antimicrobial Resistance (AMR);
2. Contributing to the prevention and containment of endemic and epidemic diseases.

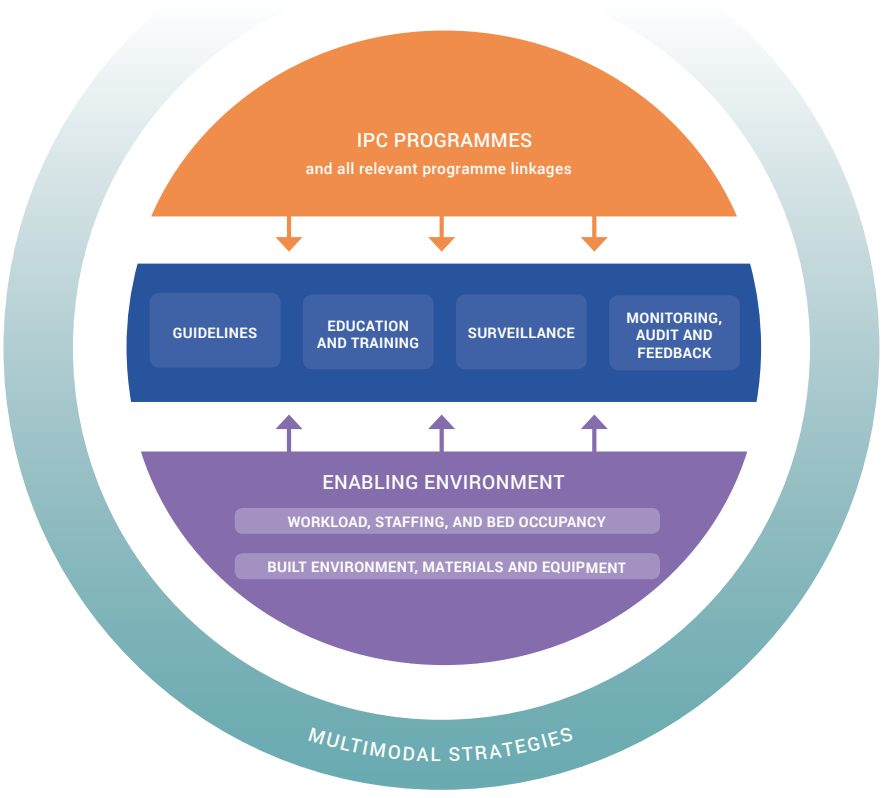


Figure 2. Core functions of the national IPC programme

Organization of the IPC programme

An effective IPC programme is an essential component of any health service delivery; its implementation depends on the efficiency of the management and organization of the programme at all levels of the health system.

National level IPC programme

The national IPC programme will perform the following activities to support its objectives and core elements:

- Provide guidelines, training, and standards to ensure HCF competency and awareness of at least:
  - Standard precautions;
  - Transmission-based precautions;
  - Preventative techniques for clinical procedures (e.g. sterile procedures, surgery) and use of invasive medical devices;
  - Sterilization and disinfection of medical devices;
  - Waste management, adequate access to safe water, sanitation and environmental cleaning;
- Perform assessment and feedback of HCF compliance with IPC practices and standards, and ensure that compliance data is disseminated and used for quality improvement;
- Ensure availability of appropriate IPC supplies and equipment in collaboration with the National Drug Service and MoH Supply Chain Management Unit, including:
  - Selection of standard IPC supplies, including: personal protective equipment (PPE), hand hygiene products, antiseptics, etc.
  - Monitoring of IPC supply availability at HCFs;
- Advocate for health care facility infrastructure improvement that is required to support IPC implementation;
- Establish linkages between the national IPC programme and other related programmes including:
  - County and District Health Teams and Quality Management Teams
  - Other programmes within the MoH Quality Management Unit
  - MoH: Family Health Division, Training Unit, Health Promotion Unit, Monitoring and Evaluation Unit, Performance-Based Financing department, Expanded Immunization Programme (EPI)
  - National Public Health Institute of Liberia (NPHIL): Emergency Preparedness and Response unit, Department of Environmental and Occupational Health (DEOH)
  - Waste management and other environmental stakeholders, including the Ministry of Public Works, Liberia Water and Sewer Corporation, Environmental Protection Agency, and municipalities
  - Academic institutions
  - National Reference Laboratory (NRL)
  - National AMR Programme, including linkages to AMR National Action Plan and antimicrobial stewardship activities
  - Priority public health programmes within MoH, including tuberculosis and HIV
  - Patients' associations/civil society bodies
  - Scientific professional organizations, including the Liberia Medical and Dental Council and nursing and physician assistant professional bodies

National IPC Team

The National IPC Team is led by the National IPC Coordinator, who is the focal point for the national IPC programme and is supported by a technical team including an assistant IPC coordinator, supply chain, data manager, diagnostic officer and IPC partners through the TWG. There is ongoing collaboration with other QMU team members. To successfully implement the programme, the national team will:

- Include trained IPC specialists (including medical and nursing professionals);
- Receive formal IPC trainings;
- Have dedicated time to conduct IPC activities;
- Have the authority to make technical decisions and influence field implementation;
- Receive a protected and dedicated IPC budget[4].

National IPC Coordinator and Team roles and responsibilities include:

1. Formulating IPC strategies, guidelines, and standard operating procedures (SOPs);
2. Supporting advocacy for IPC resource mobilization, including ensuring health care facilities (HCFs) have a designated budget line for IPC activities in their annual plans;
3. Providing technical support to the Quality Management Teams (QMT) at the various levels within the health system;
4. Ensuring standardized IPC practices during routine services, and especially during outbreaks;
5. Establishing IPC standards and mechanisms for monitoring practices within health facilities;
6. Liaising with key stakeholders to develop a sustainable IPC training programme;
7. In collaboration with the Health Promotion Unit and other stakeholders, provide information, education and communication messages on IPC;
8. Ensuring that standards are adhered to in designing, renovating, and constructing HCFs;
9. Conducting and coordinating IPC relevant implementation research;
10. Performing any other IPC functions, as required.

National IPC Technical Working Group
The National IPC Technical Working Group (TWG) will provide inputs to the IPC programme, strategic plans, guidelines, SOPs as needed. It consists of key stakeholders in the MOH and implementing partners, and will meet on a regular basis.

County level IPC programme

The County Health Team (CHT) through the County Quality Management Team (CQMT), is responsible for ensuring that the National IPC guidelines are implemented within their respective HCFs, and that sufficient resources are made available (through the county's annual operational plan).

County Quality Management Team (CQMT)
The CQMT is responsible for all quality management activities in the county, including IPC, and is coordinated by the county's clinical supervisor(s) or County Health Services Director and reports to the CHO. For more details refer to the CQMT terms of reference (TORs) in Annex 1.

County IPC Focal Person
The county IPC focal person, a key member of CQMT, will lead and report on IPC activities within the county to the CQMT. The county IPC focal person will perform specified tasks, as detailed in their TOR (see Annex 2).

District level IPC programme

District Quality Management Team (DQMT)
The District Quality Management Team (DQMT) is responsible for all quality management activities in the district, including IPC (e.g. ensuring that the National IPC guidelines and standards have been implemented and are monitored at the HCFs), and is coordinated by the District Health Officer (DHO). For more details refer to the DQMT TORs (see Annex 3).

District Environmental Health Technician
The district environmental health technician (EHT), who is the co-lead of the DQMT and reports to the DHO, may coordinate IPC activities within their district (this can vary between counties).

Health care facility IPC programme

Facility Quality Management Team
The Facility Quality Management Team (FQMT) is responsible for all quality management activities in the facility, including IPC (e.g. ensuring that the National IPC guidelines are implemented and monitored). The exact composition of FQMT will vary based on facility type. For more details refer to the FQMT TORs (see Annex 4).

Facility IPC Focal Person
A trained IPC focal person should be designated at each facility for the purpose of preventing HAIs through good IPC practices. The World Health Organization (WHO) recommends that there should be one full-time IPC specialist for every 250 beds at a minimum; ideally, there should be one full-time IPC specialist for every 100 beds.[5] The IPC focal person will be part of the facility's quality management team (FQMT), and will coordinate all IPC activities. The IPC focal person will perform specified tasks, as detailed in their TOR (see Annex 5).

IPC at the community level

Community representatives including local authority, traditional healers, community volunteers, non-governmental organizations (NGOs), and community-based organizations (CBOs), have roles to play in improving IPC practices in the community; Community Health Assistants (CHAs) oversee IPC activities in the community.

IPC and academic institutions and regulatory bodies
Academic institutions and regulatory bodies such as the Liberia College of Physicians and Surgeons (LCPS), the Liberia Medical and Dental Council (LMDC), the Liberia Nursing and Midwifery Board, the Liberia Pharmacy Board, the Liberia Medical and Health Products Regulatory Authority (LMHRA), nursing and medical schools, and other health-related training institutions and health professional regulators, are responsible for ensuring that the directives and programmes that they oversee are aligned with National IPC guidelines, policies, standards, and priorities.

2. IPC guideline development, dissemination and implementation

One of the main objectives of the national IPC programme is to protect patients and health care workers (HCWs) from HAIs; when IPC technical guidelines are implemented in combination with HCW education and training, they are effective in reducing HAI.[6] The national IPC guidelines are a reference document for IPC best practices in Liberia and are intended to be used in all health facilities by all health care workers.

National level

One of the key functions of the national IPC programme is to develop evidence-based national IPC guidelines (and update accordingly) and related implementation strategies, as well as monitoring adherence to guideline implementation. The county IPC focal person will play a key role in supporting the monitoring of guideline adherence (see county IPC TORs).

5 Guidelines on Core Components of IPC Programmes at National and Acute Health Care Facility level. WHO 2016

Facility level

The IPC focal person is responsible for overseeing IPC guideline implementation within the facility (see Facility IPC TORs). Regular discussions and close collaboration with all stakeholders will be part of the IPC focal person's routine activities as they implement the guidelines; they should therefore establish good relationships with the following as an example:

1. The ward supervisors as their continuous presence on the ward enables them to reinforce good IPC standards and practices;
2. The lab technician, who may have data that will be useful in enabling prompt HAIs detection.
3. Frontline staff (to convey suspicion/ask questions/ report trends to IP focal person)

3. IPC education and training

National level

The national IPC programme will support the education and training of health care workers as one of its core functions. The following targeted groups for IPC education and training require different strategies and training content:

1. **IPC focal person:** HCF based doctors, nurses, physician assistants or other professionals who are responsible for implementing national IPC guidelines, standard operating procedures (SOPs), and related activities. These focal persons should gain basic knowledge in all areas relevant to IPC, patient safety, AMR and quality improvement, this includes undergoing regular updates as required.
2. **All health care workers involved in patient-centered service delivery:** these clinical staff (doctors, nurses, physician assistants), lab technicians, and other health care workers should receive basic IPC training. This can take place through pre/in-service training, or new employee orientation as well as routine updates be provided as required. The training must include at least the following concepts:
   - IPC programme;
   - Standard precautions;
   - Additional precautions;
   - Occupational health and safety.
3. **Other personnel that support health service delivery:** these staff (hygienist, nurse aides, responsible and accountable for the safety and quality of health service delivery at the facility, etc.) should receive the following IPC training:
   - Standard precautions;
   - Occupational health and safety;
4. **Senior facility management:** administrative and managerial staff (e.g. hospital directors) should appreciate the importance of supporting IPC infrastructure, implementation and monitoring of IPC guidelines and practices that mitigate harm to patients and HCWs. This will empower them to become IPC champions. IPC orientation training must include the following:
   - IPC programme;
   - Leadership;
   - Standard precautions;
   - Occupational health and safety;
5. **Client education:** the importance of the facility and community IPC measures should be explained to patients, their families, caretakers and visitors. This will be undertaken through HCWs and CHAs. This includes basic IPC principles and measures that apply to them:
   - Hand hygiene;
   - Respiratory hygiene (e.g. wearing a mask, sneezing and coughing into the elbow);
   - Waste management (e.g. proper disposal of home care medical waste);
   - Additional precautions as required (i.e. when initiating isolation at facility or at home).

Facility level

Education and training are among the main responsibilities of the facility's IPC focal person; the focal person must coordinate this activity with the district EHT and county IPC focal persons, facility managers, existing training programmes, and any other educational structures already in place within their catchment area. This will also include orientation of new staff.

4. Surveillance of health care-associated infections

Strategic objectives two and three of the Global Action Plan (GAP) on AMR aims to reduce the incidence of infection through effective sanitation, hygiene and infection prevention measures, and to strengthen the knowledge and evidence base through surveillance and research.

IPC best practices are crucial to combat AMR for two main reasons: reduce occurrence of any infection (including those due to resistant germs) by preventing microbial transmission and consequently reduce antibiotics use (pressure) and limit or stop the spread of multi-drug resistant microorganisms. These guidelines support the GAP on AMR.

6 Guidelines on Core Components of IPC Programmes at National and Acute Health Care Facility level. WHO 2016

Public health surveillance is "the ongoing, systematic collection, analysis, and interpretation of health-related data essential to planning, implementation, and evaluation of public health practice." [7] HCF surveillance feeds into national surveillance and response systems. Its ultimate aim is the reduction of HAI and their associated costs. The specific objectives of a surveillance programme include:

1. To improve awareness of clinical staff and other HCW (including administrators) about HAI and AMR, so they appreciate the need for preventive action;
2. Identification of high-risk populations, procedures and exposures;
3. To monitor trends;
4. To identify possible areas for improvement in patient care, and for further epidemiological studies;
5. Early detection of outbreaks;
6. To assess the impact of interventions.

National level

Establishing a national HAI surveillance programme that includes a mechanism for timely data feedback can reduce HAI rates, assist with assessing the impact of IPC interventions thus allowing policy-makers to prioritize and develop IPC evidence-based standards, and where microbiology capacity is available can support decisions on antimicrobial resistance strategies and policies. Finally, HAI surveillance data can be used to detect hospital outbreaks.

To successfully establish a national HAI surveillance programme, full support and engagement by government will be required; resource allocation, including a budget, will need to be made available.

Key stakeholders will define which types of HAIs to monitor and accordingly develop surveillance protocols and tools. HAI surveillance data will be routinely reviewed and methods for evaluating data quality.

Facility level

Hospital-based HAI surveillance should be performed to guide IPC interventions and detect outbreaks in accordance with guidance from the national IPC programme. Each facility may develop a comprehensive surveillance plan based on the national MOH surveillance protocol that uses standard protocols (including case definitions, roles and responsibilities, and data collection tools). The optimal type and method (Figure 3) of HAI surveillance is dependent on HCF characteristics, the desired objectives, resources available (information technology (IT), investigators) and the level of support of the clinical staff.

The surveillance programme must report to hospital administration, usually through Quality Management Team, and must have a dedicated budget to support its operation. The hospital's IPC focal person may be responsible for coordinating HAI surveillance activities. Where laboratory resources for microbiology allow, data describing the types of AMR patterns seen in HAIs should be collected. HAI surveillance data should be monitored, analyzed for unusual patterns or deviations from baseline

Figure 3. Surveillance as a circular process

(e.g., 10 surgical wound infections in one week when the facility usually sees one infection per month), investigated where indicated and disseminated to key facility stakeholders in a timely manner.

Priority HAIs for surveillance should be determined and discussed with key stakeholders, including the national IPC programme. Surveillance should generally include HAIs that are the most relevant to the local context and preventable; hence the following HAIs could be prioritized:

1. Infections that may become epidemic in the facility (e.g. measles, cholera);
2. Infections in vulnerable populations, e.g. neonates, immunocompromised, burn patients;
3. Infections associated with commonly used invasive devices, such as intravascular or indwelling urinary catheters, or common surgical procedures;
4. Where laboratory resources allow, infections caused by resistant microorganisms, with an emphasis on multidrug-resistant pathogens (e.g. MDR-TB);
5. Infections that may affect patients (e.g. hepatitis B and C).

Patients should be monitored throughout the hospital stay for the development of HAIs, and in some cases (e.g., for surgical site infections), surveillance will include the post-discharge period.

In facilities that do not have sufficient resources to implement HAI surveillance, either due to limited staff or lack of access to quality laboratory services, monitoring process measures (e.g. hand hygiene compliance, adherence to safety bundles) may provide useful data for quality improvement.

5. Multimodal strategies for implementing IPC activities

IPC activities using multimodal strategies should be implemented to improve practices and reduce HAIs. By using a multi-pronged approach to bring about behaviour change, health care workers are more likely to be influenced, with a greater likelihood that changes can be made to organizational culture.

The national IPC programme will work with key stakeholders, including technical agencies and IPC focal persons, to develop multimodal strategies that can be used to achieve sustainable behaviour change in the health workforce. A summary of the WHO multimodal improvement strategy can be found in Annex 6.

6. Monitoring, evaluation, and feedback

National level

The QMU performs monitoring and evaluation to assess the extent to which standards are being met and activities are being performed according to the Unit's goals and objectives. This has been done in close collaboration with the MoH Monitoring and Evaluation Unit to ensure alignment of indicators and streamlining of feedback reports across MoH. Eleven health care facility-based IPC indicators have been included in the MoH standard monitoring tool known as the Joint Integrated Supportive Supervision tool (see Annex 7).

The IPC programme will periodically perform evaluations to assess the extent to which the objectives are met, the goals are accomplished, and the activities are performed according to requirements. Standardized audits can also inform aspects of the programme that may need improvement.

The QMU has introduced a hand hygiene compliance monitoring program as an initial step in developing a broader monitoring and evaluation programme for IPC activities. Data from a hand hygiene self-assessment framework and results from quarterly hand hygiene compliance audits are being used in ongoing monitoring and feedback from the QMU to HCFs to improve hand hygiene adherence rates and practices.

Facility level

IPC focal persons should perform regular monitoring and/or audit of IPC practices and provide timely feedback of the HCF's practices compared to national standards to inform quality improvement efforts and ultimately prevent HAI at the facility. The county IPC focal person will support the facility IPC focal person with this important activity. Feedback should be provided to all audited persons and relevant staff at the facility; this can occur at staff meetings and also be presented on facility billboards. IPC monitoring will be incorporated into routine, ongoing facility monitoring tools. Action workplans based on gaps identified will be developed and implemented.

7. Workload, staffing and bed occupancy

Overcrowding has been recognized as being a public health issue that can lead to disease transmission.[8] The standard for bed occupancy is one patient per bed with adequate spacing (1 meter) between patients.[9]

Hospital management should act to ensure appropriate staffing levels that meet patient demand and adequate distance between beds; this applies to all wards, including the emergency room.

8. Promotion of WASH infrastructure, equipment and services

The provision of adequate water, sanitation, and hygiene (WASH) infrastructure, equipment and supplies are necessary to facilitate a clean and/or hygienic environment which prevents and controls HAIs as well as AMR.

National level

The national IPC programme works closely with Division of Environmental and Occupational Health (DEOH) at NPHIL and MoH Infrastructure Unit to develop WASH standards in HCFs and support their implementation. Collaboration between these entities led to the development and introduction of MoH's standard Water and Sanitation for Health Facility Improvement Tool (WASH FIT) package, which is being rolled out across Liberia.[10]

8 Guidelines on Core Components of IPC Programmes at National and Acute Health Care Facility level. WHO 2016

9 Essential environmental health standards in health care. Geneva: WHO 2008

10 http://apps.who.int/iris/bitstream/handle/10665/254910/9789241511698-eng.pdf;jsessionid=4DB0E7B6D10F75D9C17FD7BCC2048C23?sequence=1

Several environmental issues are of concern for IPC; some of the most relevant elements for maintaining a safe environment in the HCF supporting appropriate IPC practices include:

- Adequate physical infrastructure;
- Adequate WASH infrastructure and supplies;
- Waste management structures and processes;
- Environmental cleaning;
- Decontamination and reprocessing of items, equipment, and medical devices.

Facility level

Maintaining an adequate hygienic environment is the responsibility of senior HCF managers and local authorities, including the CHT. The IPC focal person and any environmental health technicians (EHTs) working at a HCF should be involved in planning the design or renovations of buildings and associated infrastructure. The IPC focal person and EHTs should also collaborate to ensure that WASH infrastructure (sinks, waste management points, etc.) is placed at appropriate locations within HCFs. The following basic WASH infrastructure should be available:

- Water from an improved source;
- Availability of appropriate hand hygiene materials & equipment at the point of care (e.g. alcohol-based hand rub [ABHR] dispensers, sinks);
- Adequate supply of safe water at all times for drinking, handwashing, food preparations, personal hygiene, medical activities, cleaning and laundry;
- Improved sanitation facilities located on premises that are functional with at least one toilet designated for male and one for female;
- Adequate isolation area for contact, droplet or airborne precautions;
- Adequate ventilation for reducing the risk of transmission of airborne pathogens, to meet comfort requirements for operating rooms, and to provide proper ventilation for laboratory area;
- Health care waste is segregated, treated and disposed of safely (see Waste management chapter for further details).

Technical guidelines

Basic principles

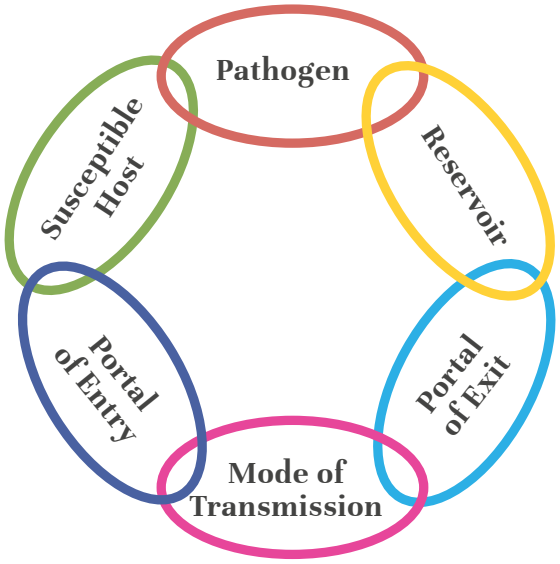
The risk of acquiring a HAI is present in every HCF across the world. The incidence, type and scope of HAI vary from one facility to another; however, the HAI prevalence is estimated at about 7.1 per 100 patients in Europe and 4.5 per 100 patients in the United States of America (USA). In countries with limited resources, the prevalence rate is estimated at three times that of USA (15.5 per 100 patients).[11]

The basic set of IPC strategies that should be implemented in every HCF, for all patients at all times are known as "standard precautions." These evidence-based practices are designed to protect health care workers and prevent transmission of infections. Standard precautions include hand and respiratory hygiene, use of personal protective equipment (PPE), injection safety, decontamination and reprocessing of medical devices, laundry, environmental cleaning and waste management.

The chain of transmission of microorganisms

IPC measures are used to protect patients, visitors and health care workers (HCW) and caretakers from acquiring an infection when receiving or providing medical care. Understanding how infections are spread is essential for ensuring effective IPC interventions. The chain of transmission illustrates the necessary conditions that must be met for a microorganism to spread; breaking any one link will interrupt this chain and prevent infection (see Figure 4).[12] Most often, IPC strategies target the mode of transmission.

Figure 4. The chain of transmission of microorganisms



Microorganism (capable of being pathogenic): a bacteria, virus, fungus or protozoa. If it has potential to cause infection and disease it is considered a pathogen.

Reservoir: a place where microorganisms can multiply or at least survive for a period (e.g. in or on humans and animals or on objects such as sinks).

Portal of Exit: a means by which a micro-organism can leave the reservoir (e.g. through the mouth from the respiratory tract, via the hands from contact with a patient).

Mode of Transmission: how the microorganism moves from one person to another (e.g. through direct contact via the hands, via respiratory droplets/secretions).

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

Susceptible Host: a person that is susceptible to colonisation or infection. The outcome of transmission (colonisation or infection) depends on the properties of the microorganism and the suscep- tibility of the host at that time.

11 Allegranzi, Benedetta, et al. "Burden of endemic health-care-associated infection in developing countries: systematic review and meta-analysis." The Lancet 377.9761 (2011): 228-241

12 https://www.google.com/search?client=safari&rls=en&q=Sierra+Leone+National+Infection+Prevention+and+Control+Guidelines,+SL+Ministry+of+Health+and+Sanitation,+2015)&ie=UTF-8&oe=UTF-8

Modes of transmission

By convention, the mode of transmission is classified into five categories: contact, droplet, airborne, common vehicle and vector. For most microorganisms, a single mode of transmission predominates, such as contact (e.g. cholera), droplet (e.g. pertussis, meningitis) or airborne (e.g. measles, tuberculosis). However, some infectious agents can be transmitted by more than one mode of transmission (e.g. Ebola Virus Disease (EVD) can be transmitted by contact or droplets).

Contact transmission

This is the most common route of transmission of infectious agents. Two types of contact transmission exist: direct and indirect. Direct contact occurs when there is physical contact (e.g., hand shake) between an infected person and a susceptible person. Indirect contact transmission occurs when microorganisms are transferred through contact with contaminated objects, such as surfaces or medical devices contaminated by an infected person.

Droplet transmission

Droplet transmission occurs when large droplets, defined as droplets >5 micrometers (μm), containing microorganisms are propelled into the air by coughing, sneezing or talking and infect a susceptible host via the mucous membranes. Droplet particles remain in the air for a short time and travel to a maximum of 2 meters. Droplets can also contaminate the surrounding environment and thereafter be further transmitted by indirect contact.

Airborne transmission

Airborne transmission occurs when micro-droplets, defined as droplets ≤5 micrometers, containing microorganisms are suspended in the air and inhaled by a susceptible host. These micro-droplets are generated by coughing, sneezing, talking or during aerosol generating procedures (e.g. intubating a critically ill patient). Airborne transmission control can be challenging as specific infrastructural controls (e.g. controlling the air flow and ensuring appropriate ventilation) are required.

Common vehicle transmission

Common vehicle transmission refers to the transmission of infection to the host by a contaminated object (known as a "vehicle"). Common vehicles can include food (e.g. salmonellosis), water (e.g., shigellosis), blood and body fluids (e.g. HBV, HCV), and medical equipment and devices.

Vector transmission

Vector transmission refers to the transmission of microorganisms by vectors or pests such as mosquitoes (e.g. Malaria, Dengue fever), flies, fleas, and rats (e.g. Lassa fever).

Standard precautions

Standard precautions are a comprehensive set of IPC measures developed for use in the delivery of care to all patients, at all times and in all care settings regardless of suspected or confirmed infection status. Standard precautions are intended to reduce or prevent the transmission of health care-associated (also called nosocomial) infections for patients, HCWs, visitors and caretakers.

Standard Precautions are based on the principle that all blood, body fluids, secretions, excretions (except sweat), non-intact skin, and mucous membranes may contain transmissible infectious agents. Every person working within a health care facility should familiarize themselves with all standard precautions and ensure they are compliant at all times.

Standard precautions include:

- Hand Hygiene
- Respiratory hygiene
- Use of Personal Protective Equipment (PPE)
- Injection safety
- Medical device decontamination and reprocessing
- Safe handling of laundry
- Environmental cleaning
- Health care waste management

In addition to the consistent use of Standard Precautions, additional precautions (also known as transmission based precautions) may be required in certain circumstances, when the route of transmission is not completely interrupted using only Standard Precautions (see Additional precautions chapter for further details).

Hand hygiene

Hand hygiene is simple, low-cost and the most effective IPC measure in preventing the transmission of HAIs. Good hand hygiene practices help to remove transient flora (germs picked up from the environment) and reduce resident flora (germs that live on our skin), thus limiting the transmission risk of microorganisms from a HCW to a patient, and vice versa.[13] Hand hygiene is a general term that includes handwashing, use of hand sanitizer or alcohol-based hand rub, and surgical hand preparation (see Box 1).

13 World Health Organization. WHO guidelines on hand hygiene in health care: first global patient safety challenge. Clean care is safer care. (2009)

KEY TERMS DEFINED

Hand Hygiene

1. **Alcohol-based hand rub (or hand sanitizer):** Applying an antiseptic hand rub to reduce or inhibit the growth of microorganisms without the need for an external water source and requiring no rinsing or drying with towels or other devices.
2. **Handwashing:** Action of performing hand hygiene for the purpose of physically or mechanically removing dirt, organic material, and/or microorganisms using soap and water.
3. **Surgical hand preparation:** Antiseptic handwash or antiseptic hand rub performed preoperatively by the surgical team to eliminate transient flora and reduce resident skin flora. Such antiseptics often have persistent antimicrobial activity.

Box 1. Types of hand hygiene

Three types of hand hygiene

Hand hygiene refers to any action of handwashing or disinfection using the following three methods:

1. Alcohol based hand rub (ABHR)

- Alcohol hand rub is the preferred method of hand hygiene, if hands are not visibly soiled, as it is:
- Able to kill microorganisms, while soap and water physically removes them;
- Quicker to perform than handwashing;
- More convenient to use at the point of care (i.e., no sink, water or paper towel required);
- Softer on hands (often contain emollients which act to protect and moisturize the skin).

2. Handwashing with soap and water

When hands are visibly soiled or contaminated with blood or body fluids, they must be washed with soap and water. Liquid soap is preferred; however, bar soap is also acceptable, if it is stored in a manner that allows water to drain (i.e., on a rack) and properly dry. It is important to note that water used for handwashing should not be cloudy or be visibly dirty (turbid).

Disposable paper or single use towels are recommended for drying hands. Shared towel use is strongly discouraged as these may harbor microorganisms and re-contaminate the hands after handwashing. Moreover, hands should never be dried on personal clothing or on wet and/or dirty towels. Hands should air dry if disposable or single use towels are unavailable.

WHO recommends a sink to patient bed ratio of 1:10. Sinks should ideally be placed near the entrance or exit of patient wards.[14]

In the absence of running water, hand hygiene is feasible using a modified bucket system, which utilizes:

- Liquid/bar soap;
- A clean water closed bucket (ideally with a tap);
- A container for holding clean paper towels
- A waste water collection bowl;
- A covered waste bin for disposal of paper towels.

If the bucket system is used, thoroughly clean and dry buckets daily to avoid growth of microorganisms.

Note that chlorinated water is not recommended as a standard product to use for hand hygiene. More information is provided in Box 2.

Hand care is an important factor to ensure hand hygiene compliance; dermatitis, cracks, cuts or scratches can negatively impact hand hygiene practices. The following are recommended:

- Always wet hands before applying soap, as applying soap directly to the skin can be irritating to the hands;
- After washing or rubbing the hands, let them dry completely;
- Use hand lotions or creams to minimize skin irritation and dermatitis.[15]

KEY LEARNING POINT:

Chlorinated water is not recommended for hand hygiene nor medical device decontamination, however is recommended for environmental cleaning

There remains little to no evidence supporting the use of chlorinated water as a standard product for hand hygiene, thus, it is not recommended for routine use in health care settings. However, as highlighted during the EVD outbreak in Liberia, chlorinated water can serve as an interim measure ONLY when standard hand hygiene products are unavailable. Chlorinated water at hand hygiene stations should be immediately replaced once standard products (ABHR or soap and water) become available for use.

Note that chlorine is still recommended for environmental cleaning. See Environmental Decontamination section of these guidelines for more information.

Box 2. Special note on use of chlorinated water for performing hand hygiene

14 Essential environmental health standards in health care. Geneva, World Health Organization, 2008

15 https://www.cdc.gov/mmwr/preview/mmwrhtml/rr5116a1.htm

3. Surgical hand preparation (see Annex 10)
Prior to performing any surgical procedure, handwashing with antiseptics must be performed to remove transient organisms, reduce resident flora and prevent microorganism growth. Surgical hand antisepsis will also help reduce risk of transmission in case of any glove tear occurring during the surgical procedure. See for further reading on safe surgery practices.

When to perform hand hygiene
There are five moments (see Figure 5 and Annex 11) during health care delivery when hand hygiene must be performed by HCW to prevent transmission. Hand hygiene compliance to these five moments can significantly reduce pathogen transmission.

How to perform hand hygiene
Annex 8 demonstrates proper technique for use of hand rub. Apply a palmful of ABHR, cover all surfaces of the hands, and rub hands until dry.

Annex 9 demonstrates proper technique for handwashing. Wet hands with water and apply the amount of soap necessary to cover all surfaces. Rinse hands with water and dry through with a single use towel. Use clean, running water whenever possible. Avoid using hot water, as repeated exposure to hot water may increase the risk of dermatitis.[16]

To improve the effectiveness of hand hygiene, the following is recommended:

- Nails should be short, clean and polish free, artificial nails/nail extensions are not acceptable;
- Watches and jewelry should be removed;
- Sleeves should be short or rolled up;
- Cuts or abrasions should be covered with waterproof dressings;
- Be aware of potential skin allergy to hand hygiene products.

Remember that glove use never replaces the need for performing hand hygiene!

16 World Health Organization. WHO guidelines on hand hygiene in health care: first global patient safety challenge. Clean care is safer care. (2009)

Figure 5. WHO's 5 Moments for Hand Hygiene

1	Before Patient Contact	**When?**	Cleany our hands before touching a patient when approaching him or her
		Why?	To protect the patient against harmful germs carriedon your hands
2	Before an antiseptic task	**When?**	Cleany our hands immediately before any aseptic task
		Why?	To protect the patient against harmful germs. including the patient's own germs
3	After body fluid exposure risk	**When?**	Clean your hands immediately after an exposure risk to body fluids (and after glove removal)
		Why?	To protect yourself and the health-care environmen from harmful patient germs
4	After patient contact	**When?**	Cleany our hands after touching a patient and his or her immediate surroundings when leaving
		Why?	To protecty ourself and the health-care environmen from harmful patient germs
5	After contact with patient surroundings	**When?**	Cleany our hands after touching any object or furniture in the patient's immediate surroundings when leaving- even without touching the patient
		Why?	To protect yourself and the health-care environment from harmful patient germs

Monitoring hand hygiene compliance

To assess and ensure hand hygiene compliance, IPC focal persons should use monitoring tools. Currently, MoH recommends the use of the WHO Hand Hygiene Self-Assessment Framework (HHSAF) 2010[17] (see Annex 12) as a first step to establish a baseline hand hygiene level. The HHSAF measures across five domains of a multimodal strategy: system change, training and education, evaluation and feedback, reminders in the workplace and institutional safety climate. Depending on local resources and culture, additional actions can be added, in particular patient involvement. The HHSAF which should be completed at least annually involves implementing five essential components.[18]

Thereafter, MoH recommends using the Hand Hygiene observation form (see Annex 13) on a quarterly basis; this will be completed by facility staff who are overseen by the facility IPC focal person. Results will be sent to the QMU data manager who will ensure external dissemination.

Hand hygiene for patients and family members

Patients, family members and visitors should also be encouraged and educated on when and how to perform hand hygiene. Opportunities for hand hygiene by patients, family members, caretakers and visitors include:

- Before and after patient care;
- Before and after eating;
- After using the toilet;
- When hands are visibly soiled.

It is also important that patient and families are supported and encouraged to ask their health providers to wash their hands prior to any contact.

Respiratory hygiene

Respiratory hygiene refers to a combination of measures to minimize the transmission of pathogens spread by droplet or airborne transmission. These control measures apply to all persons presenting with respiratory symptoms to a health care facility, and should be enforced throughout their stay or visit:

- Respiratory patients should wear a surgical mask to contain the cough (if tolerable);
- Patients, HCWs, and visitors should cover their nose and mouth with a tissue or mask when sneezing or coughing;
  - If tissue or mask are unavailable, cough/sneeze into sleeve or elbow;
- Use ABHR or wash hands with soap after coughing/sneezing;
- HCWs should wear a surgical mask or face shield when attending to patients with respiratory symptoms;
- In the waiting area, separate respiratory patients from others to avoid potential spread of respiratory infections;
- Maintain 1 meter distance between patient beds.[19]

Use of personal protective equipment (PPE)

Personal protective equipment (PPE) is specialized clothing or equipment worn by HCWs or care providers to protect against microorganisms. PPE provides a physical barrier that protects the eyes, nose, mouth, skin, and clothing from infectious material. PPE reduces, but does not eliminate, the risk of acquiring an infection.

To be effective, PPE must always be available and appropriately used (put on and removed correctly). PPE selection is based on a risk assessment; the HCW should asses their risk of exposure and potential extent of contact with body fluids, respiratory secretions and/or open skin. Risk assessment and use of PPE should be undertaken for each patient, at every encounter.

Types of personal protective equipment

Gloves

Appropriate glove use is an important part of IPC, and does not replace the need for hand hygiene. Glove misuse can result in microorganism transmission. General considerations for appropriate glove use include:

- Wash hands before putting on gloves and after taking gloves off;
- Wear the appropriate type and size (should be well fitting and comfortable);
- Gloves should be removed after every patient encounter is completed. Never use the same pair of gloves on multiple patients.

See Table 1 for indications for putting on and removing gloves. See Annex 14 for additional information about putting gloves on and types of gloves to use.

Table 1. Summary of indications for putting on and removing gloves [20]

	Indication
Gloves on	Before a sterile procedure Potential for touching blood, body fluids, secretions, excretions and items visibly soiled by body fluids
Gloves off	As soon as gloves are damaged When there is an indication for hand hygiene

17 WHO Hand Hygiene Self-Assessment Framework, 2010. Available at http://www.who.int/gpsc/country_work/hhsa_framework_October_2010.pdf?ua=1

18 World Health Organization. WHO guidelines on hand hygiene in health care: first global patient safety challenge. Clean care is safer care. (2009)

19 Guidelines on Core Components of IPC Programmes at National and Acute Health Care Facility level. WHO 2016

20 World Health Organization. WHO guidelines on hand hygiene in health care: first global patient safety challenge. Clean care is safer care. (2009)

Examples where gloves are not indicated include:
- During direct patient exposure, taking vital signs, performing subcutaneous (SC) and intramuscular (IM) injections, bathing and dressing patient, transporting patient, caring for eyes and ears (without secretion);
- Indirect patient exposure; using the cellphone, writing in the patient chart, giving oral medications, removing and replacing linen for patient bed (if not heavily soiled), moving patient furniture

Glove types, along with examples of when to use each type of glove, follow:
- Disposable (single-use) examination gloves (latex or nitrile): use when there is potential for contact with blood and body fluids, including inserting peripheral vascular catheters or drawing blood;
- Surgical (sterile) gloves: use for all surgical procedures, insertions of urinary catheters, and vaginal deliveries;
- Elbow-length (OBGYN) sterile gloves: when available, use these gloves for vaginal deliveries, as they provide additional protection of wrists and arms;
- Utility or heavy-duty gloves: used by cleaning/ disinfection and waste management staff

Instructions for wearing non-sterile and sterile gloves are included in Annexes 15 and 16.

Gowns

General considerations for appropriate gown use include:
- Wear gowns to protect skin and prevent soiling of clothing during activities with potential for contact with blood or body fluids;
- Gowns should be changed in between patients;
- Single use gowns should be disposed of immediately following their use;
- Gowns should not be worn outside of the patient environment.

Aprons

Aprons are worn over gowns when heavy fluid exposure (i.e. during labour and delivery) is anticipated. Aprons may be single use or reusable. Remove soiled apron as soon as possible and perform hand hygiene. Single use aprons should be disposed of immediately following their use, and reusable aprons should be removed and managed according to cleaning and disinfection guidelines.

Face protection

Face protection prevents transmission of microorganisms to eyes, nose, and mouth. The different type of face protection equipment includes face shield, goggles, surgical mask, and N95 respirator. General considerations for appropriate face protection use include:

Face Shield:
- Face shields are used when splashes of blood, body fluids, secretions, and excretions are expected;
- If face shields are not available, goggles and a surgical mask should be worn together.

Goggles:
- Goggles are worn to protect eyes from splashes or sprays;
- Goggles are often reusable; care should be taken when cleaning between use.

Surgical mask:
- Surgical mask protects nose and mouth when splashes of blood, body fluids, secretions, and excretions are expected;
- Surgical facemasks serve as a barrier against infections transmitted through droplets (e.g., bacterial meningitis), however are not a barrier against airborne transmitted infections (e.g., tuberculosis);
- Surgical masks should be removed/changed and disposed of if they are wet or soiled.

N95 respirator:
- N95 is used to protect against airborne transmitted microorganisms (e.g. tuberculosis);
- Require fit testing every 2 years to ensure appropriate fit to HCW's face;
- Respirators may be required for certain aerosol generating procedures even when patient is not on airborne precautions.
- Head covers
- Head covers prevent patient contamination from the HCW's hair and scalp, but are not part of routine PPE (see Box 3). General considerations for appropriate head cover use include:
- Use the appropriate size to ensure all hair is covered;
- Disposable caps should not be reused.

KEY LEARNING POINT: Appropriate use of hoods
Hoods are not part of routine PPE; they are reserved for enhanced protection of head, face, and neck while caring for patients with highly pathogenic organisms (e.g., viral hemorrhagic fevers).

Box 3. Use hoods only when caring for patients with highly pathogenic organisms

Footwear

Closed shoes should be worn at all times to protect feet from injury by sharps or heavy items and from contact with blood or body fluids. Wear rubber boots in areas where indicated, for example, in operating theatres, delivery rooms and mortuaries. Clean and disinfect reusable boots according to cleaning and disinfection guidelines.

When to use different pieces of PPE

Table 2 presents a summary of PPE recommendations for various types of activities. Additional information on PPE recommendations can be found in the Additional Precautions section.

Table 2. Recommended PPE for Standard and Transmission-based Precautions [21] [22]

Recommended PPE	Standard precautions (All patients) Transmission-based precautions (In addition to standard precautions)		Transmission-based precautions (In addition to standard precautions)		
	If no risk of exposure to blood and body fluids	If risk of exposure to blood/ body fluids and/or contaminated surfaces or equipment	Contact	Droplet	Airborne
Scrubs	X	X	X	X	X
Covered shoes (preferably boots)	X	X	X	X	X
Gloves		X	X	i	i
Gown		X	X	ii	ii
Apron		If risk of excessive fluids	iii	iii	iii
Surgical mask			iv	v	
N95 Respirator					X
Face shield		If risk of splashes to face	vi	X	vi
Goggles + surgical mask		If face shield indicated but not available	vii	X (If face shield indicated but not available)	vii

I Based on risk assessment and likelihood of direct contact with blood or body fluids or touching contaminated equipment or surfaces.

ii Based on risk assessment and the likelihood of splashes or sprays form blood or other body fluids.

iii Based on risk assessment and the likelihood of contact with large or excessive amounts of body fluids (e.g., during delivery or invasive surgical procedures).

iv Based on risk assessment and the likelihood of splashes or sprays directly to the face

v Surgical masks are loose fitting and reserved only for protection against microorganisms spread by droplet route (>5mm). Not a suitable alternative when N95 respirators are indicated for microorganisms spread by airborne route.

vi Based on risk assessment and the likelihood of splashes or sprays directly to the face.

vii Based on risk assessment and the likelihood of splashes or sprays directly to the face. Can be used as a substitute for when face shields are indicated, but unavailable.

21 CDC 2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in HCF. http://www.cdc.gov/hicpac/pdf/isolation/Isolation2007.pdf.

22 WHO Practical Guidelines for Infection Control in HCF 2004 http://www.wpro.who.int/publications/docs/practical_guidelines_infection_control.pdf

Putting on and taking off PPE

To be effective, PPE must be correctly and carefully put on (also known as donning) and removed (also known as doffing). The following are general principles that should be considered when donning and doffing PPE:

- It is important that PPE is put on correctly before attending to a patient or entering a contaminated area. A buddy (trained observer) may supervise putting on PPE to ensure it is correctly worn;
- During patient care, PPE must remain in place and be worn correctly while in the contaminated areas;
- PPE should not be adjusted during patient care; specifically, under no circumstances should the face be touched. If there is concern and/or breach of these practices, leave the patient care area when safe to do so and properly remove and change the PPE;
- PPE must be removed in the correct sequence and slowly to reduce the possibility of self-contamination;
- Hand hygiene should be performed during the doffing process as described in Box 4.
- The "buddy system" of using a trained observer to assist with the doffing process is not routinely required, but should be used in particular contexts (e.g. viral haemmorhagic fever outbreaks).

The steps to put on and remove PPE are described in Annexes 17 and 18.

KEY LEARNING POINT:

Use of hand hygiene during PPE doffing

Hand hygiene is recommended after every piece of PPE is removed during doffing; spraying with chlorine solution is not advisable, as it poses serious occupational hazards to health care workers.

Box 4. Hand hygiene and PPE doffing

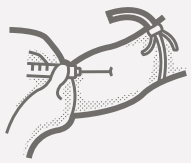
Injection safety and sharps injury prevention

Injections are one of the most common health care procedures.[23] In health care settings, accidental needle-stick injuries are the number one cause of occupational exposure to blood borne pathogens (e.g. Hepatitis B and C, and HIV).[24]

Safe injection practices and handling of sharps are two very important components of basic IPC controls aimed to protect both the health care worker and patient (see Box 5). Injections should be safely administered and only when medically indicated.

KEY TERMS DEFINED

– Injection and Sharps Safety



A safe injection is one that does not harm the patient, expose the caregiver to an avoidable risk, and result in waste that is dangerous to other people.

The term sharps refer to any sharp instrument or object used in the delivery of health services including hypodermic needles, suture needles, scalpel blades, sharp instruments, IV catheters, and razor blades.

Box 5. Safe injections and sharps

There are 7 general principles to consider when providing safe injections, summarized in Table 3.

23 WHO guideline on the use of safety-engineered syringes for intramuscular, intradermal and subcutaneous injections in health care settings (2016)

24 Simonsen et al. Unsafe injections in the developing world and transmission of bloodborne pathogens. Bull WHO 1999; 77:789-800

Table 3. Guiding principles for providing safe injections

No.	General principle	Key points
1.	Clean work space	• A clean and organized work station is vital in preventing contamination and necessary for safe preparation
2.	Hand hygiene	• Health care workers must always perform hand hygiene before preparing injections and before and after giving an injection
3.	Sterile injection material	• Carefully inspect the packaging before opening – discard the syringe and needle if the packaging has been damaged or is moist inside. • Always use a syringe and needle from a new and sealed package (sterile). • Syringe with a re-use prevention (RUP) feature are highly recommended where feasible.
4.	Sterile medications and diluent	• Use single dose vials where feasible. • Each medication/vaccine should be administered aseptically and separately.
5.	Skin cleaning/preparation	• If skin is visibly clean, it is safe to give an injection without skin disinfection. • If skin is visibly dirty, wash with soap and water • Use appropriate skin disinfection when performing blood draws: • Routine (70% alcohol) • For cultures or donation (2% chlorhexidine in 70% alcohol)
6.	Sharps collection	• Never re-cap needles. • Sharps containers should be located at point of care for easy access. • Always place sharps directly into sharps containers; once ¾ full, close and seal shut and store in a secure place until final disposal/ treatment.
7.	Waste management	• Eliminate sharps by an effective, safe and environmentally appropriate manner and ensure that all persons are protected against possible exposure.

Depending on the type of injection being given to the patient, different skin preparations are required, as described in Table 4.[25] Additional recommendations for skin preparation are provided in Box 6.

Table 4. Skin preparation for different types of injections

Type of injection	Skin preparation and disinfection	
	Soap and water	60-70 % alcohol (isopropyl alcohol or ethanol)
Intradermal	Yes	No
Subcutaneous	Yes	No
Intramuscular		
• immunization	Yes	No
• therapeutic	Yes[a]	Yes[a]
Venous access	No	Yes

[a] Unresolved issue because there is insufficient evidence on the need to disinfect the skin wih alcohol before an intramuscular injection to change the 2003 WHO recommendation (7) ; further studies are warrared.

DO NOT pre-soak cotton wool in a container -these become highly contaminated with hand and environmental bacteria.
DO NOT use alcohol skin disinfection for administration of vaccinations.

Box 6. Additional recommendations for skin preparation for injections

Avoid giving injections if skin integrity is compromised by localized infection or other skin conditions (e.g. weeping dermatitis, skin lesions or cuts), and cover any small cuts. Additional recommendations for preparing and maintaining sterile medications to prevent contamination:

- Protect fingers with a clean barrier, like a small gauze pad when opening ampoules;
- Administer medication/vaccine with a disposable syringe and needle;
- If a single dose vial is not available, a multi-dose vial can be used as single dose vial. However, always ensure the following:
  - Use a sterile needle when piercing the septum;
  - Never leave the needle in place in the vial stopper;
  - Discard multi-dose vial after single dose use
- Inspect and discard medicines or vaccines when there is a risk of contamination or if the integrity of the packaging is visibly damaged (e.g., cracks or leakage of the container);
- Always clean the top of new vials or ampoules with an antiseptic.

Additional recommendations for safe handling of sharps:
Wear gloves when handling sharps;
- Use instruments, rather than fingers, to pick up, load or unload needles and scalpels;
- Give verbal alerts when passing sharps to another HCW;
- Avoid hand-to-hand passing of sharp instrument - use a receiver or tray instead;
- Never direct the point of a needle towards any part of the body except prior to injection;
- Do not reuse syringes;
- Do not recap used needles or disinfect needles after use;
- Put sharps containers near the point of use at a suitable height and ideally within arm's reach;
- Do not force sharps into a sharps container;
- Do not put fingers inside a sharps container;
- Do not shake the sharps container to adjust its content and make room for more items.

Decontamination of medical devices and equipment

This section outlines the levels of decontamination, the different methods and actions required for safe decontamination of re-usable devices and equipment.

Table 5 summarizes key terminology used in medical equipment reprocessing.

25 WHO best practices for injections and related procedures toolkit. 2010. Available at: http://apps.who.int/iris/bitstream/handle/10665/44298/9789241599252_eng.pdf;jsessionid=AC801C0D61CC91A633D3720CA90C05D2?sequence=1

Table 5. Key terms used in reprocessing of medical equipment

Key term	Definition
Cleaning	The step required to physically remove contamination by foreign material (e.g. dust, soil) to prepare a medical device for disinfection or sterilization. Pre-cleaning occurs prior to clean if medical devices are grossly contaminated.
Contamination	The soiling of inanimate objects or living material with harmful, potential infectious or unwanted matter.
Decontamination	Removes soil and pathogenic microorganisms from objects so they are safe to handle, subject to further processing, use or discard.
Disinfectant	A chemical agent that is capable of killing most pathogenic microorganisms under defined conditions, but not necessarily bacterial spores. It is a substance that is recommended for application to inanimate surfaces to kill a range of microorganisms. The equivalent agent, which kills microorganisms present on skin and mucous membrane, is called an antiseptic.
Disinfection	A process to reduce the number of viable microorganisms to a less harmful level. This process may not inactivate bacterial spores, prions and some viruses.
Medical device	Any instrument, apparatus, appliance, material or other article, where used alone or in combination, intended by the manufacturer to be used in humans for the purpose of the diagnosis, prevention, monitoring, treatment or alleviation of – or compensation for – an injury or handicap.
Pre-cleaning	This is cleaning at the point of use; rinsing gross organic material (e.g. blood clot, vomitus, stool) off and placing in a container.
Reprocessing	All steps that are necessary to make a contaminated reusable medical device ready for its intended use. These steps may include cleaning, functional testing, packaging, labelling, disinfection and sterilization.
Sterilization	A validated process used to render an object free from viable microorganisms, including viruses and bacterial spores, but not prions.

The goals of safe reprocessing of medical devices include:

- Protecting patients, visitors, caretakers and staff from infection risks via medical devices and equipment;
- Eradicating or significantly reducing the number of microorganisms on medical devices and equipment;
- Minimizing damage to medical devices from foreign material (e.g. blood, body fluids, saline and medications) or inappropriate handling;
- Ensure the health care facility meets the Ministry of Health requirements and fulfils its responsibility to provide a safe environment for patients, visitors and staff.

To minimize this risk, there are certain principles and processes that must be applied to ensure that all instruments and/or equipment have been properly reprocessed and rendered safe for re-use; the life cycle of decontamination illustrates these salient features, each step being as important as the next (see Figure 6).[26] Note that the Acquisition stage may also be through donations or lease.

26 WHO. Decontamination and Reprocessing of Medical Devices for Health-care facilities (2016)

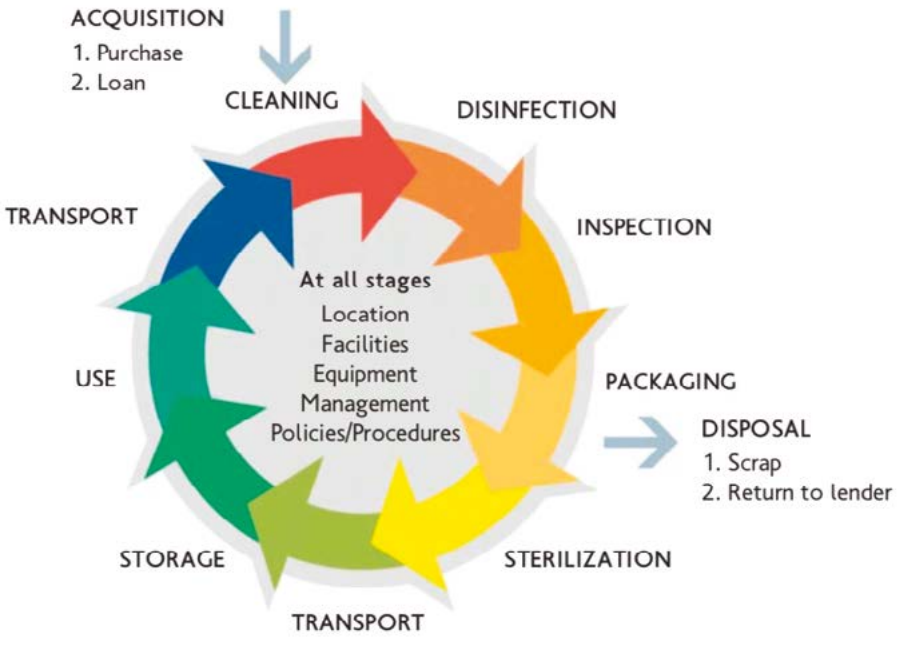
Risk assessment prior to reprocessing medical devices
Once medical devices and equipment are contaminated they present a risk to patients, as well as to staff, both in the immediate environment and to those who subsequently handle them (e.g. technicians). The risk of acquiring an infection from instruments and/or equipment depends on the following factors:

- The presence of microorganisms, their number and virulence;
- The type of procedure that will be performed (invasive or non-invasive);
- The part of the body where the instrument and/or equipment will be used (sterile cavity vs mucous membranes vs intact skin only).

The body site where the instrument or equipment will be used/have contact with, will determine whether cleaning, disinfection or sterilization is required.

In 1968, Spaulding classified medical/surgical devices as critical, semi-critical and non-critical based on the potential risk of infection that utilizing these articles would represent. This classification is useful for understanding the method of decontamination required to ensure safety according to the degree of risk for infection involved (see Table 6).

Figure 6. The decontamination life cycle



Source: Health Building Note 13, Department of Health, United Kingdom, 2004

Table 6. Spaulding classification of medical devices

Risk category	Definition	Examples of medical devices	Recommended level of decontamination
Low (non-critical)	Instruments that come into contact with intact skin	Stethoscopes, blood pressure cuffs, bedpans, bedside tables, walls, floors, basins, and toilets	Cleaning/Low-level disinfection (LLD)
Intermediate (semi-critical)	Instruments that come into contact with mucous membranes or body fluids	Urine bottles, respiratory and anesthesia equipment, non-invasive flexible endoscopes, and vaginal specula	High-level disinfection (HLD)
High (critical)	Instruments that are involved with a break in skin or mucous membrane or entering a sterile body cavity	Biopsy forceps, surgical instruments and devices, implants, dental instruments and dressings	Sterilization (using heat or chemical sterilants)

Cleaning prior to disinfection or sterilization

Cleaning is the essential first step in reprocessing any device after use. For the effective reprocessing of medical devices and equipment, cleaning to remove organic materials and/or chemical residues must precede both disinfection and sterilization.

The first step in the cleaning process is the pre-cleaning of medical devices at the point of use, which aims to prolong the life of medical equipment and reduce infectious risks by removing obvious, gross soiling of organic and foreign material. Note that equipment should not be pre-cleaned by soaking in chlorine solution (see Box 7). Immediately after use, medical devices shall be cleaned by following the guidelines listed:

- PPE shall be worn for handling and cleaning contaminated devices (see Annex 20)
- Separate contaminated devices and instruments from linen and disposable items and dispose of these items appropriately
  - Be sure to safely segregate sharps and dispose directly into sharps containers
- Remove gross soil from instruments by:
  - wiping with a damp, clean cloth;
  - rinsing with water;
  - placing in a basin with cold or room temperature water.
- Once pre-cleaned, place items in a fully enclosed, leak and puncture-proof covered container prior to transporting for reprocessing:
  - Avoid prolonged soaking of devices;
  - Cover items with a moist towel with water (not saline) to prevent equipment from drying out;
  - Do not use saline as it can damage medical equipment;
  - Do not transport containers filled with water or other solutions as this can pose an occupational hazard.

Cleaning is normally accomplished by manual wiping, brushing or flushing using water and detergent, or by using automated washing equipment to remove foreign material (see Annex 19 for complete steps on how to manually clean instruments). Use of detergents are important in cleaning as they reduce surface tension and cut through fat and other types of organic matter. Other additional considerations include:

- Cleaning products used should be appropriate for medical devices and approved by the device manufacturer;
- As much as possible, avoid using domestic detergents (home cleaning or laundry use), as these are not suitable for the cleaning of medical devices or instruments.
  - However, where clinical detergents are not available, locally available detergents intended for washing items by hand may be used. Take care that it is fully dissolved before use and thoroughly removed from the instrument by rinsing afterwards. These detergent solutions should not stay in use for more than one day. Containers used for making up and using detergents should be rinsed after use and dried;
- Use a neutral pH or enzymatic detergent; these types of detergents help to suspend greases, oil and other foreign material for easy removal during the cleaning process;
- Do not use abrasive cleaners, such as steel wool.

KEY LEARNING POINT:

Do not soak instruments in disinfectants prior to cleaning

Soaking instruments in disinfectants such as 0.5% chlorine prior to cleaning equipment is not recommended as it damages the instruments, is ineffective at removing the soil, and may contribute to development of antimicrobial resistance to disinfectants.

Box 7. Avoid soaking instruments in chlorine solution before cleaning

Disinfection

Disinfection is an important step in the reprocessing cycle of used medical devices. This is a process by which microorganisms are removed or destroyed, it does not however destroy bacterial spores. There are three levels/categories of disinfection (low, intermediate and high level) and various types of disinfectants available within each category (see Table 7).

Table 7. Levels of disinfection and disinfectants for use on medical devices

Levels of disinfection	Disinfectant
Low-level disinfection (LLD)	Phenolic (e.g. Dettol) Quaternary Ammonium Compounds
Intermediate-level disinfection (ILD)	Alcohol 70% Iodophor disinfectants Hypochlorite/Chlorine compounds*
High-level disinfection (HLD)	Pressure Cookers or boiling pots** Hydrogen peroxide Glutaraldehyde Formaldehyde Peracetic acid

* Hypochlorite/chlorine compounds result in ILD, but should only be used for environmental decontamination and not for decontamination of reusable medical devices

** Pressure cookers or boiling pots only result in sterilitization if temperature, pressure, and time parameters are met. If they are not, pressure cookers or boiling pots only provide HLD.

Levels of disinfection:

1. Low-level disinfection (LLD):
- Low-level disinfectants can kill most bacteria, some fungi, and some viruses in a practical period of time (<10 minutes).
- Used for non-critical items which come in contact with intact skin only.

2. Intermediate level disinfection (ILD):
- Intermediate-level disinfectants are capable of killing most bacteria, viruses, and fungi but do not kill bacterial spores;
- Used for some semi-critical and non-critical items only.

3. High-level disinfection (HLD):
- High-level disinfectants kill microorganisms however not high numbers of bacterial spores;
- Used for semi-critical items (except dental) which will come in contact with mucous membrane or non-intact skin;
- For instruments and equipment that cannot be sterilized (too delicate or heat-sensitive) or when sterilization is not available, HLD can be used; however, HLD is not a sterilizing process and it should not be used as a substitute for sterilization;
- In these cases, HLD is the only acceptable alternative and can be achieved either by physical (high pressure steam - autoclaving) or chemical methods (e.g., hydrogen peroxide 7.5%, peracetic acid 0.2%, glutaraldehyde ≥2%);
- Autoclaving is normally categorized as a form of sterilization, however, when it cannot be accurately monitored and/or measured, the equipment cannot be classified as sterilized; therefore, it is classified as highly disinfected (see next section);
- Sterile, or bacteria free, water must be used for rinsing to remove disinfectant residues.

Sterilization of reusable medical devices

Sterilization is the elimination of all disease-producing microorganisms (bacteria, viruses, fungi and parasites), including bacterial spores. Sterilization is recommended to be used on critical medical devices and, whenever possible, semi-critical medical devices. Items and equipment can be sterilized by the following physical or chemical methods:

1. Moist heat or steam sterilization – available in selected facilities
2. Dry heat (oven) – most commonly used at health facilities in Liberia
3. Cold sterilization (using chemical sterilants) – currently not available in Liberia

Before sterilizing any instrument or equipment, it is important to ensure that it can withstand the process, has been properly cleaned and does not require any special treatment. Records of the sterilization process must be kept, ensuring traceability of instruments.

Steam sterilization

Moist heat or steam sterilization is a process that uses saturated steam under pressure as the sterilants. It is the preferred method of sterilizing medical devices; as it is effective, all medical devices including cotton and

gauze can be sterilized and stored. The removal of air is essential to ensure an efficient sterilization process – sterilization cannot occur in the presence of air. [27]

Autoclaving:
The autoclave uses high pressure steam to sterilize medical equipment or instruments depending on the context (for an SOP see Annex 21). There are several types of autoclaves:

1. Pressure cooker: can be used as steam sterilizers adequate for sterilization of solid items such as scissors and forceps (but not for hollow bore items) as long as temperature, pressure, and time parameters are met. Temperature should be at 121 C (249 F) for 15- 20 minutes depending on the load and content. Mixing of equipment and overloading should be avoided. **If it is not possible to monitor the entire sterilization process (e.g. pressure gauge is not working, temperature cannot be monitored, etc.) the equipment cannot be considered sterile, and is instead classified as highly disinfected (see Box 8).** Items sterilized using a pressure cooker should be re-sterilized immediately before use if they are to be used in critical procedures.

2. Pre-vacuum (porous load) sterilizers: suitable for sterilization of wrapped clean instruments, gowns, drapes, toweling and other dry materials that are required for surgery.

KEY LEARNING POINT:

Requirements for using a pressure cooker for sterilization

For a pressure cooker to be used as a sterilizer the temperature and time must be closely monitored and maintained; temperature must be at 121 C (249 F) for 15- 20 minutes depending on the load and content. If it is not possible to monitor the temperature (e.g. gauge is not working), the equipment cannot be considered sterile, and is instead classified as highly disinfected. In this case an alternative method of sterilization must be identified (e.g. dry heat).

Box 8. Requirements for using a pressure cooker for sterilization

- Other general considerations for the safe operation and use of autoclaves include:
- To ensure proper steam contact, first clean and dry objects before autoclaving
- Keep instruments disassembled, opened, and unlocked
- Do not stack instruments
- Do not wrap packages too tightly
- Do not arrange packs in the autoclave too close to one another
- 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 sterilizer is not clogged. This could result in trapping air inside the sterilizer
- Follow specific operating instructions from the manual that was supplied by the manufacturer
- 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 instruments trays (mesh or perforated) flat
- Do not overload the sterilizer or make packs too large
- Double wrap items using correct wrapping material.

Only select facilities have access to this type of technology and therefore should use this as their primary method for sterilization. In facilities that do not have access to steam sterilization, dry heat technology can be used providing it is reliably monitored.

Dry heat sterilization

Dry heat sterilization requires higher temperature for longer exposure periods than moist heat sterilization to kill all microorganisms. Due to the high temperature required, only glass or metal objects can be sterilized by dry heat - do not use this method for other items such as gauze or cotton which may melt or burn.

Overall, dry heat ovens are not as safe as autoclaves as they do not maintain consistent heat, thus jeopardizing the sterilization process. If there is no alternative, then it is preferable to use an industrial dry heat oven rather than the common home oven.

See Annex 22 for a complete SOP for the use of dry heat sterilizers. Other general considerations for the safe operation and use of dry heat sterilizers include:

Keep the oven clean;
- The oven must have a reliable temperature gauge and where possible a timer. If no timer is available, a portable timer is required;
- Maintenance of dry-heat ovens should be part of every sterilization procedure. If the oven does not reach the correct temperature, sterilization will not be achieved;
- To check that the temperature gauge is working correctly, place a thermometer in the oven and compare the temperature reading with the one on the gauge. Do this on a weekly basis, record the findings and take any remedial action as required;
- Items should not be wrapped, stacked or overcrowded within the dry heat oven.

27 WHO. Decontamination and Reprocessing of Medical Devices for Health-care facilities (2016)

Cold sterilization

If heat is not available, chemicals such as glutaraldehyde represents the best alternative.

Packaging materials for sterilization

Packaging prevents equipment contamination after sterilization and before use. The following should be considered when packing:

- The packaging materials must act as a barrier against dust, repel water and provide adequate seal of its contents;
- Wrappers must be available in sufficient quantities and stored in an easily accessible site;
- The packaging must completely cover the instrument or item; the edges should be properly folded so that the instrument can be presented in an aseptic manner during a procedure. While the edges and corners of the wrapper need to be folded inside, there should not be excessive wrapping material around the instrument as it interferes with the penetration of the sterilizing agent;
- The wrapper should resist tears and punctures and be free of holes or toxic ingredients;
- All items must be double wrapped before sterilization;
- All packages must be lint free.
- There should be an indication on the pack to show if the item is ready for patient use; indicator tape with date of sterilization should be visible on the package;
- All sterile packaging should be handled as little as possible;
- Only wrapped or packaged materials that have been sterilized should be described as sterile.

Sterilization packaging material

The following packaging is recommended:

- **Sterilization wrap** made from cellulose fibres and non-woven from a combination of cellulosic and synthetic fibres. Both types are suitable for porous-load steam sterilization and most gas processes because they are permeable to air, steam and other gases
- **Rigid reusable sterilization containers** (metal containers designed for sterilization) should be suitable for the method of sterilization used and compatible with the cleaning method and cleaning agent

The following packaging is not recommended:

- **Metal (sterilization) drum trays** with holes that can be opened and closed manually. These do not guarantee sterility of its contents
- **Newspapers, brown paper bags** and other products that do not allow air removal or penetration of steam must not be used
- **Recycled material packaging** because these have lost their integrity and the bacterial barrier and do not allow adequate air removal or steam penetration- *while this is common procedure currently in many facilities, with time it is hoped that this practice will discontinue as other methods become available.*

Monitoring sterilization procedures

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

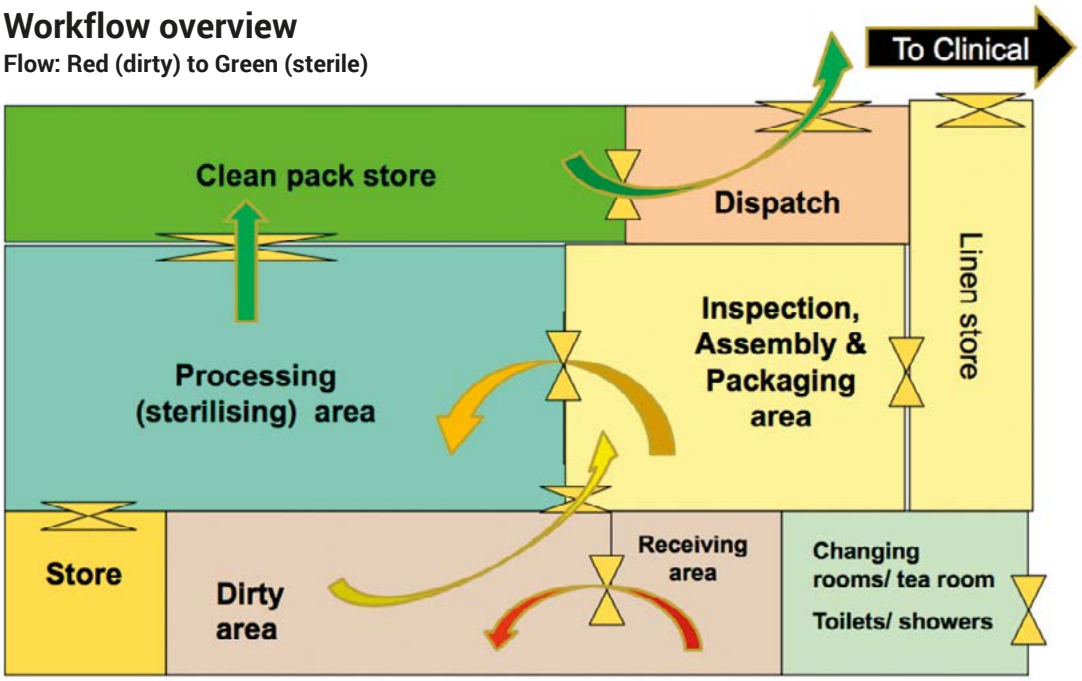
- A chemical indicator (CI) is a system that responds to a change to one or more predefined process variables with a physical or chemical change i.e. colour changing tape. A CI does not indicate sterilization, but rather that a package has undergone a sterilization cycle. Apply a CI to every package.
- A physical (or mechanical) control is a device that monitors the physical parameters of a sterilizer, such as time, temperature and pressure, which are measured during the sterilization cycle and recorded at the end of each cycle (on a printed statement or in an electronic file). These should be monitored with every cycle.
- A biological indicator (BI)* is a test system containing viable microorganisms (e.g. Strips or vials loaded with spores) providing a defined resistance to a particular sterilization process. BIs should be used daily (with the first package of the day) and whenever there is:
  - ▷ A new type of packaging material or tray
  - ▷ After training new personnel
  - ▷ After repairing a sterilizer
  - ▷ After any change in the sterilizing process

  *Use of biological indicators is not current practice in Liberia. As sterilization practices improve and additional resources become available, these should be introduced.

Decontamination unit layout

Basic requirements that must be adhered to in the sterilization unit include restricted access, presence of a dedicated changing area for staff prior to entering, and gowning points for PPE prior to entering specific work areas (see Figure 7 for overview of decontamination workflow).

Figure 7. Decontamination process workflow



Source: World Health Organization advanced IPC training pilot in Liberia: Decontamination of medical equipment presentation

Decontamination areas

- Dirty area: receiving and cleaning of used medical devices
- Clean area: Inspection, assembly and packing (IAP)
- Sterilization area: load and unload
- Sterile store (cooling and short-term storage)
- Storage area: devices, chemicals and packaging materials (see below for details)
- Offices, break rooms for staff and changing areas

Storage of sterile supplies

Proper storage of sterile supplies is essential to ensure that the product retains its level of sterilization or disinfection. The sterile storage area should be located next to the sterilization area, preferably enclosed and separate (dedicated area to sterile storage) with limited access.

- Keep the storage area clean, dry and dust free;
- Maintain temperature at about 24 C and relative humidity less than 70%, where possible;
- Correctly choose the containers used for storage of sterile supplies (or HLD). They should be moisture resistant and cleanable i.e., do not use cardboard boxes;
- Store sterile supplies (or HLD) to 20-25 cm above the floor, 45-50 centimeters from the ceiling and 15-20 centimeters from the exterior wall;
- Rotate supplies according to the sterilization dates (first in, first out); this process serves as a reminder, but does not guarantee the sterility of packaging;
- Clean supplies, sterile (or HLD) should be stored separately. The unpacked supplies must be immediately used and should not be stored;
- The material should be stored in a place where it cannot be manipulated by unauthorized persons.

The storage life of a sterile package is related to its integrity rather than time. The storage life is based on the concept that instruments are sterile as long as all correct procedures have been followed and packaging remains intact. Once the package integrity has been compromised (e.g. the package is open, wet or dirty), the instruments are no longer considered sterile and require reprocessing.

Linen management

Standard precautions should be used properly at all times when treating soiled linen. Linen soiled with blood, body fluids, secretions or excretions should be handled in a secure and safe manner.

General precautions

Laundry staff should follow these guidelines for safe linen management:

- Always wear appropriate PPE (rubber gloves and apron) when collecting, handling, transporting and sorting linen;
- Always wash hands before and after removing gloves

and whenever indicated according to the five moments for hand hygiene. Hand washing stations will be located in laundry facilities to ensure hand hygiene is performed;
- Handle soiled linen as little as possible with minimal movement to prevent possible contamination or splashing. Be sure to check for any sharps or other hazardous material within the linen that may cause injury. If found, discard appropriately;
- Consider all linen, such as surgical drapes and gowns, used during a procedure as contaminated and infectious. Even if there is no visible contamination, the article must be washed;
- Never place soiled linen on the floor or clean surfaces;
- Do not sort or rinse laundry in patient care areas;
- Transport and store clean linen to prevent contamination and ensure cleanliness;
- Always separate clean and dirty linen;
- Reusable heavy-duty gloves used by laundry staff must be washed then air dried. Discard punctured or torn gloves.

Collecting soiled linen

- Remove soiled linen from wards/patient rooms on a daily basis, or as needed, and after invasive medical or surgical procedures;
- Soiled linen should be removed using plastic bags or cloth, covered plastic containers or covered carts. This will help prevent any additional spills and splashes;
- Limit dirty linen storage to designated areas (interim storage areas) prior to transporting for laundering;
- Large amounts of feces or blood clots should be removed from the linen with a gloved hand and toilet paper, put in a basin and disposed of in a toilet or pit latrine, as soon as possible.

Transporting soiled linen

- Collect soiled linen from the treatment area daily or as needed in waterproof bags, containers with closed lids or covered carts;
- Use separate carts, marked accordingly for clean and dirty linen; where there is no alternative but to use the same container or cart to transport both linen types, transport clean linen before soiled linen;
- Clean carts after each use with a detergent and water, then disinfect with a 0.5% chlorine solution;
- Transport and store clean linen in a way that prevent contamination and ensures that the linen remains clean;
- Health care workers must avoid carrying soiled linen near their body, even when they wear a plastic apron.

Sorting soiled linen

- See Annex 23 for a complete SOP on sorting soiled linen
- In the laundry room, carefully sort all the linen before washing. Do not pre-sort or wash the soiled sheets at the point of use. Sorting must be done carefully because:
  - Dirty laundry from the operating room or other services performing procedures may contain sharps (knives, sharp tip scissors, hypodermic needles and sutures, etc.).
  - Bedding from wards/patient rooms may contain dirty bandages, blood stained or soaked with other bodily fluids.

Washing laundry

All laundry items including sheets, surgical drapes and gowns should be thoroughly washed before reuse; heavy washers and dryers are recommended for hospital laundry facilities. Heavily soiled linen must be decontaminated before washing. Machine washing of laundry is preferable over handwashing linen. See Annex 24 for a complete SOP on washing linen.

Drying, checking, ironing and folding linen

The steps of drying, checking, ironing and folding linen are the same for both machine and hand washing methods:

- Linen should be completely dry prior to further processing. Dry outdoors in the sun, if possible, keeping the fabric off the ground as well as free of dust and moisture;
- When the linen is completely dry, check for holes and/or worn areas;
- Iron and fold clean linen, including curtains, if possible. Do not iron and fold the linen that will be sterilized (ironing the material dries it out, making autoclaving more difficult). If surgical drapes should be sterilized, do not iron.

Storage, transportation, and distribution of clean laundry

- Store cleaned clothes in a clean and closed place;
- Use physical barriers to separate soiled linen, clean linen folding and storage areas from each other;
- Keep shelves clean at all times;
- Manipulate the stored linen as little as possible.

Environmental decontamination

To prevent HAIs, a clean environment is essential. Many factors including the design and planning of facilities, air quality, water availability, proper cleaning of the premises and an efficient laundry system can significantly influence the risk of contamination.

General environmental cleaning practices and principles

Environmental cleaning of health care facilities refers to cleaning floors, walls, fixed and mobile medical equipment, furniture and accessories which may come in direct or indirect contact with patients. If the environment is not routinely cleaned, microorganisms can reside in the environment and subsequently be transmitted to patients, visitors, caretakers and staff.

The following general principles of environmental cleaning should be followed:

- Cleaning is necessary to remove dirt, debris and other materials that can decrease the effectiveness of many chemical disinfectants;
- Scrubbing (friction) is the best way to physically remove dirt, debris and microorganisms;
- Always wear risk appropriate PPE when performing any type of cleaning or decontamination, especially when there are risks of splashes or sprays of blood or body fluids;
- Always clean from the least contaminated (cleanest) to most contaminated (dirtiest) area and from highest level to lowest level so that the dirtiest areas and debris that falls to the ground are cleaned last;
- Avoid dry sweeping and dusting to prevent dust, debris and microorganisms from landing on clean surfaces;
- Follow the correct dilution instructions for disinfectants as per the manufacturer's instructions. Poor dilution may reduce the effectiveness of disinfectants;
- Cleaning methods and schedules should be written, documented and done according to standards;
- Cleaners should be trained on how to perform their assigned tasks, understand potential risks associated with cleaning activities and be regularly monitored with feedback provided.

Cleaning frequency

The frequency of cleaning surfaces in a particular area or department depends on:

- Whether surfaces are frequently or infrequently touched (these are also called 'high-touch' and 'low-touch' surfaces);
- The type of activity taking place in the area and the risk of infection associated with it (e.g. critical care areas vs. meeting rooms);
- The vulnerability of patients in the area (e.g. immunosuppressed patients);
- The probability of contamination based on the amount of body fluid contaminating surfaces in the area.

Suggested cleaning frequencies can be found in Tables 8 and 9.

Table 8. Cleaning frequency recommendations by item or surface type

Item/Surface	Frequency
Frequently touched, for example: • Tables and countertops • Beds and chairs • IV poles	At least twice daily AND when visibly soiled
Infrequently touched, for example: • Floors and walls • Ceilings	At least once daily AND when visibly soiled
Medical equipment, for example: • Axillary thermometers • Blood pressure cuffs	After every patient
Plates and utensils	After every patient
Reusable PPE	• After all procedures • After exiting an isolation area • When visibly soiled
Linen and mattresses	After every patient and when visibly soiled

Table 9. Cleaning frequency recommendations by area

Place/Area	Frequency
Screening area	At least twice daily AND after a patient with a suspected infectious disease
Isolation room	At least twice daily AND after each patient discharge
Offices/ administration areas	Once daily
Inpatient areas	At least twice daily AND when visibly soiled
Latrines/toilets	At least twice daily AND after a patient with a suspected infectious disease

For advice and direction on common cleaning methods and specifically cleaning blood and other large spills see SOP in Annex 25.

Use of chlorine as a disinfectant for routine environmental decontamination

A 0.5% chlorine solution is the ideal concentration for general environmental decontamination; it should not be mixed with other cleaning solutions. Due to its instability, it is necessary to prepare a new solution every morning, after every 8 hours, or whenever the solution becomes visibly dirty. A 0.5% chlorine solution can be made from liquid or chlorine tablets (see Annex 26).

Guidelines for cleaning specific areas

Cleaning schedules must be planned, written, strategically posted, closely monitored and strictly enforced. Cleaning schedules must be developed according to the needs of each service. The specific procedures for cleaning operating rooms and delivery rooms are described in Annexes 27 and 28.

Health care waste management

The term health care waste includes all waste generated within the health care facility, research centers and laboratories related to medical procedures. In addition, it includes the same type of waste originating from minor and scattered sources, including waste produced in the course of health care undertaken in the home.[28] Strict adherence to established environmental norms and standards for all waste management activities and compliance with national policies on waste, environmental health and vector control are a must.

All staff have a responsibility to manage waste in a manner that poses minimal hazard to all persons. Proper handling, treatment and disposal of waste minimizes the spread of infections, reduces the risk of accidental injury, maintains a clean and safe workplace for health care workers, reduces waste related odors, contributes towards vector management and provides an aesthetically pleasing environment.

Classification of health care waste

The greater part of waste generated by health care providers (75%-90% of all waste) is "non-hazardous" and can be managed like general household waste; it comes from administrative, kitchen and housekeeping functions at facility. The remaining 10%-25% of health care waste is regarded as "hazardous" and may pose an environmental and health risk, and therefore requires special arrangements for treatment and disposal.

28 Safe management of wastes from health-care activities. WHO (2014)

Non-hazardous waste

Non-hazardous (also known as domestic waste), is similar to waste generated in households; free of hazardous physical or chemical characteristics. Examples of non-hazardous waste include: disposable paper plates, empty containers, boxes, packaging, etc.

Hazardous waste

Hazardous waste is any type of waste that poses risk to human health and the environment (see Table 10).

Table 10. Categories of hazardous health care waste

Waste category	Description and examples
Infectious waste	Bloody or purulent bandages, laboratory specimens and cultures, used PPE, drainage bags, etc.
Sharps waste	Needles and syringes, scalpels, scissors, broken ampoules or bottles (or any other easily broken item)
Pathological waste	Body parts, placenta, tissues from surgery, birth, etc.
Chemical waste	Formaldehyde, mercury, acids, solvents, lithium batteries, etc.
Pharmaceutical & cytotoxic waste	Discarded antibiotics, returned dosages, left-over drugs, IV lines used to administer cytotoxic drugs, etc.
Radioactive waste	Contrast agents (radio diagnostic and therapy)

Health care facility responsibilities

Health facilities are responsible for their own waste management activities; the facility's quality management team, IPC focal person, and environmental health technicians will be involved in health care waste management. The goals of good waste management are to:

- protect people who handle waste from accidental injury;
- prevent the spread of infection to patients, HCWs, and the community;
- safely remove hazardous materials and protect the environment.

Waste management principles

The following principles are general guidelines for waste management in a health care facility:
Develop a health care waste management plan based on evidence that minimizes the amount of waste generated, in line with the health care waste management guidelines of Liberia;

1. Segregate clinical waste in specific color coded containers using the three bin system with appropriate garbage bags. If containers and colored linings are not available, label the containers used;
2. Waste must be transported in a covered cart or wheelbarrow. Ensure that the carts/wheelbarrow used for the collection of sorted waste are not used for other purposes. They should be cleaned regularly. Transport the different categories of waste separately;
3. Store waste in specified areas with limited access. Identify a storage area for waste before treatment or disposal. Mark storage areas with a biohazard symbol;
4. Collect and store sharps in sharps safety container;
5. The HCWs responsible for waste should use risk appropriate PPE and practice hand hygiene according to WHO 5 Moments of Hand Hygiene;
6. Treat waste using appropriate treatment technologies as outlined in the health care waste management guidelines of Liberia.

Waste management steps

Waste management activities include waste minimization, segregation, collection, transportation, storage, treatment and final disposal in accordance with environmental regulations (see Figure 8).

It is critical that all steps for the safe management of health care waste be followed on a daily basis. Staff must be trained and oriented to the standards and norms outlined in national and facility level policies, guidance documents and standardized operating procedures

Waste minimization

Waste minimization is a process that involves reducing the overall amount of waste generated. The most preferred method for waste minimization is avoiding unnecessary waste production. However, when this is not feasible, health facilities should place a strong emphasis on other waste minimizing strategies, such as:

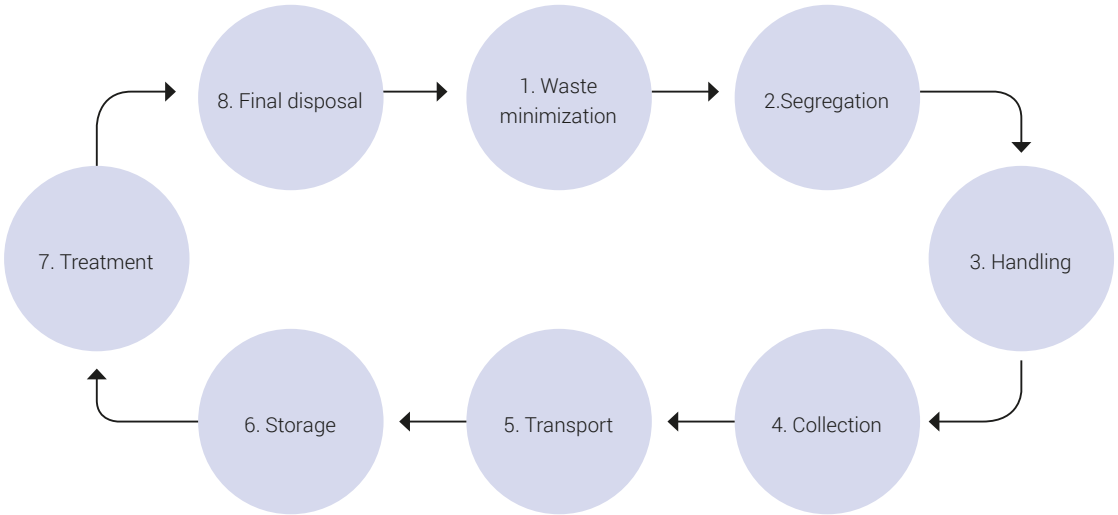
- Establishing a waste minimization plan (see Box 9);
- Purchasing of environmentally friendly products and packaging;
- Purchasing reusable devices whenever possible;
- Effective management of stock: first in, first out (FIFO);
- Encourage recycling and reuse of non-infectious materials

Developing a waste minimization plan

Step 1: Assess the total amount of waste generated
Step 2: Set an annual percent reduction goal for waste minimization that is achievable
Step 3: Brain-storm means by which your goal will be achieved (e.g., search web for ideas)
Step 4: Assess the success of the goal
Step 5: Re-set a higher goal for the next year

Box 9. Steps in developing a waste minimization plan

Figure 8. The waste management cycle



Waste segregation

Waste segregation is the sorting of waste based on its classification and in accordance with national policies and guidelines (*see draft National Safe Waste Management for Health Care Facilities Guidelines*). This process should be done at the point of waste generation (also called point of production) and placed in the appropriate, labelled container. In Liberia, waste is segregated according to the three-bin system: general/domestic/non-hazardous, infectious and sharps. However, it should be noted that radioactive and pharmaceutical waste are also produced in Liberia, therefore, they must also be segregated accordingly. If waste is not segregated according to its type and risk profile, there exists increased risk for potential environmental contamination and exposure risk to health care workers, caretakers and patients, in addition to other associated occupational hazards. Once segregated, waste should remain separated until final disposal.

Guidelines for the Safe Management of Health Care Waste in Liberia (2009) recommendations for waste segregation can be found in Figure 9.

Effective waste segregation can best be achieved by:

- Providing education and training programmes for all health care facility staff;
- Providing the appropriate protective equipment when handling waste;
- Establishing a color coding and labeling system for easy identification of waste containers and types. This can also include color coding waste bags accordingly;
- Providing appropriate waste containers and placing them in in the right places (i.e. at sites of waste production and other key areas);
- Filling waste containers up to three-quarters full, then securing for waste transportation and storage;
- Never sorting waste once already mixed, especially infectious waste and sharps materials. If mixed waste is identified dispose immediately and provide mentoring to HCW to prevent reoccurrence;
- Ensuring a functional Quality Management Team at every HCF, with a person responsible for waste management activities.

Handling waste

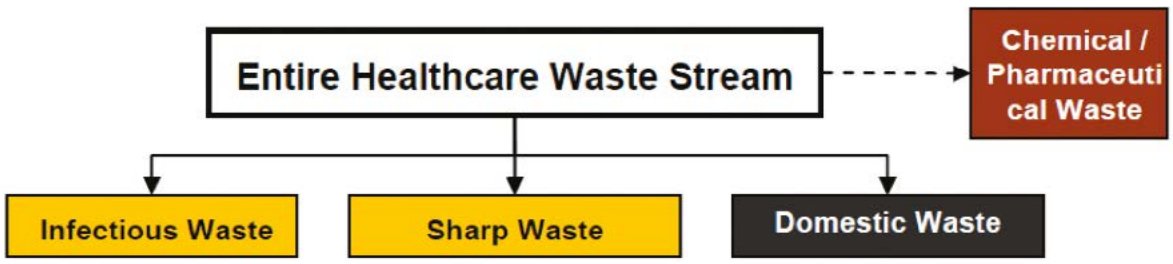
All hazardous wastes must be handled minimally (only touch when required); this reduces the risk of accidents, self-contamination, contamination of others and the environment. When handling waste at any time throughout the waste management cycle, the following apply:

- Wear risk-appropriate PPE; at a minimum, waste management staff should wear heavy duty gloves and aprons, and boots;
- Handle waste with care and minimal manipulation;
- Place waste containers in convenient locations and at the points of generation;
- Never place waste against the body;
- Use covered cart/wheelbarrows when handling large volumes of hazardous waste.

Waste collection and transportation

- Collect waste containers on a regular basis to reduce overfilling and waste-related odors;
- Empty infectious and domestic/general/non-hazardous waste on a daily basis;
- Empty sharps containers when ¾ full;
- Sharps containers should be sealed and never reopened when ¾ full; never attempt to compress or remove sharps from sharps containers;

Figure 9. Waste classifications in Liberia



- All steps in health care waste management must be explained to health care facility staff responsible for waste management activities. Job-aides and standardized operating procedures should be posted or made available for easy reference at or near waste generated, handled, collected and transported areas;
- When handling waste, hygienist/cleaning staff must wear risk appropriate PPE at all times;
- Waste should be collected in its appropriate container or bag and kept separately;
- Waste collection bins, carts/wheelbarrow should be used to reduce risks associated with collection and transportation of waste (see below section for more details);
- Waste transport routes within the facility should be as direct as possible and clearly defined, not crossing or passing through high risk areas, including any area where food preparation occurs.

Transporting waste in bins and carts or wheelbarrows

- Mobile waste bins and carts/wheelbarrow should be used when transporting waste to reduce spills and minimize direct contact between the person collecting the waste and the waste itself;
- Bins/carts/wheelbarrows should be dedicated for this purpose and be easy to load, unload, clean and leak-proof;
- Bins/carts should also have a lid or cover, and if used as waste storage, be lockable as well, and kept in a dedicated storage room;
- They should never be overfilled;
- When cleaning:
  - Rinse with cold water and then wash with warm water and mild detergent;
  - Drain into the drainage system of wastewater and dry mobile waste bins and carts/wheelbarrow;
  - Store separately clean and dirty bins and carts containers;
  - Wear risk appropriate PPE when cleaning mobile waste bins and carts.

Waste storage

Health care waste should be stored in designated storage facilities. All storage facilities should have restricted access, be cleaned and well maintained to decrease risks of infections and attraction of pests and vermin. Other storage requirements include15:

- The storage facility should be located within the health care facility premises; the facility should be near the treatment unit where applicable and away from the kitchen or designated food preparation areas;
- The storage facility should be designated for health care waste only with access limitation to non-waste management staff;
- The storage facility should be well ventilated with natural or, where feasible, mechanical ventilators;
- The floor surfaces and walls in a storage facility should be tiled for easy cleaning and disinfection;
- Infectious waste should not be stored longer than 48 hours (2 days). Organic waste should be disposed of daily;
- There should be a weighing scale for waste, and staff should weigh and keep record by filling-in the monitoring form;
- The size of the storage room should be large enough to accommodate treatment facilities, if required.

Waste treatment

Waste treatment refers to activities required to ensure that waste has the least impact on the environment and poses minimal risk to human health. All health facilities have the responsibility to treat health care waste prior to final disposal. General waste treatment principles include15:

- Non-infectious (or general) waste should be disposed of according to city ordinances/ regulations. If no general waste disposal service is offered by the city corporation, arrangements should be made with local waste collection companies for the safe collection and disposal of general waste to the nearest dump;
- De Montfort incinerators should only be used in health centers and clinics where waste generation rate is low;
- Burning of the infectious waste in primitive incinerators or barrels shall only be allowed on an exceptional, temporary basis with the written permit of the local Environmental Protection Agency, issued in consultation with the County Health Team;
- Incinerators must be located 61 meters away from habitable buildings, 46 meters from water sources and 300 meters from agricultural site;[29]
  Waste treatment sites must be enclosed by fencing and protected from animals or unauthorized entry by humans;
- Off-site treatment facilities are recommended in urban areas and in counties where onsite treatment is not possible due to lack of space; facilities are responsible for coordinating this with disposal companies so they pick up waste within acceptable framework (48 hours);
- Ash from incinerators must be removed safely and properly buried in an appropriate ash pit;
- Health care facilities should practice proper segregation of health care waste to avoid the incineration of the following materials:
  - Halogenated plastics such as polyvinyl chloride (PVC) equipment including intravenous (IV) bags, tubes and other plastic materials;
  - Waste materials containing mercury such as thermometers and dental amalgam waste;

29 http://www.path.org/publications/files/TS_mmis_incin_guide.pdf

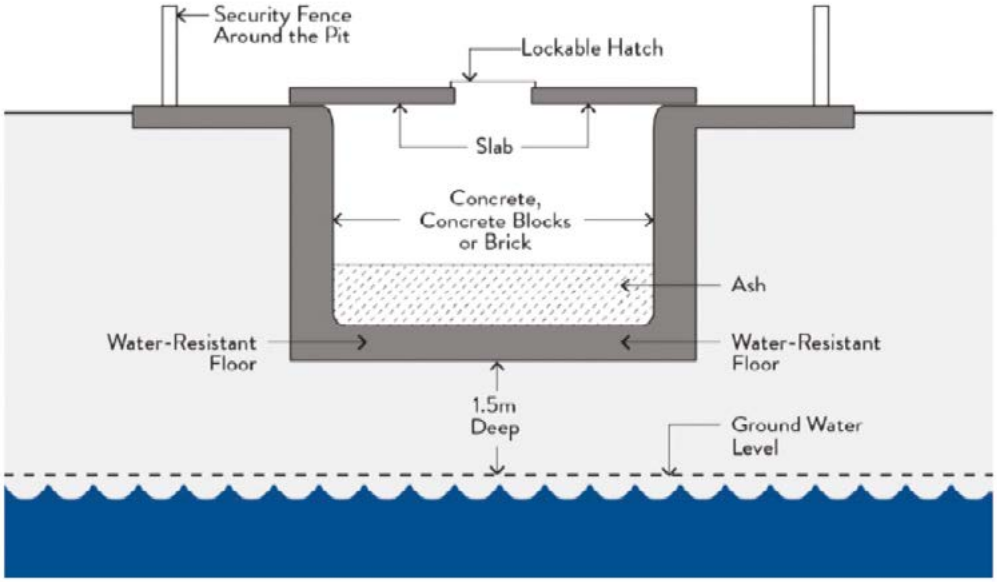
- ▹ Sealed ampoules and cytotoxic waste;
- ▹ X-ray films;
- ▹ Anatomical wastes or body parts should safely be disposed of in pits.

Final disposal of waste

Treated health care waste should be disposed of in a safe manner not to cause environmental contamination. The following general principles and practices should be followed for final disposal of waste:

- The disposal of infectious waste and sharps mixed together with the domestic waste shall be in no way allowed;
- Use lined-ash pits for the disposal of incinerated ash;
- Autoclaved material should be disposed of as general waste in a landfill or waste pit using burial method;
- Disposal of untreated sharps in sharps pit is not allowed, and thus sharps pits should not be used. Sharps should be incinerated and the ashes disposed of in an ash pit;
- In the event that storage capacity is limited and incinerators and autoclaves are not operational for waste treatment, health care waste can then be disposed of by burning in primitive incinerators, barrels or pits under EPA and CHT supervision, and ash disposed of in ash pit.
- Placenta and body tissues should be disposed of in lined placenta pits (see Figure 10 for a sample schematic).

Figure 10. Design criteria and specifications for a placenta pit



Additional (transmission-based) precautions

Additional precautions, also known as transmission-based precautions, are used for patients who are suspected or have a confirmed infection with a highly transmissible or epidemiologically important pathogen. This set of additional measures are based on the specific mode of transmission for infectious diseases and meant to compliment standard precautions.

Additional precautions can be categorized into three main types:

- Contact
- Droplet
- Airborne

Such measures should be used whenever there is concern of transmission of an infectious disease, known or unknown. The role of health care workers is to recognize the potential signs and symptoms of infectious diseases in patients. This process should be done at point of entry (screening and triage) but also applied routinely for patients already admitted. Transmissible diseases do not always initiate from outside the facility, but can also be acquired while hospitalized. Implementation of empiric transmission-based precautions is a valuable intervention to stopping and/or preventing the spread of disease within hospital.

Contact precautions

In addition to standard precautions, use contact precautions for infectious diseases spread by direct or indirect contact (touch), described in Box 10. This is the most common route of infection transmission.

KEY TERMS DEFINED

Contact Transmission

Direct contact transmission: occurs when pathogens are transferred from person to person without a contaminated intermediate (e.g., body fluids from patient directly enter HCW or other patients body through mucous membrane or non-intact skin)
Indirect contact transmission: occurs when pathogens are transferred from person to person with a contaminated intermediate (e.g., contaminated hands, patient-care devices, instruments or toys)

Box 10. Types of contact transmission

See Table 11 for a complete list of requirements when implementing contact precautions when caring for a patient that is suspected or confirmed of having an infection or condition spread by contact.

Table 11. Requirements for contact precautions

Patient Placement	Preferred option: • Single room with dedicated toilet or latrine
	When the preferred option is not available: • Place patients with the same disease or similar symptoms together in the same area of the ward (cohort) • Ensure beds are spaced 2m (6 feet) apart • Assign one latrine bucket per patient • In outpatient settings, place patients in a separate examination room
Personal Protective Equipment (PPE)	All PPE must be donned before entering and doffed when exiting the patient room or ward. PPE for contact precautions include: • Gloves (required) • Gown (required) • +/- apron if large volumes of body fluids are anticipated or likely • +/- additional PPE based on risk assessment (see Table 15)
	PPE must be changed in between managing patients with different diseases; however, when managing patients with the same disease (cohort) hand hygiene between patients is sufficent.
	Always perform hand hygiene: • before donning PPE • after doffing PPE • whenever indicated and according to the WHO Five Moments of Hand Hygiene (Annex 11)
Patient transport	Transportation outside of the isolation room or ward should be limited. If deemed necessary, ensure the following: • that any part of the patient body that could shed infectious material (e.g. wound dressing) is covered or contained • that the receiving facility or department is notified that the patient is under contact isolation • PPE used to prep the patient for transport is removed, hand hygiene performed and new, clean PPE is donned for patient transport • that the patient room is cleaned and decontaminated • that transportation device is cleaned and decontaminated in between use
Equipment	Preferred option: 1. Reusable equipment should be dedicated to the patient whenever possible
	When the preferred option is not available: 1. Ensure equipment is cleaned between each use 2. Ensure equipment is safely stored in between use
Environment	Preferred option: • Rooms should be cleaned twice daily, especially all frequently touched surface areas
	When the preferred option is not available: • Rooms should be cleaned at least once daily with special attention to all frequently touched surface areas

Droplet precautions

In addition to standard precautions, use droplet precautions for infectious diseases spread by large particle droplets (defined as greater than 5 microns). These precautions reduce the risk of pathogens transmitted by droplets which are generated by coughing, sneezing or talking. Particles do not remain in the air for long durations, nor travel further than 2 meters in distance.

See Table 12 for a complete list of requirements when implementing droplet precautions when caring for a patient that is suspected or confirmed of having an infection or condition spread by large droplet particles.

Table 12. Requirements for droplet precautions

Patient Placement	Preferred option: • Single room with good ventilation
	When the preferred option is not available: • Place patients with the same disease or similar symptoms together in the same area of the ward (cohort) • Patients can be placed in a multi-bedded room, however, should not be placed in a room with severely immunocompromised patients • Ensure beds are spaced 2m apart • In outpatient settings, place patients in a separate examination room
Personal Protective Equipment (PPE)	All PPE must be donned before entering and doffed when exiting the patient room or ward. PPE for droplet precautions include: • Face protection (required) – face shield OR goggles + surgical mask • +/- additional PPE based on risk assessment (see Table 15)
	PPE must be changed in between managing patients of different diseases; however, when managing patients with the same disease (cohort) hand hygiene between patients is sufficient.
	Always perform hand hygiene: • before donning PPE • after doffing PPE • whenever indicated and according to the WHO Five moments of Hand Hygiene (Annex 11)
Patient transport	Transportation outside of the isolation room or ward should be limited. If deemed necessary, ensure the following: • patients don a surgical mask if tolerated ▷ If patients cannot tolerate wearing a mask, instruct them to follow respiratory hygiene principles • PPE used to prep the patient for transport is removed and hand hygiene performed ▷ If patients are wearing a facemask during transport, HCWs do not need to wear additional PPE ▷ If patient cannot tolerate wearing a facemask, HCWs should don new PPE for patient transport (therefore carry PPE with you or ensure PPE readily available in room/ward) • That the receiving facility/department is notified that the patient is under droplet isolation • Transportation device is cleaned and decontaminated in between use
Equipment	Preferred option: • Reusable equipment should be dedicated to the patient whenever possible
	When the preferred option is not available: • Ensure equipment is cleaned between each use • Ensure equipment is safely stored in between use
Environment	Preferred option: • Rooms should be cleaned twice daily, especially all frequently touched surface areas
	When the preferred option is not available: • Rooms should be cleaned at least once daily with special attention to all frequently touched surface areas

Airborne precautions

In addition to standard precautions, use airborne precautions with infectious diseases that are spread by tiny particles (defined as equal to or smaller than 5 microns and during aerosol-generating procedures e.g. suctioning of respiratory secretions on patients with droplet transmitting diseases or conditions). These particles can remain in the air for several hours and travel far distances on air currents.

See Table 13 below for a complete list of requirements when implementing airborne precautions when caring for a patient that is suspected or confirmed of having an infection or condition spread by tiny droplet particles.

Table 13. Requirements for airborne precautions

Patient Placement	Preferred options (in order of priority): • Single room with negative pressure (exhausted directly to the outside) OR • Air-conditioned, single room with direct exhaust outside OR Single room with natural ventilation ▷ Exhaust fan or similar portable option to help direct air flow towards the window, leading directly outside ▷ Windows open and doors closed OR • all windows and doors open **but only** if they lead directly outside. If not directly outside, keep door closed.
	When the preferred option is not available: • Place patients with the same disease or similar symptoms together in the same area of the ward (cohort) • Ensure beds are spaced 2m apart • In outpatient settings, place patients in a separate examination room and provide them with a mask
Personal Protective Equipment (PPE)*	All PPE must be donned before entering and doffed when exiting the patient room or ward. PPE for droplet precautions include: • Face protection (required): N95 respirator • +/- additional PPE based on risk assessment (see Table 15)
	PPE must be changed in between managing patients of different diseases; however, when managing patients with the same disease (cohort) hand hygiene between patients is suffice.
	Always perform hand hygiene: • before donning PPE • after doffing PPE • whenever indicated and according to the WHO Five Moments of Hand Hygiene (see Annex 11)
Patient transport	Transportation outside of the isolation room should be limited. If deemed necessary, ensure the following: • patients don a surgical mask if tolerated ▷ If patients cannot tolerate wearing a mask, instruct them to follow respiratory hygiene principles • PPE used to prep the patient for transport is removed and hand hygiene performed ▷ If patients are wearing a facemask and all lesions or wounds covered and contained during transport, HCWs do not need to wear additional PPE ▷ If patient cannot tolerate wearing a facemask and wounds and lesions cannot be covered during transport, HCWs should don new PPE for patient transport • The receiving facility/department is notified that the patient is under airborne isolation • Transportation device is cleaned and decontaminated in between use
Equipment	Preferred option: Reusable equipment should be dedicated to the patient whenever possible
	When the preferred option is not available: 1. Ensure equipment is cleaned between each use 2. Ensure equipment is safely stored in between use
Environment	Preferred option: • Rooms should be cleaned twice daily, especially all frequently touched surface areas • Room should be allowed for full air exchange (1hr) after patient discharge • Air conditioning filters and ceiling fans should be regularly cleaned***. They should never be used in high-risk areas such as operating rooms.

When the preferred option is not available:
- Rooms should be cleaned at least once daily with special attention to all frequently touched surface areas
- Room should be allowed for full air exchange (1hr) after patient discharge

* In case of chickenpox or measles, HCWs with documented immunity do not need to wear face protection.
** The maximum time that HCWs are expected to use the respirator is based on comfort, practicalities and hygiene
*** air conditioning filters should be cleaned every 3-9 months, and ceiling fans every week

Tables 14 and 15 on the following pages provide a summary of high priority epidemic prone diseases reported through IDSR and describe the necessary additional precautions for health care workers to take when treating patients with these diseases.

Table 14. Descriptions of selected epidemic prone diseases reported through IDSR and precautions for health care workers

Disease**	Signs and symptoms (health care facility case definition)	Type of Precautions
Cholera	Any person 5 years of age or more who develops severe dehydration or dies from acute watery diarrhea	Contact (if patient is diapered/ incontinent)
Diarrhea with blood (Shigellosis)	Any person with diarrhea and visible blood in the stool	Contact
Measles	Any person with fever and maculopapular (non-vesicular) rash and cough, coryza (nasal discharge) or conjunctivitis (red eyes) or any person in whom a clinician suspects measles.	Airborne
Meningitis	Any person with sudden onset of fever (>38.5 C rectal or 38 C axillary) and one of the following signs: neck stiffness, altered consciousness or other meningeal signs	Droplet for at least 24h after starting appropriate antibiotic therapy
Viral hemorrhagic fevers (e.g. Ebola, Lassa Fever)	Any person, alive or dead with onset of fever and no response to usual causes of fever in the area, and at least one of the following signs: bloody diarrhea, bleeding from gums, bleeding into skin (purpura), bleeding into eyes and urine OR clinical suspicion of EVD	Droplet + contact (N95 for potential aerosol generating procedures)
Acute Flaccid Paralysis (Poliomyelitis)	Any child less than 15 years of age with acute flaccid paralysis or a person with paralytic illness at any age in whom the clinician suspects poliomyelitis	Contact
Human Rabies	Any person with one or more of the following: headache, neck pain, nausea, fever, fear of water, anxiety, agitation, abnormal tingling sensations or pain at the wound site, when contact with a rabid animal is suspected.	Standard Precautions

Source: Liberia MOH 2016 Integrated Disease Surveillance and Response Guidelines

Table 15. PPE recommendations for selected epidemic prone diseases

	Cholera/ Shigella	Measles	Meningitis	Acute Flaccid Paralysis (Polio)	Viral Hemorrhagic Fevers (e.g., Ebola, Lassa, Yellow Fever)	Pulmonary tuberculosis	Influenza
Scrubs	X	X	X	X	X	X	X
Covered shoes (preferably boots)	X	X	X	X	X	X	X
Gloves	X	i	i	X	X	i	i
Gown	X	ii	ii	X	X	ii	ii
Apron	Iii	iii	iii	iii	X	Iii	iii
Hair cover					X		
Surgical mask	iv	v	X	iv	X	v	X
Respirator (e.g., N95)		X			X	X	
Face shield	vi	vi	X	vi	X	vi	X
Goggles + mask	vii		X (If face shield not available)	vii	X (If face shield not available)	vii	X (If face shield not available)

I Based on risk assessment and likelihood of direct contact with blood or body fluids or touching contaminated equipment or surfaces.
ii Based on risk assessment and the likelihood of splashes or sprays form blood or other body fluids.
iii Based on risk assessment and the likelihood of contact with large or excessive amounts of body fluids (e.g., during delivery or invasive surgical procedures).
iv Based on risk assessment and the likelihood of splashes or sprays directly to the face
v Surgical masks not a suitable alternative when N95 respirators are indicated for microorganisms spread by airborne route.
vi Based on risk assessment and the likelihood of splashes or sprays directly to the face.
vii Based on risk assessment and the likelihood of splashes or sprays directly to the face; a substitute for when face shields are indicated, but unavailable.

Isolation in health facilities

This section provides an overview of recommended isolation procedures and protocols when caring for patients under isolation. *Isolation is defined as the separation of infected individuals from those uninfected for the period of communicability of a particular disease.*[30] Isolation creates a barrier to prevent the transmission of infectious disease from one patient to another, health care professionals, and visitors. Isolation precautions are special precautionary measures, practices, and procedures used in the care of patients with contagious or communicable diseases. Isolation rooms, wards or units are available within the Liberian health system; however, their capacity vary by and even within facility type (clinic vs health center vs hospital).

Control at point of access

Control at point of access is used to prevent the spread of microorganisms from a contagious source. In any care setting, patients and other people with symptoms should receive instruction from the first point of access (e.g. screening, triage, waiting area, and consultation rooms) and in strategic locations within the health care facility. Measures should be implemented to develop a source control programme. Source control measures are, amongst others:

- Signs at the entrance indicating signs and symptoms of infectious diseases (passive screening);
- Hand hygiene stations available at all entrances and exits;

30 https://medical-dictionary.thefreedictionary.com/isolation+precautions

- Identification, diagnosis and early treatment of infections (e.g. tuberculosis, cholera, Ebola);
- Respiratory hygiene.

Following lessons learnt from the EVD outbreaks, the Ministry of Health endorsed standardized triage and isolation units (previously also known as "UNOPS" structures) at referral health care facilities (mainly hospitals). See Annex 29 for the design of the small triage and isolation structure prototype. These structures are used to promptly screen, isolate, treat and, when required, refer cases of priority infectious diseases to regional specialized isolation units.

Screening

Screening is a process aimed to early identify patients presenting with potentially highly infectious diseases before entering a health care facility; hence, all patients entering an HCF should be screened for potential signs and symptoms.

General screening process for all health facilities in Liberia:

1. **SCREEN** all persons entering the health care facility for symptoms of infectious diseases;
2. **ISOLATE** symptomatic persons immediately in an isolation room;
3. **NOTIFY** the clinician so that the isolated patient can be further evaluated and, if required, referred to the appropriate isolation ward or facility.

A standardized screening form with set questions and an algorithm for non-outbreak settings has been validated by MoH and NPHIL (see Annex 30); this should be laminated and posted at all screening booths in triage facilities, for easy access for the screeners. Screeners should be clinicians, however in facilities with limited human resources, they may be non-clinicians (e.g., nurse-aides). This screening algorithm will be modified during outbreak periods, in accordance with outbreak case definitions.

Isolation, management and referral

In alignment with the IDSR epidemic prone diseases (see Table 16) all suspected infectious patients will immediately be isolated and management initiated at the presenting facility.

There are numerous levels of isolation capacity within Liberia, and patients are managed accordingly:

1. For suspect cases presenting at health clinics and health centers they will be screened, promptly isolated, blood specimen taken where feasible, management initiated and then referred to the district/county referral hospital for ongoing management (the isolation referral flow chart is included as Annex 31);
2. For suspect cases presenting at the county hospital with triage and isolation units, patients will be screened at triage, and then admitted to the 2-bedded isolation room within the triage unit, where they will be managed until a laboratory confirmation is available or clinical diagnosis is made; pending results and the local capacity the case will continue to be managed at the triage and isolation unit, admitted to a ward at the same hospital, referred to a regional isolation center or discharged (the triage and isolation unit SOP is included as Annex 32).
3. Suspect and/or confirmed cases will be referred from the clinics, health centers or county hospital to regional isolation units for further management until patient discharge. In general regional isolation units will not receive patients directly from the community.

Table 16. List of epidemic prone diseases reported through IDSR

	Disease
1	Acute bloody diarrhoea (Shigella)
2	Cholera (severe acute watery diarrhoea)
3	Human influenza
4	Monkeypox
5	Measles
6	Meningitis (bacterial)
7	Pertussis (whooping cough)
8	SARS (Severe Acute Respiratory Syndrome)
9	Viral Haemorrhagic Fevers (includes Lassa, Ebola, Marburg, CCHF)
10	Other PHEIC (public health event of international concern; includes zoonotic, foodborne, chemical, radio nuclear, or due to unknown conditions)

IPC during outbreaks

IPC is a key component of outbreak prevention and response. Outbreaks can occur at two levels:

1. Facility and/or
2. Community level

When an outbreak only occurs within the facility (e.g. E. coli) the interventions to address the outbreak may be different than in community (public health interventions). The facility IPC focal person and outbreak management team (including lab technician) will be actively involved in identification and diagnosis of the source and implementing control measures within the facility to ensure that the outbreak does not spread to the community.

With respect to community outbreak response, the National Technical Guidelines for Integrated Disease Surveillance & Response (IDSR) and National Epidemic Preparedness and Response Plan (EPR plan) describe the county IPC pillar and taskforce roles & responsibilities. Although cases identified in the community will be managed at facility level, by ensuring prompt isolation of the case transmission will not occur within the facility.

Standard operating procedures specifically related to IPC practices during a viral haemorrhagic fever (VHF) outbreak, including HCWs risk exposure assessment and IPC ring activation (amongst others), are available in the MOH/ NPHIL VHF Outbreak SOP Compendium (2018).

IPC considerations for invasive devices and surgical procedures

Good IPC practices must be applied in the context of common clinical procedures, such as insertion and management of invasive devices like peripheral venous catheters and urinary catheters and during surgical procedures. Breaches in IPC in these situations can lead to common HAIs, such as bloodstream infections (BSI), urinary tract infections (UTI), and surgical site infections (SSIs).

Peripheral venous catheters

Intravascular devices inserted into the venous or arterial bloodstream penetrate the skin and provide a route for microorganisms to enter the bloodstream either during time of insertion or subsequent contamination of the device or attachments during line maintenance. Peripheral venous catheter infections may be localized to skin and soft tissue infections (exit site infection) and, in more severe cases, cause bloodstream infections (with little or no evidence of infection at the catheter site).
Hand hygiene must be performed prior to and after inserting, accessing, maintenance and removing peripheral venous catheter (see Annex 33 for hand hygiene guidance in this context). To prevent bloodstream infection due to peripheral venous catheter the following measures should be taken (also found as an SOP in Annex 34):

1. Order for insertion:
   - This is done by a trained clinician

2. Insertion :
   - Explain the procedure to the patient and obtain consent
   - Avoid intravascular catheterization whenever possible
   - Always perform hand hygiene (with ABHR or soap and water) and use clean gloves when inserting intravenous (IV) catheters
   - Always perform skin antisepsis at the site of insertion. If visibly dirty, wash first then dry before applying skin antiseptic. Site should be dry before inserting IV catheter
   - Always use sterile equipment and follow aseptic non-touch technique
   - Use sterile plaster (ideally transparent) to cover the site and fix the IV device accordingly
   - Record time and date of insertion in the patient chart and on adhesive tape
   - For peripheral IV lines avoid using the lower limbs (including groin area), if possible as these are more likely to become infected

3. Maintenance:
   - Inspect the IV site daily and remove immediately if signs of infection are observed or if the IV is no longer necessary. One of the most important principles of safe management of peripheral IV related infection is early removal of the device.
   - Always document clinical observations
   - If dressings are removed to inspect the site, discard appropriately and use a new dressing
   - Keep site dry, free from contamination, and secure.
   - If dressing becomes soiled, loosened or wet change immediately.
   - Close injection ports that are not needed with sterile stopcocks.
   - Ensure that infusion fluid is free from contamination – no cloudiness, no sediments, and not expired.
   - Administration sets should be changed:
     - Immediately after using blood/blood products
     - Within 24hrs after using lipids/parenteral nutrition
     - Any time there are signs of infection or after 96 hours
   - Routine change of intravascular catheters more frequently than every 72-96 hours is not necessary provided that there is no evidence of infection and there is no resistance to injection or fluid administration;
   - Appropriately dispose of IV line and any remaining fluid when infusion is replaced or discontinued;
   - Needle and catheter should be disposed of using sharps containers.

4. Removal:
   - Practice hand hygiene;
   - Put on examination gloves;
   - Check the patient's hand or wrist for phlebitis or evidence of infection. If phlebitis is associated with other signs of infection, such as fever or pus coming from the exit site, this is classified as a clinical exit-site infection;
   - Carefully remove the needle or the plastic catheter with one hand and with the other hand cover the insertion site with sterile gauze;
   - Press the insertion site firmly for about a minute and cover it with a sterile plaster;

- Dispose of waste appropriately, remove gloves, and perform hand hygiene;
- Document clinical observations of IV site (ex. Intact without signs/symptoms of infection, warm, erythema, pus, etc.) in patient record.

Urinary catheterization

Urinary tract infections (UTI) are one of the most common HAIs. The majority of UTIs acquired in hospitalized patients are associated with the use of urinary catheters; these types of infections are called catheter-associated urinary tract infections (CAUTI). When a catheter is used, this creates a direct pathway for bacteria to enter the bladder, causing infections. Urinary catheters should only be inserted when medically necessary. Some indications include:

- Relief of urinary tract obstructions
- Urinary drainage in patients with neurogenic bladder dysfunction and urinary retention
- Urologic surgery or other surgeries on contiguous structures
- Accurate measurement of output in critically ill patients
- Radiological investigations
- Patients should not be considered to have a CAUTI and receive antimicrobial treatment solely based on discoloration of the urine, odor, or because of a positive laboratory culture from the urine. Unless the patient has clinical features of infection (e.g. fever, rigors, other systemic features) they should not be considered to have catheter related UTI.

Other safe, alternative methods for managing urinary tract problems are available and should be considered before the use of indwelling catheters. These include:

- intermittent catheterization using a sterile straight catheter
- condom catheters for male patients
- adult diaper pads, bladder retraining, or stimulating urination with running water from tap

Hand hygiene must be performed prior to and after inserting, handling, and removing urinary catheters (see Annex 35 for hand hygiene guidance in this context). To prevent infection as a result of urinary catheterization, the following measures should be taken (also found as an SOP in Annex 36):

1. Insertion:
   - Explain the procedure to the patient and obtain consent
   - Have an assistant available (if possible)
   - Ensure you have sterile materials at the point of care:
     - sterile indwelling urinary catheter (single-use)
     - sterile drape
     - sterile syringe filled with sterile water
     - clean examination gloves and sterile gloves
     - antiseptic solution (2 % aqueous chlorhexidine gluconate or 10 % povidone-iodine)
     - sterile gauze or sponge-holding forceps
     - single use lubricant
   - Practice aseptic non-touch technique
   - Perform hand hygiene and put on clean examination gloves
   - Clean with soap and water and rinse the uretheral area and external genitals carefully and thoroughly
   - Separate and hold the labia apart or hold the head of penis with the non-dominant hand and prepare the urethral area with the antiseptic solution using sterile gauze or sponge forceps with sterile gauze
   - Perform hand hygiene and put on sterile gloves
   - Grasp the catheter about 5 cm from the catheter tip with the dominant hand and place the other end in the urine collection bag
   - Gently insert the catheter until urine flows, then for a further 5 cm. Inflate the balloon.
   - All procedures involving the catheter and drainage system should be documented in the medical or nursing notes. These should include:
   - Date of catheter insertion and removal
   - Type and size of catheter
   - Volume of water in the balloon

2. Maintenance:
   - Daily review of urinary catheter necessity. If no longer required, remove as soon as possible, preferably within 24 hours
   - Daily cleaning of the periurethral area. The urine bag should not be resting on the floor.
   - Urine flow through the catheter should be checked several times a day to ensure that the catheter is not blocked
   - Avoid raising the collection bag above the level of the bladder. If it becomes necessary, clamp the tubing beforehand
   - Before the patient stands up, drain all urine from the tubing into the bag
   - Perform hand hygiene and put on clean examination gloves then remove the urine
   - To avoid contamination, the collection bag should be emptied in a clean bucket, without the tip touching
   - If a sample is required, collect the urine from the needleless sampling port with a sterile needle
   - Unless obstruction is anticipated, bladder irrigation is not recommended

3. Removal:
   - Indwelling urinary catheters should be removed as soon as possible to reduce the risk of UTI
   - Before removing the catheter, ensure that all necessary materials are available at the point of care:

    - Clean examination gloves
    - Sterile syringe
    - Antiseptic solution (2 % aqueous chlorhexidine gluconate or 10 % povidone-iodine)
    - Sponge forceps
    - Sterile gauze
- Perform hand hygiene and put on clean gloves
- Empty the catheter balloon using a syringe, compare the volume removed to that inserted. It should be the same volume.
- Swab the urethra two times with an antiseptic solution using forceps with sterile gauze
- Gently remove the catheter
- Dispose of all waste appropriately
- Remove gloves and perform hand hygiene

Surgical procedures

Surgical site infections (SSIs) are often the result of contamination during surgery or surgical wound after the procedure. SSIs, like most other types of HAIs, can delay recovery, increase length of stay and increase health care costs as they often require additional surgical procedures as treatment. Risk factors that increase vulnerability to SSIs include:

- Patient age (e.g., elderly and neonates), pre-existing co-morbidities (e.g., diabetes), and nutritional status (e.g., obesity);
- Type of surgery to be performed;
- Duration of surgery, hemorrhage and hematomas, degree of tissue trauma, and location and types of drains used;
- Inappropriate antibiotic prophylaxis, inadequate skin preparation and care, unsuitable theatre environment, and excessive staff movement;
- Inadequate sterilization and reuse of processed invasive devices;
- Prolonged post-operative stays in the surgical ward and the use of inappropriate postoperative wound care techniques.

To prevent infection as a result of surgery, the following broad areas need to be considered:

- Environmental controls during surgery
- Peri-operative measures (pre-, intra and post-operative)

A summary of priority recommendations to prevent surgical site infections can be found in Annex 37.

Environmental controls

Infrastructural prerequisites

- Ensure that ceilings in operating theatres are smooth, washable, and made of a solid surface free from cracks and crevices;
- Seal all ceiling-mounted lights or fixtures;
- Ensure that walls are water-impermeable, cleanable and resistant to cracks;
- Keep floors smooth, slip resistant and robust enough to withstand frequent washings and harsh cleaning/ scrubbing.

Ventilation and temperature controls

- Maintain good ventilation. Ideally air should flow from the most to least clean areas (positive pressure differential – air flowing from operating theatre to corridor);
- Introduce air at the ceiling and exhaust near the floor;
- If the operating theatre is not equipped with a positive-pressure system, focus on less expensive strategies, such as:
- Keeping doors and windows closed. If this is not possible, ensure they are covered with insect proof netting;
- Keeping personnel to a minimum during a procedure and restrict personnel once the operation has started (unless it is absolutely essential);
- Absolutely minimizing talking, moving, and opening and closing of doors;
- Keep the temperature of the operating theatre between 20°C – 23°C (68°F – 75°F] and if feasible, general humidity levels at 30-60%.

Cleaning

- All theatres should be cleaned at the start and end of each day, as well as between patients/cases (see Annex 27 for SOP on cleaning OT);
- Always keep operating theatres clean, dry and dust free;
- Avoid unnecessary clutter to aid cleaning. The theatre should be free of all items other than the equipment necessary to perform the surgical procedures;
- Do not clean any instrument in the operating theatre after an operation but rather send to the designated decontamination area.

Peri-operative measures

While surgical procedures are intended to save lives, unsafe surgical care can cause substantial harm.[31] The WHO Surgical Safety Checklist was developed aiming to decrease errors and adverse events, and increase teamwork and communication in surgery. The 19-item checklist has gone on to show significant reduction in both morbidity and mortality and is now used by a majority of surgical providers around the world. The checklist identifies three phases of an operation, each corresponding to a specific period in the normal flow of work: before the induction of anaesthesia ("sign in"), before the incision of the skin ("time out") and before the patient leaves the operating room ("sign out"). In each phase, a checklist coordinator must confirm that the surgical

31 http://www.who.int/patientsafety/safesurgery/en/

team has completed the listed tasks before it proceeds with the operation (see Annex 38 for WHO Surgical Safety Checklist).

Additional recommendations for the prevention of surgical site infections can be found below.

Preparation of the patient

- Pre-existing conditions should be addressed and stabilized prior to any operation;
- Surgical antibiotic prophylaxis (SAP) is recommended for procedures with significant risk of infection (for example, surgery that involves entering the colon);
  - Where feasible, it is recommended that health care facilities develop local surgical antibiotic prophylaxis policy based on international guidelines. Antibiotic prophylaxis should be considered for:
    - clean surgery involving the placement of a prosthesis or implant
    - clean-contaminated surgery
    - contaminated surgery
    - surgery on a dirty or infected wound (requires antibiotic treatment in addition to prophylaxis)
  - The antibiotics selected for prophylaxis must cover the expected pathogens for that operative site. The prophylactic antimicrobial drug(s) should be directed against the most likely infecting organisms;
  - Selection of antimicrobial drug (s) for surgical prophylaxis should take account of local/national data on antimicrobial resistance (if available);
  - If surgery is prolonged (>4hrs), if major blood loss occurs, or if an antimicrobial with a short half-life is used, one or more additional doses should be given;
  - Narrow spectrum, less expensive antibiotics should be the first choice for prophylaxis during surgery;
  - A single dose of intravenous antibiotic with a long enough half-life to achieve activity throughout the operation is recommended and this should be given within 120 minutes before the skin is incised.
    - There is no additional value in administering additional doses of intravenous antibiotic after the incision is made.
  - Prolonging of antibiotic prescription should be avoided during the post-operative period in the absence of an infection;
- Avoid preoperative shaving as hair should not be removed at the operative site. If hair is to be removed, consider the following:
  - Preoperative shaving with a razor should be avoided;
  - Only the area needing to be incised should be shaved;
  - Use clippers and remove hair immediately before incision;
- Avoid prolonged preoperative hospitalization and recommend ambulatory surgery as often as possible;
- Preoperative showers are preferable; patient should be instructed to shower or bathe the night before an operative procedure;
- Sterile drapes should be applied after proper asepsis which must be maintained throughout the surgical procedure.

Preparation of the surgical team

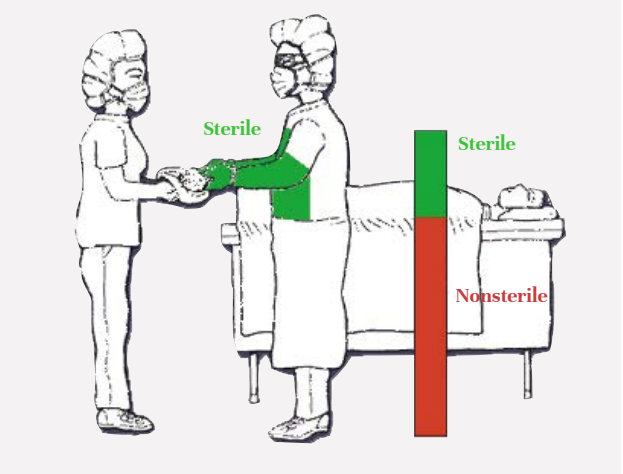
- Ensure surgical team is adequately trained and experienced
- A surgical hand decontamination (scrub) should be undertaken before every invasive procedure to ensure effective surgical hand decontamination (see annex 10)
- It is necessary to perform surgical hand preparation either by scrubbing with a suitable antimicrobial soap (i.e. 4% chlorhexidine based product) and water or using a suitable ABHR before donning sterile gloves:
  - If using antimicrobial soap and water, running water is preferred; however, when no running water is available, use a bucket with a tap or use a buddy to pour the water directly
  - The purpose of antiseptic solutions such as Chlorhexidine gluconate or iodo- phores is to reduce the microbial load significantly and suppress regrowth for as long as possible thus reducing the risk of contamination at the operating site
- Proper surgical hand scrubbing for 3-5 minutes and the wearing of sterile gloves and a sterile gown provide the patient with the best possible barrier against pathogenic bacteria in the environment and against bacteria from the surgical team;
- Standard hand care and rules apply;
- All jewelry should be removed before entering the scrub area;
- Staff should wear short sleeved shirts / scrubs to allow thorough decontamination of the forearms;
- The following PPE should be worn:
  - Sterile gloves of good quality and the correct fit/ size
  - Disposable hats/hoods should completely cover the hair (including facial hair and sideburns)
  - Masks to completely obscure the mouth and nose. They should be removed at the end of each case
  - N95 masks must be available for procedures where there is a risk of exposure to TB or other airborne pathogens
  - Full face shields/visors or protective goggles must be available for all staff
  - Scrub gowns should be fluid repellent and disposable or reusable. If reusable, should be

laundered according to linen management protocols
    - ▷ Staff should wear closed toe non-slip footwear
        - – Boots should be worn if there is a high risk of heavy blood/body fluid loss
        - – Staff should not leave the operating theatre wearing shoes that are visibly stained

Intra-operative measures

- In the surgical room, prepare a wide area around the proposed incision site with antiseptic solution (2% alcohol chlorhexidine is generally appropriate). Always follow the brand recommendation for appropriate application and drying time
    - ▷ If area is heavily soiled, wash with soap and water and dry before applying antiseptic solution
- Practice good surgical techniques that minimize tissue trauma, control bleeding, eliminate dead space, use minimal sutures, and maintain adequate blood supply and oxygenation;
- Keep the duration of surgical procedures as short as possible. The rate of infection doubles with each hour of surgery;
- Only sterile objects and personnel dressed in sterile attire should be allowed within the sterile field (see Figure 11);
- A properly gowned and gloved provider's sterile area extends from the chest to the level of the sterile field;
- Areas below the level of the draped patient are considered non-sterile;
- Once a sterile object comes in contact with a non-sterile object, person, dust, or other airborne particles, the object is no longer considered sterile. Only sterile items are free of potentially harmful microorganisms;
- Do not allow non-sterile personnel to reach across the sterile field or to touch sterile items;
- Open, dispense, and transfer items without contaminating them;
- Do not place sterile items near open windows or doors;
- If a sterile barrier has been wet, cut, or torn, consider it contaminated;
- Be conscious of where your body is at all times;
- Ensure safe management of sharps.

Figure 11. Maintaining a sterile field during a surgical procedure



Postoperative measures

- Hand hygiene must be performed before caring for a patient with a post-operative surgical wound (see Annex 39 for hand hygiene considerations while managing post-operative wound);
- Healthy tissue growth is damaged when dry gauze is removed from surgical wounds. Moisten the dry gauze with sterile normal saline solution before removing it;
- In an effort to reduce health care-associated pneumonia, surgical units should have effective plans for postoperative management that include:
    - ▷ Provide adequate pain control for patient comfort and to facilitate movement and encourage deep breathing/coughing
    - ▷ Move and exercise patients daily to prevent skin breakdown and pressure sores
    - ▷ Encourage deep breathing/coughing in the immediate postoperative period and for the next few days
    - ▷ Encourage early mobilization of patients
    - ▷ Ensure adequate nutrition
- Do not continue SAP after the completion of the operation. In addition to the potential adverse events and contribution towards AMR, there is increasing evidence suggesting no additional benefit in prolongation of SAP.

IPC considerations in facility design

The design, planning, construction, refurbishment and ongoing maintenance of the health care facilities are connected to the prevention and control of infection. A high standard of environmental hygiene is needed to minimize the risk of transmission of infection. It is important that IPC is included at the planning and design stage of a new building or refurbishment of a facility. Including IPC means that designers, architects, engineers (MoH Infrastructure Unit) and planners should work in collaboration with the IPC team to deliver a facility in which IPC needs have been planned for, anticipated and met. IPC standards shall be adhered to when designing new facilities or renovation of facilities and be applicable to both public and private. To ensure this, the national IPC team shall be part of planning and implementation.

The facility should be designed to promote IPC best practices and support quality care delivery; specific issues to be addressed by the IPC team at the planning stage will include:

- Handwashing station;
- Bed spacing;
- Ventilation;
- Flooring;
- Laundry room;
- Cleaners room;
- Furnishing and fitting;
- Incinerator;
- Appropriate finishes which permit efficient cleaning methods, equipment and safe chemicals to be used;
- Types and number of isolation facilities;
- Storage (including waste collection points and delivery areas) and equipment cleaning, disinfection, and sterilization area;
- Disability access;
- Advising on dust and debris minimization during construction related activities (i.e. temporary barriers encasing work areas)

Dust particles contaminated with bacteria and fungi can be dispersed during construction, which may be of health risks for patients, staff, and visitors. Early planning in construction and renovation projects must integrate infection prevention and control, engineering services, and building design to prevent health care-associated infections, and minimize allergen load and other workplace hazards.[32]

32 http://publications.gc.ca/collections/collection_2016/aspc-phac/HP3-1-27-S2-eng.pdf

Laboratory safety

Introduction

Any laboratory worker handling clinical specimens, including blood or potentially infected boy fluids is at risk of accidental injury or exposure to infection, especially when standard precautions are not followed for all patient specimens. People working in clinical, public health laboratories or research units that handle clinical specimens and/or pathogenic microorganisms for bacteriology, mycology, parasitology, virology, clinical chemistry, molecular biology, hematology, immunology, and pathology laboratories are most at risk.

The validity of laboratory test results is as much a function of the laboratory analysis as of the proper collection and handling of specimens. Specimens from all patients should be handled as potentially infectious. Health care workers should be supported to implement the safe and appropriate collection and transport of specimens.

All specimens of blood and body fluids should be put in a well-constructed container with secure lid to prevent leaking during transport. Care should be taken when collecting each specimen to avoid contaminating the outside of the container and the laboratory form accompanying the specimen.

A well-designed laboratory, suitable equipment and well-trained staff, all contribute to the protection of workers. The primary goal of this section is to provide basic information on laboratory bio-safety. More in-depth information can be found in manuals detailing laboratory safety practices.

Classification of biological agents

The inherent risks of a pathogen are judged according to:

- The severity of the disease it causes
- Routes of infection
- Its virulence and infectivity
- Existence of effective therapies
- Existence of vaccine
- Presence or absence of vectors.

Biological agents are classified into four risk groups, which primarily reflect the judgments made on their inherent risk. There are four corresponding levels of containment, described in Table 17.

Table 17. Summary of risk groups and level of containment

Risk Group	Biosafety Level	Description of organism type	Containment Level	Examples of pathogens handled at this level
1	Basic - Biosafety Level 1	Agents most unlikely to cause human disease	Good microbiological practice recommended for all work with microorganisms should minimize risks for inadvertently culturing pathogenic organisms or nonpathogenic organisms proving harmful Basic teaching laboratory	Bacillus subtilis
2	Basic - Biosafety Level 2	Agents that may cause human disease and may be a hazard to laboratory workers but unlikely to spread to community Laboratory exposure rarely produces infection Effective prophylaxis or treatments are usually available	Good microbiological practice is mandatory, including protective clothing and biohazard sign Most work can take place on open bench but safety cabinets are required for operations generating significant aerosols Diagnostic services Research Laboratory	Salmonella spp. Shigella spp. Streptococcus pneumoniae Staphylococcus aureus Cryptococcus neoformans
3	Containment Biosafety Level 3	Agents that may cause serious human disease and may be a hazard to laboratory workers There may be high risk of spread to community Effective prophylaxis is usually available	Risks of airborne contamination reduced by working in biosafety cabinets (Level 1 or 2) Restricted access Directional airflow	Mycobacterium tuberculosis Histoplasma capsulatum Bacillus anthracis
4	Containment Biosafety Level 4	Agents that cause severe human disease and are a serious hazard to laboratory workers. May be high risk of spread to community. Usually no effective prophylaxis or treatment available	Work performed in closed cabinets in maximum containment laboratories with airlock entry and shower exit, special waste disposal Special considerations may be made depending on the technology employed for diagnosis, e.g PCR (GeneXpert) vs virus culture	Ebola virus Marburg Virus

Source: WHO Laboratory Biosafety Manual, 3rd Edition, 2004

Biosafety guidelines

- All laboratory personnel and others whose work requires them to enter the laboratory must be knowledgeable about the chemical and biological hazards with which they will come in contact through their normal work in the laboratory, and be trained in appropriate safety precautions and procedures.
- All situations in the laboratory that should be dealt with as an emergency should be clearly identified and made known to all who work in or make use of or access the laboratory.
- All personnel working in the laboratory should be competently trained to deal with emergency procedures.
- All laboratories must have clear written procedures for dealing with spillages or other accidental contamination.
- The laboratory should be kept neat, orderly and clean, and storage of materials not pertinent to the work shall be minimized.
- Protective laboratory clothing (uniforms, coats, gowns) should be made available, and worn properly by all personnel including visitors, trainees, and others entering or working in the laboratory. Protective laboratory clothing should not be worn in non-laboratory areas. Suitable footwear with closed toes and heels and preferably with non-slip soles should be worn in all laboratory areas. Safety face and eyewear, (e.g. glasses, goggles, face shields, or other protective devices) should be worn when necessary to protect the face and eyes from splashes, impacting objects, harmful substances, UV light, or other rays. Contact lenses should be worn only when other forms of corrective eyewear are not suitable, and always with goggles.
- Eating, drinking, smoking, storing food or utensils, reading newspapers, applying cosmetics, and inserting or removing contact lenses should not be permitted in any laboratory work area.
- Long hair should be tied back or restrained.
- Oral pipetting is prohibited in any laboratory.
- When using hypodermic needles and syringes extreme caution should be used to avoid needle-stick injury and the generation of aerosols during use and disposal. Needles should not be bent or recapped, and should be promptly placed in a puncture-resistant sharps container for disposal.
- Latex gloves should be worn for all procedures that might involve direct skin contact with toxins, blood, infectious materials, or infected animals. Gloves shall be removed carefully and treated and disposed as infectious waste. Heavy duty rubber gloves shall be decontaminated as per existing guidelines.
- Hands should be washed after removal of gloves, before leaving the laboratory and at any time after handling materials known or suspected to be contaminated.
- Work surfaces should be cleaned and decontaminated with suitable disinfectant at the end of the day and after any spill of potentially dangerous material. Loose or cracked work surfaces should be replaced.
- All technical procedures should be performed in a manner that minimizes creation of aerosols.
- All contaminated or infectious liquid or solid materials including patient specimens and culture plates, should be autoclaved before disposal or reuse or disposed as biological waste. Contaminated materials that are to be autoclaved or incinerated at a site away from the laboratory shall have the outside disinfected chemically or be double-bagged and then transported to the autoclave or incinerator in durable leak-proof containers which are closed and wiped on the outside with disinfectant before being removed from the laboratory.
- Access to the laboratory should be severely restricted at Levels 3 and 4. Decisions on entry into Levels 1 and 2 laboratories should be at the discretion of the lab manager (e.g. only persons who have been advised of the potential hazards and meet any specific requirements such as immunization should be allowed to enter the laboratory area).
- Hazard warning signs shall be posted outside laboratories operating at Levels 2, 3 or 4. Where the infectious agent(s) used in the laboratory require special provisions for entry, the relevant information should be included in the sign.
- All spills, accidents/incidents and overt or potential exposures should be reported in writing to the supervisor. Appropriate medical evaluation, surveillance, and treatment shall be provided as required.
- Laboratory personnel should be protected against relevant infection by vaccination where possible. [33]

Biological spills

Biological spills outside biological safety cabinets will generate aerosols that can be dispersed in the air throughout the laboratory. These spills can be very serious if they involve micro-organisms that require Level 3 containment, since most of these agents have the potential for transmitting disease by infectious aerosols. To reduce the risk of inhalation exposure in such an accident, occupants should leave the laboratory immediately. The laboratory should not be re-entered to decontaminate or clean up the spill for at least one hour. During this time, the aerosol may be removed from the laboratory via the exhaust ventilation systems, such as biological safety cabinets or chemical fume hoods, if present.

33 WHO Laboratory Biosafety Manual 3rd edition 2004

Spills on the Body

- Remove contaminated clothing
- Soak affected area of clothing in disinfectant and place in a plastic bag. Send to laundry. If contaminated with a risk level 4 organism the clothing should be incinerated
- Wash exposed area vigorously with soap and running water for one minute
- Report the incident to the laboratory supervisor
- Obtain medical attention (if and as may be necessary)

Biosafety Level 1 Organism Spill

- Wear disposable gloves
- Soak paper towels in disinfectant and place over spill
- Place paper towels in a plastic bag for disposal
- Clean up spill area with fresh paper towels soaked in disinfectant

Biosafety Level 2 Organism Spill

- Alert people in immediate area of spill
- Put on additional personal protective equipment. This may include a back-fastening gown or jumpsuit, disposable shoe covers, safety goggles, surgical mask or full-face shield
- Cover spill with paper towels or other absorbent materials
- Pour a freshly prepared 1% hypochlorite (10,000ppm chlorine) around the edges of the spill and then into the spill. Avoid splashing
- Allow 10-15 minutes contact period
- Clean up the spill area with fresh paper towels soaked in disinfectant, after the spill has been absorbed
- Place paper towels in a plastic bag and incinerate or burn

Biosafety Level 3 Organism Spill

- Attend to injured or contaminated persons and remove them from exposure
- Remove contaminated clothing and shower and seek medical attention
- Alert people in the laboratory to evacuate
- Close doors to affected area
- Notify safety officer, infection control focal person, or supervisor
- The spill should be dealt with by designated personnel wearing gown, apron and a respirator. The spill can be treated with disinfectant as for Biosafety Level 2

Biosafety Level 4 Organism Spill

- Follow the procedure for Biosafety level 3. For protective clothing use scrub suits, rubber boots, gloves, a second pair of gloves, a respirator, head cover and protective eye wear (Refer to WHO, USDHHS, CDC. Infection Control for Viral Hemorrhagic Fevers in African Health Care Setting. WHO/EMC/ESR/98.2).

Blood Spills

- Appropriate PPE should be worn for cleaning up a blood spill. Heavy duty gloves should be worn during the cleaning and disinfecting procedures
- The personnel should wear a face shield and plastic apron, if the possibility of splashing exists
- Overalls or aprons, as well as boots or protective shoe covers should be worn for large blood spills
- PPE should be changed if torn or soiled, and always removed before leaving the location of the spill, and then hands are washed
- The blood spill area should be cleaned of obvious organic material before applying a disinfectant. Blood and other material substantially inactivate sodium hypochlorite and other disinfectants. However newer disinfectants that can be poured directly onto a blood spill should be used, if available. 0.5% (5000 ppm) sodium hypochlorite is recommended for disinfecting small spills
- For Large spills remove the waste with disposal paper towel/disposable cleaning cloth. Discard in a plastic lined infectious waste bin. Disinfect using 1.0% (10,000 ppm) sodium hypochlorite
- After cleaning, the area should be disinfected for 10 minutes with an intermediate level chemical disinfectant such as sodium hypochlorite
- Concentrations ranging from approximately 0.5% household bleach (500 ppm available chlorine) are effective, depending on the amount of organic material, (e.g. blood or mucus) present on the surface to be cleaned and disinfected, as well as the nature of the surface
- Disposable items should be discarded immediately after use in a plastic lined waste receptacle
- Care should be taken to avoid splashing or generating aerosols during the clean up
- Hands should be thoroughly washed and dried after gloves are removed

General first aid

1. First aid is defined as any one-time treatment of scratches, cuts, burns, splinters before medical care
2. First aid equipment should be readily available in each laboratory
3. Following any first aid, a nurse or physician qualified to handle chemical emergencies should provide further examination and treatment
4. It is recommended that each laboratory have staff trained in basic first aid and cardiopulmonary resuscitation
5. Someone knowledgeable about the accident/incident should always accompany the injured person to the medical facility
6. Minor injuries requiring first aid should always be reported to a supervisor and recorded on an Injury/

Exposure Report Form. Reasons for this are:

a. A minor injury may indicate a hazardous situation, which should be corrected to prevent future injuries.
b. It is important to document an injury as having been "work related" if the injury later leads to serious complications, such as from an infected cut. A copy of the injury report should go to the safety officer or laboratory leadership so that an analysis of the incident may be taken to improve future practices.

Personal Protection during First Aid

Persons responding to a medical emergency shall adhere to Standard Precautions.

- For most situations in which first aid is given, the following guidelines should be adequate:
  - ▷ For controlling minimal bleeding and for handling and cleaning instruments with microbial contamination, disposable gloves should be sufficient
  - ▷ For controlling severe bleeding, disposable gloves, a gown, a surgical mask and protective eye wear are recommended
- After care has been rendered, hands and other skin surfaces shall be washed immediately and thoroughly with soap under running water and dried with disposable towels. Hands should always be washed after gloves are removed, even if the gloves appear to be intact.

Occupational health and safety

Global statistics indicate that huge amount of pain and suffering is experienced by people who simply go to work to earn a living. When health and safety is not managed properly people can get infected, injured and even killed or acquire terrible diseases that have massive impact not only on them, but also their dependents, families, friends and colleagues. Injury or ill-health should not be a price that has to be paid in order for the worker to feed their family. Employers and supervisors are obliged to implement all reasonable precautions to protect the health and safety of workers.

Health care workers stand greater risk due to their exposure to blood and other body fluids during the course of their work. Therefore, they are at an increased risk of infection by viruses transmitted by blood or other biological fluids, such as HIV, hepatitis B, Ebola and other viruses and bacteria. They are also at risk of contracting diseases transmitted by direct or indirect contact or by inhalation of large and small droplets. The risk of infection to health care workers depends on the prevalence of the disease in the population, frequency of exposure and susceptibility. Also, staff working with imaging tools such as x-ray machines, CT scanners, and medical wastes are exposed to various substances that put their health at risk.

To eliminate or reduce the risk of infection, health care facilities should establish good health and safety measures. Employer duties and responsibilities should include:

1. Ensuring a healthy and safe working environment for all employees. Employees should have access to basic facilities such as toilet facilities, hand wash stations, changing rooms, rest rooms and places where food can be prepared and eaten in hygienic conditions.
2. Providing employees appropriate orientation, training and supervision on safety procedures. Training should consist of basic hazard awareness, site specific hazards, safe work practices, and emergency procedures for fire, evacuation, and natural disaster, as appropriate. Any site-specific hazard or color coding in use should be thoroughly reviewed as part of orientation training
3. Having safety and employee health standard operating procedures readily available to staff
4. Assessing and managing any identified risks (e.g., investigate accidents and illnesses)
5. Documenting and reporting worker injury or illness that occurs in the health care facility
6. Ensuring best practices for HCW safety and ensuring availability of infection prevention and Control supplies and supportive infrastructure
7. Having a process for worker feedback on safety issues (e.g., reporting to the QMU)
8. Ensure that the hours of work do not adversely affect employees' safety and health
9. Ensure that pre-employment screening for workers for diseases such as HIV, Hepatitis etc is done for staff and regular checks for health care-related infections are made available

Health care workers roles and responsibilities should include:

1. Following safe work practices at all times, including adhering to IPC best practices
2. Be familiar with employer's written departmental policies
3. Know the potential health and safety hazards of the job and protective measures by participating in appropriate safety training programs
4. Know how to report unsafe working conditions
5. Report any work-related injury or illness to supervisor
6. Participate in accident and injury investigations
7. Know what to do in an emergency
8. Take reasonable care of their own safety and that of other people who might be affected by the things that they do and things that they fail to do

Since hospital personnel are at risk of exposure to and possible transmission of vaccine-preventable diseases because of their contact with patients and/or potentially infectious equipment, materials, blood and other body fluids, staff immunity is an essential part of a hospital's safety culture (see Annex 40 for further details on possible work restrictions due to exposure to infectious diseases).

1. Optimal use of immunizations serves to protect the health of personnel and also patients from becoming infected by staff
2. Following a consistent program of immunizations could eliminate the problem of susceptible personnel and avoid unnecessary activity restrictions
3. Immunizations should be made available to health personnel and include the following (see Annex 41):
    a. Hepatitis B vaccine (for HCWs whose occupational tasks place them at risk of exposure to blood or other potentially infectious material)
    b. MMR (Measles, mumps, rubella)
    c. Influenza (flu)
    d. Chickenpox (varicella)
    e. Tdap (Tetanus, Diphtheria, Pertussis)
    f. Meningococcal Meningitis

Medical screening

Pre-employment screening of health care workers for preventable conditions such as Tuberculosis, Hepatitis B & C and HIV is good occupational safety health practice. For vaccine - preventable diseases, vaccines should be offered to health care workers.

Post exposure prophylaxis

An individual or a small team needs to take responsibility for implementation post-exposure prophylaxis services. At the local level, infection prevention professionals or clinicians with experience in HIV management are appropriate for implementation of the PEP policy.

The care provider will need to firstly provide pre- and post-counselling to the exposed health care worker.

HIV testing is done for the exposed person and whenever possible for the source person whenever possible

PEP must be started within two hours of exposure to HIV infection or within 72 hours of exposure. The CDC recommends that "percutaneous injury or contact of mucous membrane or nonintact skin with blood, tissue, or potentially infectious body fluids, such as semen, vaginal secretions, and visibly bloody fluids and reasonable suspicion that the source patient is HIV".[34]

PEP proves ineffective if taken later than 72 hours of HIV exposure and usually will need to be taken once or twice daily for 28 days. The CDC also recommends HIV antibody testing of health care worker at baseline, week four post-exposure, week 12 post-exposure and alternatively, if the clinician is certain that a fourth-generation antibody/antigen combination assay is being used, then HIV testing could be performed at baseline, 6 weeks, and concluded at 4 months post-exposure.

According to the Johns Hopkins University HIV clinical guidelines program of 2016, the medical care criteria committee recommends tenofovir disoproxil fumarate + emtricitabine plus either raltegravir or dolutegravir as the preferred initial PEP regimen because of tolerability, proven potency in established HIV infection, and ease of administration.

Zidovudine is no longer recommended in the preferred PEP regimen because it is believed to have no clear advantage in efficacy over tenofovir disoproxil fumarate while having significantly higher rates of treatment-limiting side effects. Lamivudine may be substituted for emtricitabine.[35]

Tenofovir disproxil fumarate 300 mg PO daily + Emtricitabine 200 mg PO daily plus Raltegravir 400 mg PO twice daily. For alternative treatments refer to Updated U.S Public Health Service Guidelines for the Management of Occupational Exposures to HIV and Recommendations for Postexposure Prophylaxis[36]

It is also advised to conduct HIV serologic screening for the exposed health care workers and the source patients, however PEP should continue pending the results of these test results.

Occupational hazards

Health care workers suffer from some of the most hazardous conditions on the job including sharps injuries, harmful exposure to chemicals, drugs, back injuries, latex allergy, violence, and stress. There are currently a growing number of cases of occupational injury and illness among the highest of any industry sector.

Infectious Agents

There is a very high risk of contact with infectious agents as a result of the various types of activities involved with the job of a health care worker. A few conditions that easily transmissible include: blood borne pathogens like HIV/AIDS, Hepatitis B, and Hepatitis C; the influenza virus that is responsible for seasonal, pandemic, avian and swine FLU. Ebola has caused the loss of lives for thousands of health care workers making them the most vulnerable of the individual infection (e.g Viral Haemorrhagic Fevers). The presence of an Ebola patient in any health care facility no matter what part of the world it is, installs maximum fear in those caring for that patient. Infection transmission rate is extremely high, so health care professionals need all the required personal protective equipment or materials needed to stay safe while caring for these patients. Methicillin-resistant staphylococcus aureus, a type of staph bacteria resistant to many antibiotics. Air borne diseases like tuberculosis poses serious risks for health care workers. This kind of patient needs to be identified promptly in order to protect health care worker who might be met off guard at their respective work stations. Proper triage and isolation systems are very vital in helping to prevent these kinds of infections. Once they break that barrier and contaminate the health care facility, it becomes a serious problem for everyone.

Chemical Hazards

Health care workers are exposed to various kinds of chemical hazards while giving care to patients in the hospital setting. Chemicals used to treat patients like antineoplastic drugs, aerosolized medications, leaking

anesthetic gases (nitrous oxide, halothane); ones used to clean, disinfect and sterilize work surfaces (phenolics, quarternary ammonium compounds, bleach and medical supplies and instruments (ethylene oxide, glytaraldehyde; ones used as fixative for tissue specimens (xylene, toluene, formaldehyde); and radioactive materials such as x-ray films. When using these hazardous chemicals, it is advisable to follow basic safety precautions for chemical exposure and use the required risk appropriate PPE.

Protectives measures to include are preventing worker exposure to dangerous substances and to wet work, technical protective measures have priority over organizational protective measures.

Organizational measures include to prevent chemical hazards include: Separation of activities involving exposure to dangerous substances from any form of food intake as well as the separation of working clothing and protective clothing or the establishment of certain cleaning or skin protective plans

The selection and use of protective gloves, protective overalls, googles or respiratory mask. The use of PPE equipment is necessary when a particular danger for workers remains, after taking the necessary when a particular danger for workers remains, after taking necessary technical or organizational measures, for example due to values in excess of air limits or to possible skin contact with substances which are a danger to the skin.

Occupational medical measures: precautionary examinations, may also be necessary if existing air limit values or biological limits are exceeded with activities are in progress.

Physical Hazards

Health care workers also face different forms of physical injuries. A common type of injury is one due to repeated handling of patients, which is concerned with heavy manual lifting when transferring or repositioning patients. Other forms of work place injuries result from different forms of violence which most often traumatizes the health care worker especially in psychiatry centers or involving patients with some form of psychological issue.

To prevent and control hazards, there are few recommendations to follow:

- Analysis of work incapacity data;
- Work situation analysis;
- Health circle
- Worker surveys
- Worker interview
- Organization measures available for circumstantial prevention include:
  - Design of work organization
  - Creation of degrees of freedom
  - Possibilities of social support
  - Provision of feedback for workflow and the results
  - Good social and communication relationship with other occupational groups are also important
- Helpful individual-related measures include:
  - Continuous and further training
  - Training in social and communicative skills
  - Time management

Coping with stress

There are a number of stresses that can be identified in health care workers in Liberia. Health care workers have to work at health care facilities with the knowledge that they work in a country emerging from a collective health crisis (EVD outbreak), they are usually working even though they have not been paid, they also work in a resource limited setting. Other issues like their exposure to any form of danger at the job site, working with moral and ethical dilemmas, grieving the death of colleagues or family just to name of few.

Health care facilities are advised to create a work environment that promotes healthy practices, helps prevent stress in the work place and make available psychosocial support for staff to get help in dealing with stress. Health care workers are advised to cultivate the positive coping strategy for dealing with stress. They are advised to adapt the following:

- Get enough rest
- Eat regularly & drink sufficient water
- Talk and spend time with family, friends, or other community members
- Discuss problems with someone you trust
- Do physical exercise
- Do activities that help you relax (sing, pray)
- Find safe ways to help others in the crisis and getting involved in community activities.
- Deal with burnout by being able to recognize it, reverse it and become resilient in dealing with your emotional and physical health

Annex 1:

County Quality Management Team TOR

Ministry of Health
Quality Management Unit
Terms of Reference: County Quality Management Team (CQMT)

Introduction

The National Health Quality Strategy (NHQS) has been developed to improve the capacity of the health system so that it provides safe and quality health services and restores public trust in the health system to provide responsive services through improved leadership, governance, accountability and community engagement. Quality management is about delivering effective care in an environment that is safe for patients, staff and the public. It also ensures that health care teams are accountable for the quality*, safety and satisfaction for patients in the care they have delivered. County Health Teams play critical supervisory role in ensuring quality of care for services provided, hence this TOR provides guidance for county quality management teams (QMT).
Purpose of CQMT

To provide leadership, direction and is accountable for health care quality in the county. Members of CQMT are assigned to carry out specific quality management tasks and should see those tasks as part of their routine responsibilities rather than extra duties.

Overall roles and responsibilities

The CQMT oversees health care quality and patient safety. A CQMT is a multidisciplinary team whose roles are directly concerned with establishing, developing and implementing health care quality management (quality planning, improving, and control). The CQMT drives all health care quality and patient safety related issues as prescribed in the National Health Quality Strategy (NHQS).

Specific roles and responsibilities of the CQMT

- Lead and coordinate county health care quality management activities with key stakeholders;
- Ensure that quality management activities align with national strategies and priorities; oversee the implementation of policies and programs including Joint Integrated Supportive Supervision (JISS) tool on health care quality management in the county with other programs;
- Ensure resource mapping for health care quality management
- In collaboration with health promotion oversee the implementation of the communication strategy on health care quality education
- Develop a platform to share best practices on quality management activities
- Oversee implementation of quality management workforce training

Proposed issues for discussion at the CQMT meeting

- Ensuring quality of care and patient safety
- How to maintain ethical standards at all times
- How to improve public confidence in health system
- Ensuring patient is informed and involved in his or her care and promoting positive staff-patient relationships
- Conduct root cause analysis for adverse events to identify systemic defects
- Follow up action plans generated from JISS supervisions for prompt redress and improvement along with the DQMT
- Ensuring medical errors are followed-up

Expected deliverables

- Quarterly JISS conducted and reports submitted to national level and feedback provided to District level
- JISS Scorecard and Action Plan developed and posted at Health facilities
- Biannual Quality Management report, including resources mapping submitted to national level
- Established CQMT platform that is used to share quality management best practices quarterly

Membership and governance

The CQMT will comprise of the following members:
- Clinical Supervisor
- County Health Officer
- County Hospital Medical Director
- CHDD
- County Health Services Administrator
- County HR

- County IPC Focal Person
- County M&E Officer
- County RH Supervisor
- County EHT
- County Surveillance Officer
- County Diagnostic Officer
- County Pharmacist
- Quality Management Partners

The CQMT will be led by the county clinical supervisor(s); co-leads will include CHO and CHDD. The CQMT reports directly to the QMU and Assistant Minister for Curative Services/Deputy Chief Medical Officer (DCMO) at national level. The Quality Management committee will meet monthly.

Approvals and review

The CQMT shall review its TORs every two years or as needed based on emerging issues and provide an annual report, including any recommendations, to the Quality Management Unit.

*Definition of quality:

"The degree to which health services for individuals and populations, and all components of the health system, increase the likelihood of desired health outcomes and are consistent with current professional knowledge, standards, and health structures."

Annex 2:

County IPC Focal Person TOR

Ministry of Health
Quality Management Unit
Terms of Reference: County Infection Prevention and Control (IPC) Focal Person

Introduction

The National Health Quality Strategy (NHQS) has been developed to improve the capacity of the health system so that it provides safe and quality health services and restores public trust in the health system to provide robust services through improved leadership, governance, accountability and community engagement.

Quality management is about delivering effective care in an environment that is safe for patients, staff and public. It also ensures that health care teams are accountable for the quality, safety and satisfaction of patients in the care they have delivered. County and district health teams play critical supervisory roles, while the health care facility is responsible for the provisions of routine health services with the highest quality standard. This term of reference (TOR) will provide guidance for the County Infection Prevention and Control (IPC) Focal Person of the County Quality Management Team (CQMT).

Purpose

To provide updates and recommendations for key IPC issues arising within the county (e.g. district, health care facility, community) and submit to the CQMT on a quarterly basis and share with National IPC Coordinator. The County IPC Focal Person of the CQMT/CHT is expected to carry out specific IPC activities / tasks and should see those tasks as part of their routine responsibilities rather than extra duties.

Overall roles and responsibilities

The County IPC Focal Person reports to the CQMT and oversees all IPC activities and patient safety as prescribed in the national infection prevention and control guidelines.

He/she focuses on driving the supervision of all issues related to IPC as well as:

- Work directly with the National IPC Coordinator, other relevant ministry of health (MoH) units, technical and implementing partners to drive the county IPC agenda and strategy, monitoring progress on integration and harmonization with other county priorities.
- In collaboration with key stakeholders, conduct health care facility assessments including the Joint Integrated Supportive Supervision (JISS), hand hygiene audit, hand hygiene self-assessment framework, etc. to monitor and evaluate implementation of IPC standards.
- Ensure assessment results are shared with key stakeholders and developed action plans are implemented to address identified gaps
- Oversee the implementation of the basic IPC training package for use during orientation of new staff and in-service training of various cadres of health care workers.
- Coordinate training for health care workers who will be responsible for IPC activities at health care facilities across the county to avoid overlapping of functions
- Work with county pharmacist and other key stakeholders to ensure continuous availability of IPC materials in all health care facilities; including personal protective equipment (PPE), hand washing supplies (soap and alcohol based hand rub), and other relevant materials
- Attend IPC related meetings at county and national level and provide feedback from these meetings to the C-QMT
- To provide technical support during health care facility design and/or renovation from onset to finishing of the project in order to make it complainant with IPC standards

Expected deliverables

- In collaboration with CHT, provide quarterly JISS (including scorecard and action plan) and other IPC assessment feedback to district and health facilities.
- Ensure facility IPC focal persons are oriented on national IPC programme, guidelines and SOPs, and any related updates as they become available.

Annex 3:

District Quality Management Team TOR

Ministry of Health
Quality Management Unit
Terms of Reference: District Quality Management Team (DQMT)

Introduction

The National Health Quality Strategy (NHQS) has been developed to improve the capacity of the health system, provide quality health services and restore the public's trust. The ultimate aim is to provide robust services through improved leadership, governance, accountability and community engagement.

Quality management is about delivering effective care in an environment that is safe for patients, staff and the public. It also ensures that health care teams are accountable for the quality*, safety and satisfaction of patients in the care they have delivered. County and district health teams play critical supervisory roles, while the health care facility is responsible for the provisions of routine health services with the highest quality standard. This terms of reference (TOR) will provide the guidance for district quality management teams (DQMT).

Purpose of DQMT

To provide leadership, direction, and is accountable for health care quality and safety at the district level. Members of DQMT are assigned to carry out specific quality management tasks and should see those tasks as part of their routine responsibilities rather than extra duties.

Roles and Responsibilities

The DQMT ensures health care quality and patient safety within the health district. A DQMT is a multidisciplinary team whose roles are directly concerned with developing and implementing health care quality management (quality planning, improving, and control) in consultation with the District Quality Management Team (DQMT).

Specific roles and responsibilities of the DQMT

The DQMT will:

- Lead and coordinate district health care quality management activities in collaboration with key stakeholders and CQMT;
- Ensure that quality management activities align with county strategies and priorities;
- Oversee the implementation of the monthly Joint Integrated Supportive Supervision (JISS)
- tool and provide hands-on mentorship and feedback;
- Develop a platform for health facilities to share quality improvement projects to help inform best practices on quality management activities.

Proposed issues for discussion at the DQMT meeting

- Work very closely with HFQMTs to conduct monthly quality assessment activities at health care facilities within the district
- Develop quality improvement plans for health care facilities within the district
- Quality improvement and safety meetings with HFQMTs to discuss key quality and safety issues
- Conduct root cause analysis for adverse events along with HFQMTs within health care facilities to identify systemic defects.
- Follow up action plans along with HFQMTs generated from JISS supervisions conducted for prompt redress and improvement along with the CQMT

Expected deliverables

- Monthly JISS conducted and reports submitted to county level and feedback provided to district level
- JISS Scorecard and Action Plan developed and posted at Health facilities
- Established DQMT platform for health facilities to share quality improvement projects to help inform best practices on quality management activities on a biannual basis

Membership and Governance

The DQMT will comprise of the following members:

- District Health Officer (Lead)
- District Environmental Health Technician/IPC Focal Person (Co-Lead)
- District Reproductive Health Officer
- District Surveillance Officer

The DQMT will be led by the District Health Officer; co-lead will include district EHT/IPC Focal Person. The DQMT reports directly to the County Clinical Supervisor. The District Quality Management Team will meet monthly.

*Definition of quality:

"The degree to which health services for individuals and populations, and all components of the health system, increase the likelihood of desired health outcomes and are consistent with current professional knowledge, standards, and health structures."

Annex 4:

Facility Quality Management Team TOR

Ministry of Health
Quality Management Unit
Terms of Reference: Healthcare Facility Quality Management Team (HFQMT)

Introduction

The National Health Quality Strategy (NHQS) has been developed to improve the capacity of the health system, provide quality* health services and restore the public's trust. The aim is to provide responsive services through improved leadership, governance, accountability, and community engagement.
Quality management is about delivering effective care in an environment that is safe for patients, staff and the public. It also ensures that health care teams are accountable for the quality, safety and satisfaction for patients in the care they have delivered. County and District Health Teams play critical supervisory roles, while the health facility is responsible for the provision of routine health services with the highest quality standard. This terms of reference (TOR) will provide the guidance for health care facility quality management teams (HFQMT).

Purpose of HCQMT

To provide leadership, direction and is accountable for regular monitoring and implementation of healthcare quality in the health facility. All members of HFQMT are expected to carry out specific quality management activities and should see those tasks as part of their routine responsibilities rather than additional duties.

Overall roles and responsibilities

The HQFMT oversees quality and safety of all personnel and patients accessing the health facility. A HQFMT should be a multidisciplinary team whose roles are directly concerned with establishing, developing and implementing quality within the health facility. It focuses on driving the supervision of all the issues in quality and safety as prescribed by the NHQS.

Specific roles and responsibilities of the HFQMT

- Develop and implement quality improvement activities in the health care facility;
- Use facility data to drive the agenda and action plans for quality improvement;
- Conduct monthly quality management meetings to review facility activities and available data. All meetings should have minutes and identified action points with responsible persons noted for appropriate follow up;
- Provide monthly progress reports to District Health Team on quality improvement activities;
- Provide regular feedback to staff within the health facility
- Support the implementation of the Essential Package for Health Services (EPHS) using the Joint Integrated Supportive Supervision (JISS) findings;
- Mentor health care workers to improve their knowledge and skills on quality improvement;
- Ensure that monthly meeting minutes are written and made available at the facility.

Proposed issues for discussion at the HFQMT meeting

- HFQMT will work closely with the OIC to conduct monthly quality improvement meetings at the health care facility to discuss key quality and safety issues/activities within the facility (e.g., prolonged waiting times, lack of adherence to guidelines/protocols/standards, medication errors, patient complaints, etc.);
- Conduct root cause analysis for adverse events along with facility staff to identify systemic defects;
- Follow up on action plans generated from JISS supervisions conducted for prompt redress and improvement within the facility.

Expected deliverables

- HFQMT is established and functional (e.g., holds regular meetings with minutes and data);
- Monthly quality improvement reports submitted to District and County Quality Management Teams;
- Monthly feedback provided to staff on quality activities;
- JISS scorecard and action plan reviewed and updated on a regular basis and shared with County and District Health Teams.

Membership and governance

The HFQMT at the **clinic and health center** level will comprise of the following members:

- Officer in Charge – Lead
- Midwife/MCH Supervisor – Co-Lead
- Infection Prevention and Control (IPC) Focal Person – Co-Lead
- Vaccinator – Member
- Cleaner – Member
- Dispenser – Member
- Community representative - Member

The HFQMT at the health center and clinic level will be led by the OIC; co-leads will be the midwife/MCH Supervisor and IPC Focal Person. The HFQMT reports directly to District and County Health Services. The HFQMT will meet monthly.

The HFQMT at the **hospital** level will comprise of the following members:

- Medical Director – Lead
- Nursing Director – Co-Lead
- IPC Focal Person – Co-Lead
- All unit supervisors – Member
- Registrar – Member
- Hospital pharmacist – Member
- Community representative – Member

The HFQMT at the hospital level will be led by the Medical Director; co-leads will be the Nursing Director and IPC Focal Person. The HFQMT reports directly to District and County Health Services. The HFQMT will meet monthly.

*Definition of quality:

"The degree to which health services for individuals and populations, and all components of the health system, increase the likelihood of desired health outcomes and are consistent with current professional knowledge, standards, and health structures."

Annex 5:

Facility IPC Focal Person TOR

Ministry of Health
Quality Management Unit
Terms of Reference: Healthcare Facility Infection Prevention and Control (IPC) Focal Person

Introduction

The National Health Quality Strategy (NHQS) has been developed to improve the capacity of the health system so that it provides safe and quality health services and restores public trust in the health system to provide robust services through improved leadership, governance, accountability and community engagement.

Quality management is about delivering effective care in an environment that is safe for patients, staff and public. It also ensures that health care teams are accountable for the quality, safety and satisfaction of patients in the care they have delivered. County and district health teams play critical supervisory roles, while the health care facility is responsible for the provisions of routine health services with the highest quality standard. This term of reference (TOR) will provide guidance for the Healthcare Facility Infection Prevention and Control (IPC) Focal Person of the Healthcare Facility Quality Management Team (HFQMT).

Purpose

To provide updates and recommendations for key IPC issues arising within the healthcare facility and submit to the District Quality Management Team (DQMT) on a regular basis and share with the County Health Team IPC Focal Person. The Healthcare Facility IPC Focal Person is expected to carry out specific IPC activities / tasks and should see those tasks as part of their routine responsibilities rather than extra duties.

Qualification

The Healthcare Facility IPC Focal Person must have had basic training in IPC (e.g., the Safe and Quality Health Services, or SQS, training package) and should preferably be a clinician.

Overall roles and responsibilities

The Healthcare Facility IPC Focal Person reports to the HFQMT and oversees all IPC activities and patient safety as prescribed in the national infection prevention and control guidelines. He/she focuses on driving the supervision of all issues related to IPC as well as:

- Implementation of the national IPC programme, policies, guidelines, and SOPs;
- In collaboration with key stakeholders, conduct healthcare facility assessments including the Joint Integrated Supportive Supervision (JISS), hand hygiene audits, etc. to monitor and evaluate implementation of IPC standards;
- In collaboration with the District Health Team, provide quarterly feedback from JISS (including scorecard and action plans) and other IPC assessments to key stakeholders and develop action plans to address identified gaps;
- Support antimicrobial resistance (AMR) activities as required (e.g, antibiotic stewardship);
- Oversee the implementation of the IPC training package for use during orientation of new staff and in-service training of various cadres of health care workers;
- Coordinate training for health care workers who will be responsible for IPC activities at the healthcare facility;
- Work with the facility pharmacist to ensure continuous availability of IPC materials in the healthcare facility, including personal protective equipment (PPE), handwashing supplies (soap and alcohol based hand rub), and other relevant materials;
- Co-lead HFQMT meetings within the healthcare facility and provide feedback from these meetings to the DQMT;
- Ensure coordination and alignment of all IPC activities of implementing partners at the facility;
- Support the monitoring and evaluation of an enabling and supportive healthcare environment, including water, sanitation, and hygiene (WASH);

Expected deliverables

- All staff are oriented on national IPC programme, guideline, and SOPs (as applicable to their healthcare facility);
- In collaboration with key stakeholders, healthcare facility assessments including the Joint Integrated Supportive Supervision (JISS), hand hygiene audits, etc. are regularly conducted, monitored, and evaluated;
- Feedback on the quarterly JISS (including scorecard and action plans) and other IPC assessments is provided to the district and healthcare facilities
- All assessment results are shared with key stakeholders and developed action plans are implemented
- All newly hired staff are provided with IPC orientation and refresher training provided on a needs basis

Annex 6:

The WHO multimodal improvement strategy

The WHO multimodal improvement strategy addresses these five areas:

1. Build it
(system change)

What infrastructures, equipment, supplies and other resources (including human) are required to implement the intervention?

Does the physical environment influence health worker behaviour? How can ergonomics and human factors approaches facilitate adoption of the intervention?

Are certain types of health workers needed to implement the intervention?

Practical example: when implementing hand hygiene interventions, ease of access to handrubs at the point of care and the availability of WASH infrastructures (including water and soap) are important considerations. Are these available, affordable and easily accessible in the workplace? If not, action is needed.

2. Teach it
(training & education)

Who needs to be trained? What type of training should be used to ensure that the intervention will be implemented in line with evidence-based policies and how frequently?

Does the facility have trainers, training aids, and the necessary equipment?

Practical example: when implementing injection safety interventions, timely training of those responsible for administering safe injections, including carers and community workers, are important considerations, as well as adequate disposal methods.

3. Check it
(monitoring & feedback)

How can you identify the gaps in IPC practices or other indicators in your setting to allow you to prioritize your intervention?

How can you be sure that the intervention is being implemented correctly and safely, including at the bedside? For example, are there methods in place to observe or track practices?

How and when will feedback be given to the target audience and managers? How can patients also be informed?

Practical example: when implementing surgical site infection interventions, the use of key tools are important considerations, such as surveillance data collection forms and the WHO checklist (adapted to local conditions).

4. Sell it
(reminders & communications)

How are you promoting an intervention to ensure that there are cues to action at the point of care and messages are reinforced to health workers and patients?

Do you have capacity/funding to develop promotional messages and materials?

Practical example: when implementing interventions to reduce catheter-associated bloodstream infection, the use of visual cues to action, promotional/reinforcing messages, and planning for periodic campaigns are important considerations.

5. Live it
(culture change)

Is there demonstrable support for the intervention at every level of the health system? For example, do senior managers provide funding for equipment and other resources? Are they willing to be champions and role models for IPC improvement?

Are teams involved in co-developing or adapting the intervention? Are they empowered and do they feel ownership and the need for accountability?

Practical example: when implementing hand hygiene interventions, the way that a health facility approaches this as part of safety and quality improvement and the value placed on hand hygiene improvement as part of the clinical workflow are important considerations.

Annex 7:

Joint Integrated Supportive Supervision (JISS) IPC indicators

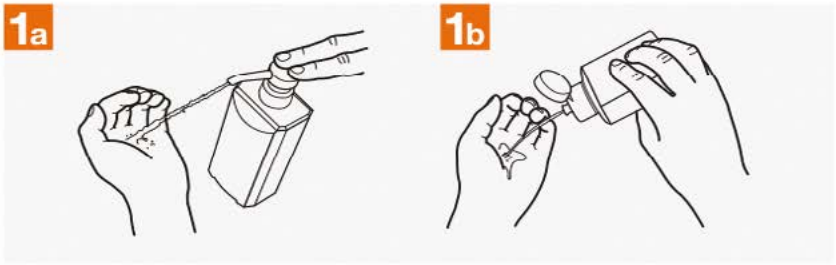
Category	Indicator number	Indicator
Administration	01	There is a person responsible for IPC and WASH activities in the facility
Administration	02	There is an IPC Committee or Quality Management Team (QMT) at the facility
Screening and isolation	03	The facility has a system for screening and isolating suspected or confirmed infectious patients
WASH	04	Water supply facilities are located on premise and water is available
WASH	05	Adequate, accessible, and appropriate sanitation is provided for patients, care givers and staff
WASH	06	Hand hygiene is prepared and monitored
Waste Management	07	There is a system in place for waste segregation and disposal
IPC supplies	08	There is a mechanism in the facility to track IPC supplies and material and identify any stock-outs

Annex 8:

How to perform hand hygiene with alcohol based hand rub

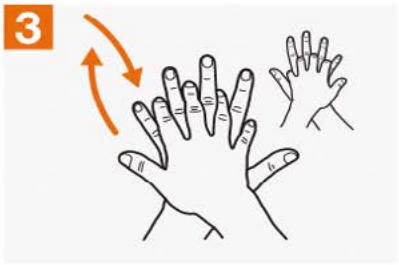
RUB HANDS FOR HAND HYGIENE! WASH HANDS WHEN VISIBLY SOILED

Duration of the entire procedure: 20-30 seconds



Apply a palmful of the product in a cupped hand, covering all surfaces;

Rub hands palm to palm;



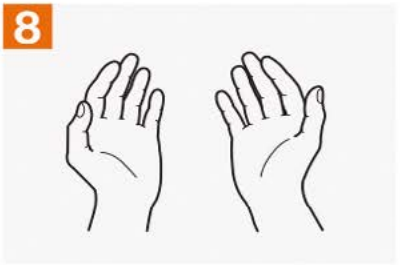
Right palm over left dorsum with interlaced fingers and vice versa;

Palm to palm with fingers interlaced;

Backs of fingers to opposing palms with fingers interlocked;

Rotational rubbing of left thumb clasped in right palm and vice versa;

Rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa;



Once dry, your hands are safe.

Annex 9:

How to perform hand hygiene with soap and water

WASH HANDS WHEN VISIBLY SOILED! OTHERWISE, USE HANDRUB

Duration of the entire procedure: 40-60 seconds

0

Wet hands with water;

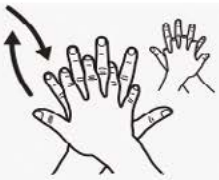
1

Apply enough soap to cover all hand surfaces;

2

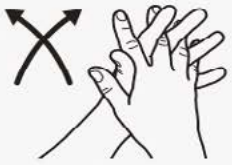
Rub hands palm to palm;

3



Right palm over left dorsum with interlaced fingers and vice versa;

4



Palm to palm with fingers interlaced;

5

Backs of fingers to opposing palms with fingers interlocked;

6

Rotational rubbing of left thumb clasped in right palm and vice versa;

7

Rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa;

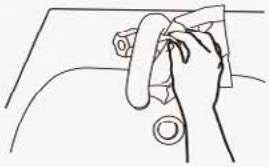
8

Rinse hands with water;

9

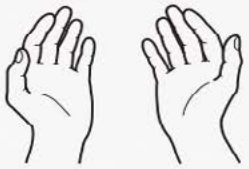
Dry hands thoroughly with a single use towel;

10



Use towel to turn off faucet;

11



Your hands are now safe.

Annex 10:

Surgical hand preparation using alcohol based hand rub

The handrubbing technique for surgical hand preparation must be performed on perfectly clean, dry hands.
On arrival in the operating theatre and after having donned theatre clothing (cap/hat/bonnet and mask), hands must be washed with soap and water.
After the operation when removing gloves, hands must be rubbed with an alcohol-based formulation or washed with soap and water if any residual talc or biological fluids are present (e.g. the glove is punctured).

Surgical procedures may be carried out one after the other without the need for handwashing, provided that the handrubbing technique for surgical hand preparation is followed (Images 1 to 17).

1
Put approximately 5ml (3 doses) of alcohol-based handrub in the palm of your left hand, using the elbow of your other arm to operate the dispenser

2
Dip the fingertips of your right hand in the handrub to decontaminate under the nails (5 seconds)

3
Images 3–7: Smear the handrub on the right forearm up to the elbow. Ensure that the whole skin area is covered by using circular movements around the forearm until the handrub has fully evaporated (10-15 seconds)

4
See legend for Image 3

5
See legend for Image 3

6
See legend for Image 3

7
See legend for Image 3

8
Put approximately 5ml (3 doses) of alcohol-based handrub in the palm of your right hand, using the elbow of your other arm to operate the dispenser

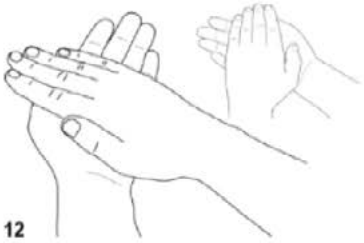
9
Dip the fingertips of your left hand in the handrub to decontaminate under the nails (5 seconds)

10

Smear the handrub on the left forearm up to the elbow. Ensure that the whole skin area is covered by using circular movements around the forearm until the handrub has fully evaporated (10-15 seconds)

11

Put approximately 5ml (3 doses) of alcohol-based handrub in the palm of your left hand, using the elbow of your other arm to operate the distributor. Rub both hands at the same time up to the wrists, and ensure that all the steps represented in Images 12-17 are followed (20-30 seconds)



12

Cover the whole surface of the hands up to the wrist with alcohol-based handrub, rubbing palm against palm with a rotating movement

13

Rub the back of the left hand, including the wrist, moving the right palm back and forth, and vice-versa

14

Rub palm against palm back and forth with fingers interlinked

15

Rub the back of the fingers by holding them in the palm of the other hand with a sideways back and forth movement

16

Rub the thumb of the left hand by rotating it in the clasped palm of the right hand and vice versa

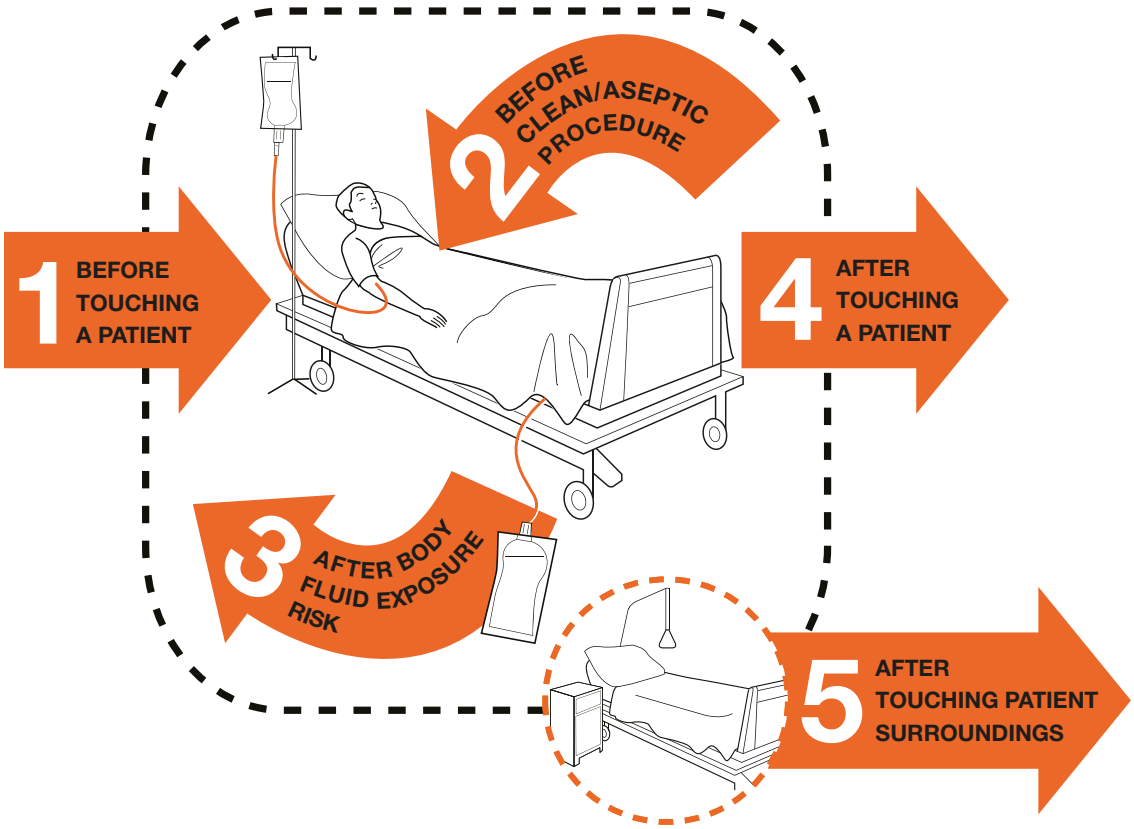
17

When the hands are dry, sterile surgical clothing and gloves can be donned

Repeat the above-illustrated sequence (average duration, 60 sec) according to the number of times corresponding to the total duration recommended by the manufacturer for surgical hand preparation with an alcohol-based handrub.

Annex 11:

WHO Five Moments for Hand Hygiene



1	BEFORE TOUCHING A PATIENT	WHEN?	Clean your hands before touching a patient when approaching him/her.
		WHY?	To protect the patient against harmful germs carried on your hands.
2	BEFORE CLEAN/ ASEPTIC PROCEDURE	WHEN?	Clean your hands immediately before performing a clean/aseptic procedure.
		WHY?	To protect the patient against harmful germs, including the patient's own, from entering his/her body.
3	AFTER BODY FLUID EXPOSURE RISK	WHEN?	Clean your hands immediately after an exposure risk to body fluids (and after glove removal).
		WHY?	To protect yourself and the health-care environment from harmful patient germs.
4	AFTER TOUCHING A PATIENT	WHEN?	Clean your hands after touching a patient and her/his immediate surroundings, when leaving the patient's side.
		WHY?	To protect yourself and the health-care environment from harmful patient germs.
5	AFTER TOUCHING PATIENT SURROUNDINGS	WHEN?	Clean your hands after touching any object or furniture in the patient's immediate surroundings, when leaving – even if the patient has not been touched.
		WHY?	To protect yourself and the health-care environment from harmful patient germs.

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

Annex 12:

Hand Hygiene Self-Assessment Framework (HHSAF)

In order to preserve the formatting of the HHSAF, it is included over the following 9 pages.

Additionally, the HHSAF is available online at http://www.who.int/gpsc/5may/hhsa_framework/en/.

Hand Hygiene Self-Assessment Framework 2010

Introduction and user instructions

The Hand Hygiene Self-Assessment Framework is a systematic tool with which to obtain a situation analysis of hand hygiene promotion and practices within an individual health-care facility.

What is its purpose?
While providing an opportunity to reflect on existing resources and achievements, the Hand Hygiene Self-Assessment Framework also helps to focus on future plans and challenges. In particular, it acts as a diagnostic tool, identifying key issues requiring attention and improvement. The results can be used to facilitate development of an action plan for the facility's hand hygiene promotion programme. Repeated use of the Hand Hygiene Self-Assessment Framework will also allow documentation of progress with time.

Overall, this tool should be a catalyst for implementing and sustaining a comprehensive hand hygiene programme within a health-care facility.

Who should use the Hand Hygiene Self-Assessment Framework?
This tool should be used by professionals in charge of implementing a strategy to improve hand hygiene within a health- care facility. If no strategy is being implemented yet, then it can also be used by professionals in charge of infection control or senior managers at the facility directorate. The framework can be used globally, by health-care facilities at any level of progress as far as hand hygiene promotion is concerned.

How is it structured?
The Hand Hygiene Self-Assessment Framework is divided into five components and 27 indicators. The five components reflect the five elements of the WHO Multimodal Hand Hygiene Improvement Strategy (http://www.who.int/gpsc/5may/tools/en/index.html) and the indicators have been selected to represent the key elements of each component. These indicators are based on evidence and expert consensus and have been framed as questions with defined answers (either "Yes/No" or multiple options) to facilitate self- assessment. Based on the score achieved for the five components, the facility is assigned to one of four levels of hand hygiene promotion and practice: Inadequate, Basic, Intermediate and Advanced.

- **Inadequate:** hand hygiene practices and hand hygiene promotion are deficient. Significant improvement is required.
- **Basic:** some measures are in place, but not to a satisfactory standard. Further improvement is required.
- **Intermediate:** an appropriate hand hygiene promotion strategy is in place and hand hygiene practices have improved. It is now crucial to develop long-term plans to ensure that improvement is sustained and progresses.
- **Advanced:** hand hygiene promotion and optimal hand hygiene practices have been sustained and/or improved, helping to embed a culture of safety in the health-care setting.

Leadership criteria have also been identified to recognise facilities that are considered a reference centre and contribute to the promotion of hand hygiene through research, innovation and information sharing. The assessment according to leadership criteria should only be undertaken by facilities having reached the Advanced level.

How does it work?
While completing each component of the Hand Hygiene Self- Assessment Framework, you should circle or highlight the answer appropriate to your facility for each question. Each answer is associated with a score. After completing a component, add up the scores for the answers you have selected to give a subtotal for that component. During the interpretation process these subtotals are then added up to calculate the overall score to identify the hand hygiene level to which your health-care facility is assigned.

The assessment should not take more than 30 minutes, provided that the information is easily available.

Within the Framework you will find a column called "WHO implementation tools" listing the tools made available from the WHO First Global Patient Safety Challenge to facilitate the implementation of the WHO Multimodal Hand Hygiene Improvement Strategy (http://www.who.int/gpsc/5may/tools/en/index.html).

These tools are listed in relation to the relevant indicators included in the Framework and may be useful when developing an action plan to address areas identified as needing improvement.

Is the Hand Hygiene Self-Assessment Framework suitable for inter-facility comparison?
Health-care facilities or national bodies may consider adopting this tool for external comparison or benchmarking. However, this was not a primary aim during the development of this tool. In particular, we would draw attention to the risks inherent in using a self-reported evaluation tool for external benchmarking and also advise the use of caution if comparing facilities of different sizes and complexity, in different socioeconomic settings. It would be essential to consider these limitations if inter-facility comparison is to be undertaken.

1. System Change

Question	Answer	Score	WHO improvement tools
1.1 How easily available is alcohol-based handrub in your health-care facility? **Choose one answer**	Not available	0	Ward Infrastructure Survey; Protocol for Evaluation of Tolerability and Acceptability of Alcohol-based Handrub in Use or Planned to be Introduced:Method 1; Guide to Implementation II.1
	Available, but efficacy[1] and tolerability[2] have not been proven	0	
	Available only in some wards or in discontinuous supply (with efficacy[1] and tolerability[2] proven)	5	
	Available facility-wide with continuous supply (with efficacy[1] and tolerability[2] proven)	10	
	Available facility-wide with continuous supply, and at the point of care[3] in the majority of wards (with efficacy[1] and tolerability[2] proven)	30	
	Available facility-wide with continuous supply at each point of care[3] (with efficacy[1] and tolerability[2] proven)	50	
1.2 What is the sink:bed ratio? **Choose one answer**	Less than 1:10	0	Ward Infrastructure Survey; Guide to Implementation II.1
	At least 1:10 in most wards	5	
	At least 1:10 facility-wide and 1:1 in isolation rooms and in intensive care units	10	
1.3 Is there a continuous supply of clean, running water[4]?	No	0	Ward Infrastructure Survey; Guide to Implementation II.1
	Yes	10	
1.4 Is soap[5] available at each sink?	No	0	Ward Infrastructure Survey; Guide to Implementation II.1
	Yes	10	
1.5 Are single-use towels available at each sink?	No	0	Ward Infrastructure Survey; Guide to Implementation II.1
	Yes	10	
1.6 Is there dedicated/available budget for the continuous procurement of hand hygiene products (e.g. alcohol-based handrubs)?	No	0	Guide to Implementation II.1
	Yes	10	

Extra Question: Action plan

Answer this question ONLY if you scored less than 100 for questions 1.1 to 1.6: Is there realistic plan in place to improve the infrastructure[6] in your health-care facility?	No	0	Alcohol-based Handrub Planning and Costing Tool; Guide to Local Production: WHO-recommended Handrub Formulations; Guide to Implementation II.1
	Yes	5	
	System Change subtotal	**/100**	

Efficacy: The alcohol-based handrub product used should meet recognised standards of antimicrobial efficacy for hand antisepsis (ASTM or EN standards). Alcohol-based handrubs with optimal antimicrobial efficacy usually contain 75 to 85% ethanol, isopropanol, or n-propanol, or a combination of these products. The WHO-recommended formulations contain either 75% v/v isopropanol, or 80% v/v ethanol.

Skin tolerability: The alcohol-based handrub product is well tolerated by health-care workers skin (i.e. it does not harm or irritate the skin) when usedin clinical care, as demonstrated by reliable data. The WHO Protocol for Evaluation of Tolerability and Acceptability of Alcohol-based Handrub in Use or Planned to be Introduced can be used as a reference.

Point of care: The place where three elements come together: the patient, the health-care worker, and care or treatment involving contact with the patient or his/ her surroundings (within the patient zone). Point-of-care products should be accessible without having to leave the patient zone (ideally within arms reach of the health- care worker or within 2 meters).

Clean, running water: A water supply that is either piped in (or where this is not available, from onsite storage with appropriate disinfection) that meets appropriate safety standards for microbial and chemical contamination. Further details can be found in Essential environmental health standards in health care (Geneva, World Health Organization, 2008, http://whqlibdoc.who.int/publications/2008/9789241547239_eng.pdf).

Soap: Detergent-based products that contain no added antimicrobial agents, or may contain these solely as preservatives. They are available in various forms including bar soap, tissue, leaf, and liquid preparations.

Infrastructure: The "infrastructure" here referred to includes facilities, equipment, and products that are required to achieve optimal hand hygiene practices within the facility. Specifically, it refers to the indicators included in questions 1.1-1.5 and detailed in the WHO Guidelines on Hand Hygiene in Health Care 2009, Part I, Chapter 23.5 (e.g. availability of alcohol based handrub at all points of care, a continuous supply of clean, running water and a sink:bed ratio of at least 1:10, with soap and single-use towels at each sink).

2. Training and Education

Question	Answer	Score	WHO improvement tools
2.1 Regarding training of health-care workers in your facility:			
2.1a How frequently do health-care workers receive training regarding hand hygiene[7] in your facility? **Choose one answer**	Never	0	Slides for Education Session for Trainers, Observers and Health-care Workers; Hand Hygiene Training Films; Slides Accompanying the Training Films; Slides for the Hand Hygiene Co-ordinator; Hand Hygiene Technical Reference Manual; Hand Hygiene Why, How and When Brochure; Guide to Implementation II.2
	At least once	5	
	Regular training for medical and nursing staff, or all professional categories (at least annually)	10	
	Mandatory training for all professional categories at commencement of employment, then ongoing regular training (at least annually)	20	
2.1b Is a process in place to confirm that all health-care workers complete this training?	No	0	
	Yes	20	
2.2 Are the following WHO documents (available at www.who.int/gpsc/5may/tools), or similar local adaptations, easily available to all health-care workers?			Guide to Implementation II.2
2.2a The 'WHO Guidelines on Hand Hygiene in Health-care: A Summary'	No	0	WHO Guidelines on Hand Hygiene in Health Care: A Summary
	Yes	5	
2.2b The WHO 'Hand Hygiene Technical Reference Manual'	No	0	Hand Hygiene Technical Reference Manual
	Yes	5	
2.2c The WHO 'Hand Hygiene: Why, How and When' Brochure	No	0	Hand Hygiene Why, How and When Brochure
	Yes	5	
2.2d The WHO 'Glove Use Information' Leaflet	No	0	Glove Use Information Leaflet
	Yes	5	
2.3 Is a professional with adequate skills[8] to serve as trainer for hand hygiene educational programmes active within the health-care facility?	No	0	WHO Guidelines on Hand Hygiene in Health Care; Hand Hygiene Technical Reference Manual; Hand Hygiene Training Films; Slides Accompanying the Training Films; Guide to Implementation II.2
	Yes	15	
2.4 Is a system in place for training and validation of hand hygiene compliance observers?	No	0	
	Yes	15	
2.5 Is there is a dedicated budget that allows for hand hygiene training?	No	0	Template Letter to Advocate Hand Hygiene to Managers; Template Letter to communicate Hand Hygiene Initiatives to Managers; Template Action Plan; Guide to Implementation II.2 and III.1 (page 33)
	Yes	10	
	Training and Education subtotal	**/100**	

7. Training in hand hygiene: This training can be done using different methods but the information conveyed should be based on the WHO multimodal hand hygiene improvement strategy or similar material. Training should include the following:
- The definition, impact and burden of health care-associated infection (HCAI)
- Major patterns of transmission of health care-associated pathogens
- Prevention of HCAI and the critical role of hand hygiene
- Indications for hand hygiene (based on the WHO 'My 5 Moments for Hand Hygiene' approach)
- Correct technique for hand hygiene (refer to 'How to Handrub' and 'How to Hand Wash')

8. A professional with adequate skills: Medical staff or nursing staff trained in Infection Control or Infectious Diseases, whose tasks formally include dedicated time for staff training. In some settings, this could also be medical or nursing staff involved in clinical work, with dedicated time to acquire thorough knowledge of the evidence for and correct practice of hand hygiene (the minimum required knowledge can be found in the WHO Guidelines on Hand Hygiene in Health Care and the Hand Hygiene Technical Reference Manual).

3. Evaluation and Feedback

Question	Answer	Score	WHO improvement tools
3.1 Are regular (at least annual) ward-based audits undertaken to assess the availability of handrub, soap, single use towels and other hand hygiene resources?	No	0	Ward Infrastructure Survey Guide to Implementation II.3
	Yes	10	
3.2 Is health care worker knowledge of the following topics assessed at least annually (e.g. after education sessions)?			
3.2a. The indications for hand hygiene	No	0	Hand Hygiene Knowledge Questionnaire for Health-Care Workers Guide to Implementation II.3
	Yes	5	
3.2b. The correct technique for hand hygiene	No	0	
	Yes	5	
3.3 Indirect Monitoring of Hand Hygiene Compliance			
3.3a Is consumption of alcohol-based handrub monitored regularly (at least every 3 months)?	No	0	Soap/Handrub Consumption Survey Guide to Implementation II.3
	Yes	5	
3.3b Is consumption of soap monitored regularly (at least every 3 months)?	No	0	
	Yes	5	
3.3c Is alcohol based handrub consumption at least 20L per 1000 patient-days?	No (or not measured)	0	
	Yes	5	
3.4 Direct Monitoring of Hand Hygiene Compliance Only complete section 3.4 if hand hygiene compliance observers in your facility have been trained and validated and utilise the WHO 'My 5 Moments for Hand Hygiene' (or similar) methodology			
3.4a How frequently is direct observation of hand hygiene compliance performed using the WHO Hand Hygiene Observation tool (or similar technique)? **Choose one answer**	Never	0	WHO Hand Hygiene Observation form Hand Hygiene Technical Reference Manual Guide to Implementation II.3
	Irregularly	5	
	Annually	10	
	Every 3 months or more often	15	
3.4b What is the overall hand hygiene compliance rate according to the WHO Hand Hygiene Observation tool (or similar technique) in your facility? **Choose one answer**	☒30%	0	Guide to Implementation II.3 Observation form Data Entry Analysis tools Instructions for Data Entry and Analysis Epi Info™ software[9] Data Summary Report Framework
	31 – 40%	5	
	41 – 50%	10	
	51 – 60%	15	
	61 – 70%	20	
	71 – 80%	25	
	☑81%	30	
3.5 Feedback			
3.5a **Immediate feedback** Is immediate feedback given to health-care workers at the end of each hand hygiene compliance observation session?	No	0	Guide to Implementation II.3 Observation and Basic Compliance Calculation forms
	Yes	5	
3.5b **Systematic feedback** Is regular (at least 6 monthly) feedback of data related to hand hygiene indicators with demonstration of trends over time given to:			Data Summary Report Framework Guide to Implementation II.3
3.5b.i Health-care workers?	No	0	
	Yes	7.5	
3.5b.ii Facility leadership?	No	0	
	Yes	7.5	
Evaluation and Feedback subtotal		**/100**	

4. Reminders in the Workplace

Question	Answer	Score	WHO improvement tools
4.1 Are the following posters (or locally produced equivalent with similar content) displayed?			Guide to Implementation II.4
4.1a Poster explaining the indications for hand hygiene **Choose one answer**	Not displayed	0	Your 5 Moments for Hand Hygiene (Poster)
	Displayed in some wards/treatment areas	15	
	Displayed in most wards/treatment areas	20	
	Displayed in all wards/treatment areas	25	
4.1b Poster explaining the correct use of handrub **Choose one answer**	Not displayed	0	How to Handrub (Poster)
	Displayed in some wards/treatment areas	5	
	Displayed in most wards/treatment areas	10	
	Displayed in all wards/treatment areas	15	
4.1c Poster explaining correct hand-washing technique **Choose one answer**	Not displayed	0	How to Handwash (Poster)
	Displayed in some wards/treatment areas	5	
	Displayed in most wards/treatment areas	7.5	
	Displayed at every sink in all wards/treatment areas	10	
4.2 How frequently does a systematic audit of all posters for evidence of damage occur, with replacement as required? **Choose one answer**	Never	0	Guide to Implementation II.4
	At least annually	10	
	Every 2-3 months	15	
4.3 Is hand hygiene promotion undertaken by displaying and regularly updating posters other than those mentioned above?	No	0	Guide to Implementation II.4
	Yes	10	
4.4 Are hand hygiene information leaflets available on wards?	No	0	Hand Hygiene: When and How Leaflet
	Yes	10	Guide to Implementation II.4
4.5 Are other workplace reminders located throughout the facility? (e.g. hand hygiene campaign screensavers, badges, stickers, etc)	No	0	SAVE LIVES: Clean Your Hands Screensaver Guide to Implementation II.4
	Yes	15	
	Reminders in the Workplace subtotal	**/100**	

5. Institutional Safety Climate for Hand Hygiene

Question	Answer	Score	WHO improvement tools
5.1 With regard to a hand hygiene team[10] that is dedicated to the promotion and implementation of optimal hand hygiene practice in your facility:			Guide to Implementation II.5
5.1a Is such a team established?	No	0	
	Yes	5	
5.1b Does this team meet on a regular basis (at least monthly)?	No	0	
	Yes	5	
5.1c Does this team have dedicated time to conduct active hand hygiene promotion? (e.g. teaching monitoring hand hygiene performance, organizing new activities)	No	0	
	Yes	5	
5.2 Have the following members of the facility leadership made a clear commitment to support hand hygiene improvement? (e.g. a written or verbal commitment to hand hygiene promotion received by the majority of health-care workers)			Template Letter to Advocate Hand Hygiene to Managers Template Letter to communicate Hand Hygiene Initiatives to Managers Guide to Implementation II.5
5.2a Chief executive officer	No	0	
	Yes	10	
5.2b Medical director	No	0	
	Yes	5	
5.2c Director of nursing	No	0	
	Yes	5	
5.3 Has a clear plan for the promotion of hand hygiene throughout the entire facility for the 5 May (Save Lives Clean Your Hands Annual Initiative) been established ?	No	0	Sustaining Improvement – Additional Activities for Consideration by Health-Care Facilities Guide to Implementation II.5
	Yes	10	
5.4 Are systems for identification of Hand Hygiene Leaders from all disciplines in place?			
5.4a A system for designation of Hand Hygiene champions[11]	No	0	
	Yes	5	
5.4b A system for recognition and utilisation of Hand Hygiene role models[12]	No	0	
	Yes	5	
5.5 Regarding patient involvement in hand hygiene promotion:			Guidance on Engaging Patients and Patient Organizations in Hand Hygiene Initiatives Guide to Implementation II.5
5.5a Are patients informed about the importance of hand hygiene? (e.g. with a leaflet)	No	0	
	Yes	5	
5.5b Has a formalised programme of patient engagement been undertaken?	No	0	
	Yes	10	
5.6 Are initiatives to support local continuous improvement being applied in your facility, for example:			Sustaining Improvement – Additional Activities for Consideration by Health-Care Facilities Guide to Implementation II.5
5.6a Hand hygiene E-learning tools	No	0	
	Yes	5	
5.6b A hand hygiene institutional target to be achieved is established each year	No	0	
	Yes	5	
5.6c A system for intra-institutional sharing of reliable and tested local innovations	No	0	
	Yes	5	
5.6d Communications that regularly mention hand hygiene e.g. facility newsletter, clinical meetings	No	0	
	Yes	5	
5.6e System for personal accountability[13]	No	0	
	Yes	5	
5.6f A Buddy system[14] for new employees	No	0	
	Yes	5	

10. **Hand hygiene team:** The make-up of this team will vary. It is likely to most frequently consist of an infection control unit, but may range (depending on resources available) from a single person with the role of managing the hand hygiene programme, to a group of staff members from various departments within the facility with meetings dedicated to the hand hygiene programme.

11. **Hand hygiene champion:** A person who is an advocate for the causes of patient safety and hand hygiene standards and takes on responsibility for publicizing a project in his/her ward and/or facility-wide.

12. **Hand hygiene role model:** A person who serves as an example, whose behaviour is emulated by others. In particular, a hand hygiene role model should have a hand hygiene compliance rate of at least 80%, be able to remind others to comply, and be able to teach practically about the WHO 5 Moments for Hand Hygiene concept.

13. **System for personal accountability:** explicit actions are in place to stimulate health-care workers to be accountable for their behaviour with regard to hand hygiene practices. Examples are notification by observers or infection control professionals, reproaches by peers, and reports to higher level facility authorities, with possible consequences on the individual evaluation.

14. **Buddy system:** A programme in which each new health-care worker is coupled with an established, trained health-care worker who takes responsibility for introducing them to the hand hygiene culture of the health-care setting (including practical training on indications and technique for performing hand hygiene, and explanation of hand hygiene promotion initiatives within the facility).

Annex 13:

Hand hygiene observation form

Date (yy/mm/dd): Start time: End Time:

Facility name: District:

Ward: County:

Observer: Cell number

Are Hand hygiene supplies available on the ward? Yes ☐ No ☐

Health care worker (HCW) code:

1 = Doctor/Physician
2 = Physician Assistant
3 = Nurse
4 = Nurse Aide
5 = Technician (lab, x-ray, etc.)
6 = Environmental Services Worker/Cleaner
7 = Midwife
8 = Other (specify on the form)

Instructions:

- Identify the facility, considering its size to inform number of observers required
- Choose a ward/unit and time that has a good flow of activity
- Introduce yourself to the staff and explain the purpose of your visit
- Ask if hand hygiene supplies (i.e. handrub, water, soap, buckets or sinks) are available at the start of the audit. If not available, do not conduct the audit. Question staff why these items are not available on the unit/ward.
- Position yourself such that you do not interfere with patient care, but where you have a good view of patient care delivery and hand wash stations.
- Always respect patient privacy – if the patient is uncomfortable, politely excuse yourself.
- Observe hand hygiene practice of the HCW:
    - Observe one health care worker for up to a maximum of 20 minutes; record the end time immediately after completing the observation session.
    - Conduct a minimum of 50 observations per ward/unit every quarter, considering different days and time (i.e. day & night shift, weekends and cadres of HCWs)-this may imply going back to the same unit/ward multiple times.
    - The observer may observe up to three HCWs at the same time, if there are many procedures or opportunities for hand hygiene by different HCWs.
    - The observer should follow the WHO five moments for hand hygiene (see Annex 11).
- Provide immediate feedback to staff based on what you observed, letting them know what went well and what could be improved.

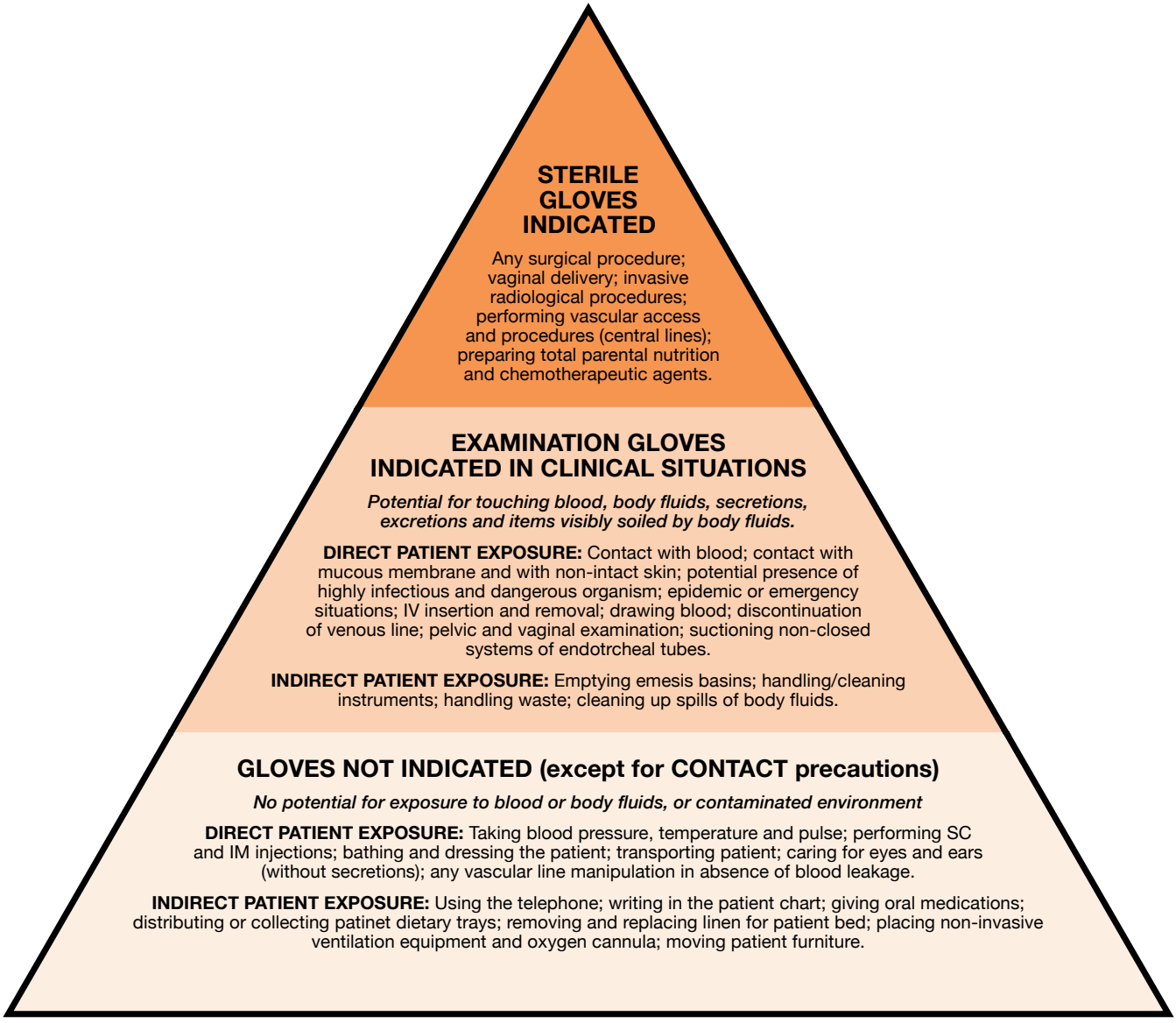
HCW Code:				HCW Code:				HCW Code:			
Opp.	**HH Moment**	**HH Method**	**Gloves***	**Opp.**	**HH Moment**	**HH Method**	**Gloves***	**Opp.**	**HH Moment**	**HH Method**	**Gloves***
1.	☐ Bef-pat con. ☐ Bef-aseptic ☐ Aft-body fld. ☐ Aft-pat con. ☐ Aft. pat surr	☐ HR ☐ HW ☐ Missed	☐ Yes ☐ No ☐ NA	1.	☐ Bef-pat con. ☐ Bef-aseptic ☐ Aft-body fld. ☐ Aft-pat con. ☐ Aft. pat surr.	☐ HR ☐ HW ☐ Missed	☐ Yes ☐ No ☐ NA	1.	☐ Bef-pat con. ☐ Bef-aseptic ☐ Aft-body fld. ☐ Aft-pat con. ☐ Aft. pat surr	☐ HR ☐ HW ☐ Missed	☐ Yes ☐ No ☐ NA
2.	☐ Bef-pat con. ☐ Bef-aseptic ☐ Aft-body fld. ☐ Aft-pat con. ☐ Aft. pat surr	☐ HR ☐ HW ☐ Missed	☐ Yes ☐ No ☐ NA	2.	☐ Bef-pat con. ☐ Bef-aseptic ☐ Aft-body fld. ☐ Aft-pat con. ☐ Aft. pat surr.	☐ HR ☐ HW ☐ Missed	☐ Yes ☐ No ☐ NA	2.	☐ Bef-pat con. ☐ Bef-aseptic ☐ Aft-body fld. ☐ Aft-pat con. ☐ Aft. pat surr	☐ HR ☐ HW ☐ Missed	☐ Yes ☐ No ☐ NA
3.	☐ Bef-pat con. ☐ Bef-aseptic ☐ Aft-body fld. ☐ Aft-pat con. ☐ Aft. pat surr	☐ HR ☐ HW ☐ Missed	☐ Yes ☐ No ☐ NA	3.	☐ Bef-pat con. ☐ Bef-aseptic ☐ Aft-body fld. ☐ Aft-pat con. ☐ Aft. pat surr	☐ HR ☐ HW ☐ Missed	☐ Yes ☐ No ☐ NA	3.	☐ Bef-pat con. ☐ Bef-aseptic ☐ Aft-body fld. ☐ Aft-pat con. ☐ Aft. pat surr	☐ HR ☐ HW ☐ Missed	☐ Yes ☐ No ☐ NA
4.	☐ Bef-pat con. ☐ Bef-aseptic ☐ Aft-body fld. ☐ Aft-pat con. ☐ Aft. pat surr	☐ HR ☐ HW ☐ Missed	☐ Yes ☐ No ☐ NA	4.	☐ Bef-pat con. ☐ Bef-aseptic ☐ Aft-body fld. ☐ Aft-pat con. ☐ Aft. pat surr.	☐ HR ☐ HW ☐ Missed	☐ Yes ☐ No ☐ NA	4.	☐ Bef-pat con. ☐ Bef-aseptic ☐ Aft-body fld. ☐ Aft-pat con. ☐ Aft. pat surr	☐ HR ☐ HW ☐ Missed	☐ Yes ☐ No ☐ NA
5.	☐ Bef-pat con. ☐ Bef-aseptic ☐ Aft-body fld. ☐ Aft-pat con. ☐ Aft. pat surr.	☐ HR ☐ HW ☐ Missed	☐ Yes ☐ No ☐ NA	5.	☐ Bef-pat con. ☐ Bef-aseptic ☐ Aft-body fld. ☐ Aft-pat con. ☐ Aft. pat surr.	☐ HR ☐ HW ☐ Missed	☐ Yes ☐ No ☐ NA	5.	☐ Bef-pat con. ☐ Bef-aseptic ☐ Aft-body fld. ☐ Aft-pat con. ☐ Aft. pat surr.	☐ HR ☐ HW ☐ Missed	☐ Yes ☐ No ☐ NA
6.	☐ Bef-pat con. ☐ Bef-aseptic ☐ Aft-body fld. ☐ Aft-pat con. ☐ Aft. pat surr.	☐ HR ☐ HW ☐ Missed	☐ Yes ☐ No ☐ NA	6.	☐ Bef-pat con. ☐ Bef-aseptic ☐ Aft-body fld. ☐ Aft-pat con. ☐ Aft. pat surr.	☐ HR ☐ HW ☐ Missed	☐ Yes ☐ No ☐ NA	6.	☐ Bef-pat con. ☐ Bef-aseptic ☐ Aft-body fld. ☐ Aft-pat con. ☐ Aft. pat surr.	☐ HR ☐ HW ☐ Missed	☐ Yes ☐ No ☐ NA
7.	☐ Bef-pat con. ☐ Bef-aseptic ☐ Aft-body fld. ☐ Aft-pat con. ☐ Aft. pat surr.	☐ HR ☐ HW ☐ Missed	☐ Yes ☐ No ☐ NA	7.	☐ Bef-pat con. ☐ Bef-aseptic ☐ Aft-body fld. ☐ Aft-pat con. ☐ Aft. pat surr.	☐ HR ☐ HW ☐ Missed	☐ Yes ☐ No ☐ NA	7.	☐ Bef-pat con. ☐ Bef-aseptic ☐ Aft-body fld. ☐ Aft-pat con. ☐ Aft. pat surr.	☐ HR ☐ HW ☐ Missed	☐ Yes ☐ No ☐ NA
8.	☐ Bef-pat con. ☐ Bef-aseptic ☐ Aft-body fld. ☐ Aft-pat con. ☐ Aft. pat surr.	☐ HR ☐ HW ☐ Missed	☐ Yes ☐ No ☐ NA	8.	☐ Bef-pat con. ☐ Bef-aseptic ☐ Aft-body fld. ☐ Aft-pat con. ☐ Aft. pat surr.	☐ HR ☐ HW ☐ Missed	☐ Yes ☐ No ☐ NA	8.	☐ Bef-pat con. ☐ Bef-aseptic ☐ Aft-body fld. ☐ Aft-pat con. ☐ Aft. pat surr.	☐ HR ☐ HW ☐ Missed	☐ Yes ☐ No ☐ NA
9.	☐ Bef-pat con. ☐ Bef-aseptic ☐ Aft-body fld. ☐ Aft-pat con. ☐ Aft. pat surr.	☐ HR ☐ HW ☐ Missed	☐ Yes ☐ No ☐ NA	9.	☐ Bef-pat con. ☐ Bef-aseptic ☐ Aft-body fld. ☐ Aft-pat con. ☐ Aft. pat surr.	☐ HR ☐ HW ☐ Missed	☐ Yes ☐ No ☐ NA	9.	☐ Bef-pat con. ☐ Bef-aseptic ☐ Aft-body fld. ☐ Aft-pat con. ☐ Aft. pat surr.	☐ HR ☐ HW ☐ Missed	☐ Yes ☐ No ☐ NA
10.	☐ Bef-pat con. ☐ Bef-aseptic ☐ Aft-body fld. ☐ Aft-pat con. ☐ Aft. pat surr.	☐ HR ☐ HW ☐ Missed	☐ Yes ☐ No ☐ NA	10.	☐ Bef-pat con. ☐ Bef-aseptic ☐ Aft-body fld. ☐ Aft-pat con. ☐ Aft. pat surr.	☐ HR ☐ HW ☐ Missed	☐ Yes ☐ No ☐ NA	10.	☐ Bef-pat con. ☐ Bef-aseptic ☐ Aft-body fld. ☐ Aft-pat con. ☐ Aft. pat surr.	☐ HR ☐ HW ☐ Missed	☐ Yes ☐ No ☐ NA

HCW: *Health care worker;* ***HH****: Hand hygiene;* ***HR:*** *Handrub;* ***HW****: Handwash;* ***Bef-pat con****: Before patient contact;*
Bef-aseptic: *Before aseptic procedure;* ***Aft-body fld****: After body fluid exposure;* ***Aft-patient con****: After patient contact****; Aft-pat-surr****: After contact with patient surrounding or environment; missed: hand hygiene indicated but not performed;* ***Opp.****: opportunity.*

*Yes: Glove use indicated, hand hygiene was performed; No: Glove use indicated, hand hygiene not performed. ***NA*** *(not applicable): Glove use not indicated, hand hygiene was performed.*

Annex 14:

Pyramid of indications for type of gloves



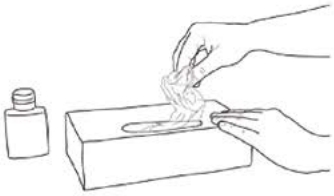
Gloves must be worn according to **STANDARD** and **CONTACT PRECAUTIONS.** The pyramid details some clinical examples in which gloves are not indicated, and others in which examination or sterile gloves are indicated. Hand hygiene should be performed when appropriate regardless of indications for glove use.

Annex 15:

How to put on and take off non-sterile gloves

When the hand hygiene indication occurs before a contact requiring glove use, perform hand hygiene by rubbing with an alcohol-based handrub or by washing with soap and water.

I. HOW TO DON GLOVES:



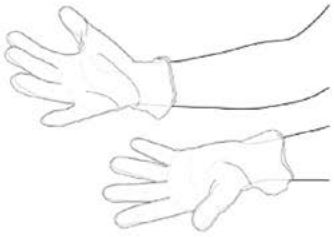
1. Take out a glove from its original box

2. Touch only a restricted surface of the glove corresponding to the wrist (at the top edge of the cuff)

3. Don the first glove

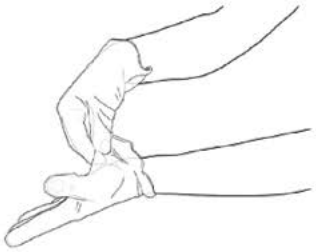
4. Take the second glove with the bare hand and touch only a restricted surface of glove corresponding to the wrist

5. To avoid touching the skin of the forearm with the gloved hand, turn the external surface of the glove to be donned on the folded fingers of the gloved hand, thus permitting to glove the second hand

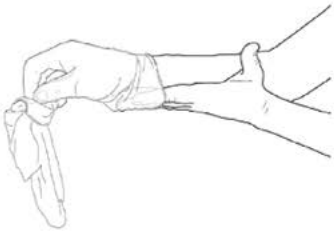


6. Once gloved, hands should not touch anything else that is not defined by indications and conditions for glove use

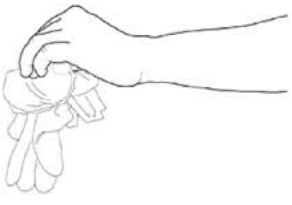
II. HOW TO REMOVE GLOVES:



1. Pinch one glove at the wrist level to remove it, without touching the skin of the forearm, and peel away from the hand, thus allowing the glove to turn inside out



2. Hold the removed glove in the gloved hand and slide the fingers of the ungloved hand inside between the glove and the wrist. Remove the second glove by rolling it down the hand and fold into the first glove



3. Discard the removed gloves

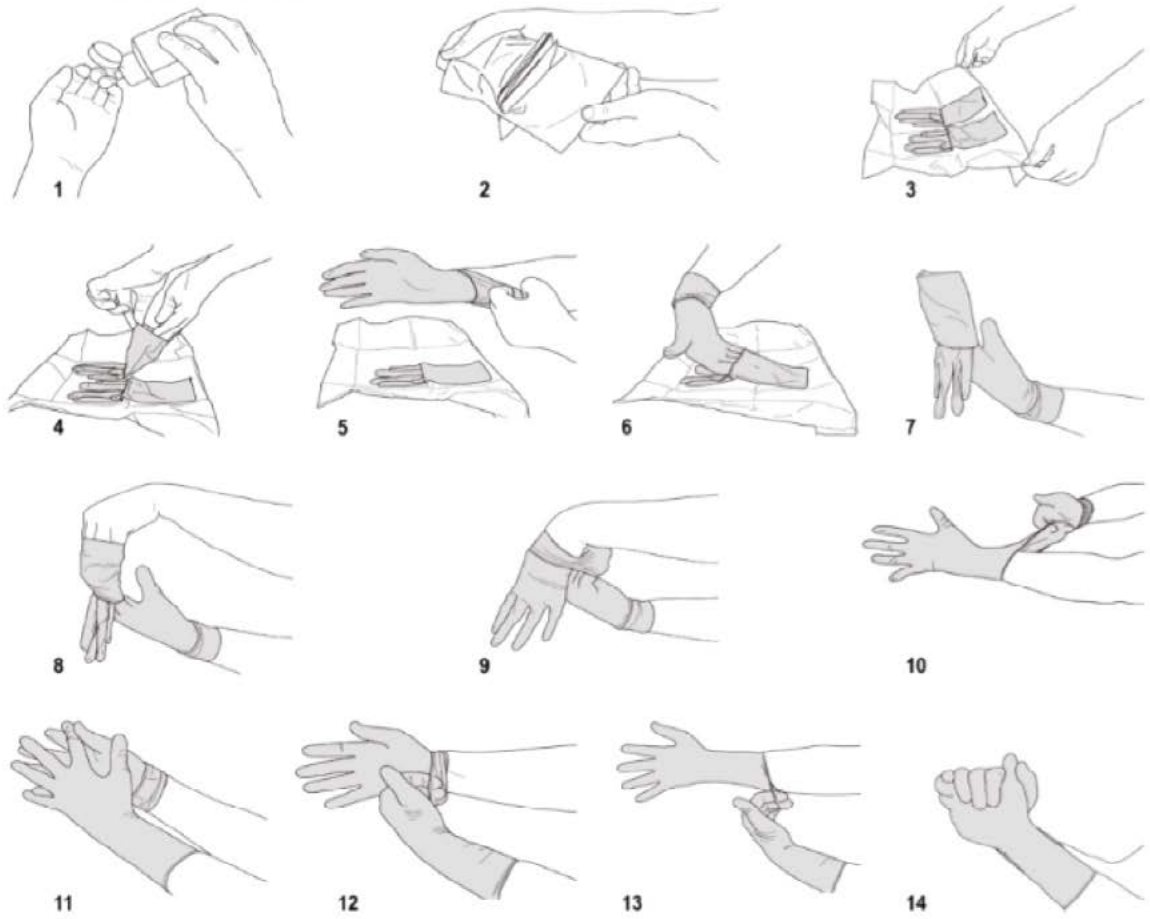
4. Then, perform hand hygiene by rubbing with an alcohol-based handrub or by washing with soap and water

Annex 16:

How to put on and take off sterile gloves

The purpose of this technique is to ensure maximum asepsis for the patient and to protect the health-care worker from the patient's body fluid(s). To achieve this goal, the skin of the health-care worker remains exclusively in contact with the inner surface of the glove and has no contact with the outer surface. Any error in the performance of this technique leads to a lack of asepsis requiring a change of gloves.

I. HOW TO DON STERILE GLOVES



1. Perform hand hygiene before an "aseptic procedure" by handrubbing or hand washing.
2. Check the package for integrity. Open the first non-sterile packaging by peeling it completely off the heat seal to expose the second sterile wrapper, but without touching it.
3. Place the second sterile package on a clean, dry surface without touching the surface. Open the package and fold it towards the bottom so as to unfold the paper and keep it open.
4. Using the thumb and index finger of one hand, carefully grasp the folded cuff edge of the glove.
5. Slip the other hand into the glove in a single movement, keeping the folded cuff at the wrist level.

6-7. Pick up the second glove by sliding the fingers of the gloved hand underneath the cuff of the glove.

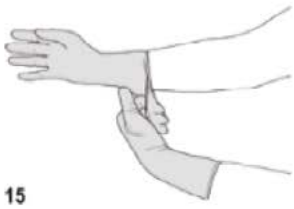
8-10. In a single movement, slip the second glove on to the ungloved hand while avoiding any contact/resting of the gloved hand on surfaces other than the glove to be donned (contact/resting constitutes a lack of asepsis and requires a change of glove).

11. If necessary, after donning both gloves, adjust the fingers and interdigital spaces until the gloves fit comfortably.

12-13. Unfold the cuff of the first gloved hand by gently slipping the fingers of the other hand inside the fold, making sure to avoid any contact with a surface other than the outer surface of the glove (lack of asepsis requiring a change of gloves).

14. The hands are gloved and must touch exclusively sterile devices or the previously-disinfected patient's body area.

II. HOW TO REMOVE STERILE GLOVES



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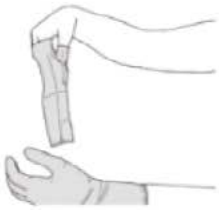

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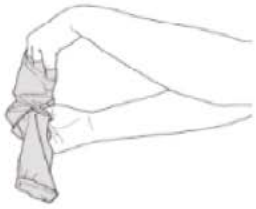

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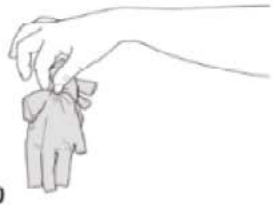

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21

15-17. Remove the first glove by peeling it back with the fingers of the opposite hand. Remove the glove by rolling it inside out to the second finger joints (do not remove completely).

18. Remove the other glove by turning its outer edge on the fingers of the partially ungloved hand.

19. Remove the glove by turning it inside out entirely to ensure that the skin of the health-care worker is always and exclusively in contact with the inner surface of the glove.

20. Discard gloves.

21. Perform hand hygiene after glove removal according to the recommended indication.

NB: Donning surgical sterile gloves at the time of a surgical intervention follows the same sequences except that:

- it is preceeded by a surgical hand preparation;
- donning gloves is performed after putting on the sterile surgical gown;
- the opening of the first packaging (non-sterile) is done by an assistant;
- the second packaging (sterile) is placed on a sterile surface other than that used for the intervention;
- gloves should cover the wrists of the sterile gown.

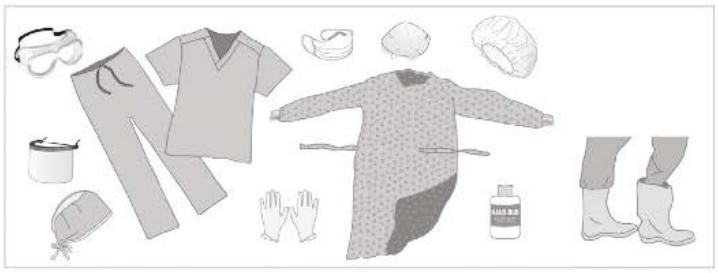
Annex 17:

How to put on personal protective equipment (PPE)

1 Always put on essential required PPE when handling either a suspected, probable or confirmed case of viral haemorragic fever.

2 The dressing and undressing of PPE should be supervised by another trained member of the team.

3 Gather all the necessary items of PPE beforehand. Put on the scrub suit in the changing room.



4 Put on rubber boots. If not available, make sure you have closed, puncture and fluid resistant shoes and put on overshoes.

OR, IF BOOTS UNAVAILABLE

5 Place the impermeable gown over the scrubs.

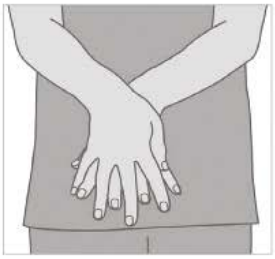
6 Put on face protection:

6a Put on a medical mask.

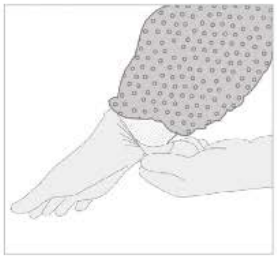
6b Put on goggles or a face shield.

7 If available, put a head cover on at this time.

8 Perform hand hygiene.



9 Put on gloves* (over cuff).



10 If an impermeable gown is not available, place waterproof apron over gown.

Annex 18:

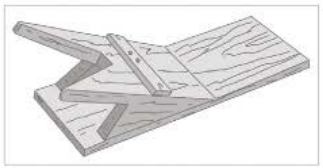
How to remove personal protective equipment (PPE)

1 Remove waterproof apron and dispose of safely. If the apron is to be reused, place it in a container with disinfectant.

2 If wearing overshoes, remove them with your gloves still on (If wearing rubber boots, see step 4).

3 Remove gown and gloves and roll inside-out and dispose of safely.

4 If wearing rubber boots, remove them (ideally using the boot remover) without touching them with your hands. Place them in a container with disinfectant.



5 Perform hand hygiene.

6 If wearing a head cover, remove it now (from behind the head).

7 Remove face protection:

7a Remove face shield or goggles (from behind the head). Place eye protection in a separate container for reprocessing.

7b Remove mask from behind the head. When removing mask, untie the bottom string first and the top string next.

8 Perform hand hygiene.

Source: Modified from Clinical Management of Patients with Viral Haemorrhagic Fever: A pocket Guide for the Front-line Health Worker. World Health Organization, 2014

Annex 19:

How to manually clean instruments

Follow this procedure to clean the instruments manually:

- Wear PPE (plastic apron, gowns, thick rubber gloves, goggles, mask or face shield surgical or both);
- Ensure that the device to be cleaned is compatible with the detergent (non-corrosive, non-abrasive, low foaming and without rinsing) used in the facility;
- Completely submerge immersible items during the cleaning process to minimize aerosolization and to assist in cleaning;
- Fully open the instrument as scissors or forceps and immerse all parts;
- Remove gross soil using tools, such as brushes and single-use cloths;
- Minimize the production of aerosols when cleaning non-immersible devices;
- Clean devices that have lumens with an appropriate brush, then manually or mechanically flush with a detergent solution and rinse with potable water;
- Check devices with lumens for obstructions and leakage.

Steps for immersion method:

- Fill sink or any other appropriate basin with sufficient lukewarm water for complete immersion of the device;
- Add the appropriate quantity of detergent following the manufacturer's instructions for dosage;
- Clean the device under the surface of the water so that aerosols are not produced;
- Use appropriate brushes to properly clean box locks, lumens and other hard-to-clean areas
  - Use soft (nylon) bristle brushes so that the surface of the instrument is not damaged
  - Brushes used to clean lumens must be the same diameter as the instrument to ensure that all internal surfaces can be reached
  - Brushes must also be long enough to exit the distal end of the instrument
- In another sink or basin, completely immerse the device in clean purified water and rinse the device thoroughly;
- Mechanically dry; if this not available or not recommended by the manufacturer, air-dry or hand-dry using a disposable clean, non-lining cloth;
- Inspect the instrument to make sure it is clean;
- Pay special attention to instruments with teeth, joints, screws or where organic material can lodge;
- Open any articulated instruments.

Steps for non-immersion method:

- Clean the device by wiping surfaces thoroughly with a disposable, clean, non-linting cloth and detergent ensuring that moisture does not enter critical areas of the device (e.g. power connections) until all visible soil is removed;
- Rinse the device by wiping surfaces thoroughly with a damp, disposable, clean, non-linting cloth until all detergent residue is removed;
- Mechanically dry; if this is not available or not recommended by the manufacturer, air-dry or hand-dry using a disposable clean, non-linting cloth. Disposable cloths should be discarded after each use;
- Cleaning solution and water should be changed at each cleaning session and when visibly soiled.

Annex 20:

Indications for the use of PPE in the sterilization department

PPE indication	Gloves	Face cover/visors	Headgear	Aprons/ gowns	Closed shoes
Decontamination area • Handling used medical devices • Removal and disposal of sharps • Manual cleaning	Domestic gloves (heavy duty); long; disposable or tear-resistant if reused if available use nitrile gloves	Cover mucous membranes and eyes • Mask with integrated visor • Full visor • Face mask with goggles	Yes	Yes	Yes
IAP • Inspection after cleaning • Assembly • Packaging	Not indicated	Not indicated	Yes	Optional	Yes
Sterilization • Loading • Emptying sterilizer	Heavy duty heat-resistant gloves	Not indicated	Yes	No	Yes
Sterile stores • Loading shelves • Taking inventory • Documentation	Not indicated	Not indicated	Optional	No	Yes
Transportation • Delivering sterile pack	Not indicated	Not indicated	Optional	No	Yes
• Returning used medical devices	Yes – domestic gloves (heavy duty)	Only when handling open wet trays		Yes	Yes

Annex 21:

Standard operating procedure for autoclaves (pressure cooker)

1. Scope

The purpose of this document is to provide standard operating procedures for the safe use of autoclaves. On the wards, autoclaving is a process used to reprocess medical devices and equipment designated as critical (Spaulding classification). In a laboratory setting, autoclaving is a process used to destroy microorganisms and decontaminate bio hazardous waste and microbiological equipment used at Biosafety Level 1, 2, 3 and 4.

2. Roles and responsibilities

Responsible person (Nurses, Physician Assistants, Laboratory technicians, Nurse Aide):

a) Familiarize themselves with this SOP and associated work instructions;
b) Abide by this SOP and associated SOP requirements;
c) Immediately report injuries, accidents, unsafe conditions, and unsafe acts to their supervisor and/or Environmental Health and Safety (EHS);
d) Attend applicable training classes.

Supervisors:

a) Ensure that permanent and temporary workers are trained in and follow the requirements of this SOP;
b) Assure that employees attend appropriate training sessions;
c) Investigate and report accidents and unsafe conditions to Environmental Health and Safety.

Environmental Health and Safety (EHS):

a) Provide guidance and resources related to management of biohazardous waste;
b) Investigate hazardous situations which may unnecessarily expose employees to biological hazards and ensure they are properly reported, evaluated, and corrected;
c) Oversee all aspects of contracts with outside biological waste vendors.

Principal Investigator/ Laboratory Director /Laboratory Manager:

a) Support managers and supervisors in their efforts to implement this SOP;
b) Investigate and report accidents and unsafe conditions to Environmental Health and Safety.

Infection prevention control (IPC) focal person:

a) Review and approve this SOP;
b) Conduct training for employees;
c) Monitor the implementation of this SOP in various labs and wards;
d) Assure that accident and other hazardous situations which may unnecessarily expose employees to biological hazards are properly reported, evaluated, and corrected;
e) Support managers and supervisors in their efforts to implement this SOP;
f) Support, when required, any Investigation.

3. Definitions

Autoclave: Pressure chamber used to carry out industrial processes requiring elevated temperature and pressure different from ambient air pressure. Autoclaves are used in medical applications to perform sterilization

Biohazardous agent: Any agent that is biological in nature, capable of self-replication, and has the capacity to produce harmful effects upon biological organisms. Biohazards agents include, but are not limited to; bacteria; fungi; viruses; rickettsia; chlamydia; parasites; recombinant products; allergens; cultured human and animal cells and the potentially bio hazardous agents these cells may contain; clinical specimens; tissue from experimental animals; toxins of biological origin; other bio hazardous agents like prions

Biological Indicator (BI): A test system containing viable bacterial spores providing a defined resistance to a specified sterilization process.

Chemical Indicator (CI): A system that reveals a change in one or more predefined process variables based on a chemical or physical change resulting from exposure to the process.

Cleaning: The physical removal of foreign material (e.g. dust, soil) and organic material (e.g. blood, secretions, excretions, microorganisms). Cleaning physically removes rather then kills microorganisms. It is accomplished with water, detergents and mechanical actions.

Critical Medical Devices: Medical devices that enter sterile tissues, including the vascular system (e.g. surgical instruments, biopsy forceps, dental pieces and equipment, etc.). Critical medical devices present a high risk of infection if the device is contaminated with any microorganisms, including bacterial spores.

Decontamination: Procedure that eliminates or reduces microbial contamination to a safe level with respect to transmission of infection.

Disinfection: Procedure that kills pathogenic microorganisms but not necessarily their spores. Chemical germicides formulated as disinfectants are used on inanimate surfaces (i.e., medical devices) and not used on skin or any body parts.

Reprocessing: The steps performed to prepare used medical devices for reuse (e.g. cleaning, disinfection, sterilization)

Pressurized Steam Sterilization: is a simple yet very effective decontamination method. Sterilization is achieved by exposing products to saturated steam at high temperatures (121°C to 134°C). Product(s) are placed in a device called the autoclave and heated through pressurized steam to kill all microorganisms including spores.

Sterilization: A validated process used to render a product free from variable microorganisms. This is the level of reprocessing required for critical medical devices.

4. Safety measures

a) The name of the person responsible for the autoclave shall be posted near the autoclave.
b) SOP should be posted on the outside to the autoclave (Appendix A).
c) Ensure employees are trained before operating any autoclave unit.
d) Procedural and instructional documents provided by the manufacturer must be followed.
e) Proper PPE must be worn when loading and unloading the autoclave.
f) Autoclaves must be inspected at least annually.
   - A basic visual inspection should be performed monthly by the person responsible for the autoclave.
   - The inspection, service and repair records should be available upon request.
g) Spore strips may be used to validate autoclave effectiveness, if available.

5. Reprocessing Procedure

1) Pre-cleaning and containment at point-of-use
2) Soiled transportation
3) Cleaning and Decontamination
4) Preparation and packaging (If required)
5) Sterilization by autoclaving
6) Clean transportation and Storage

1) Pre-cleaning and containment at point-of-use
   a) Wear appropriate PPE (see Annex 20).
   b) Segregate sharp reusable device or that incorporate sharps from other device.
   c) Rinse gross soil with water immediately after use.
   d) Sort and contain the devices.
   e) Pre-clean (e.g. soak or spray) to prevent soil from drying on devices.
   f) Keep the device moist in the transportation container by adding a towel moistened with water (not saline).
2) Soiled transportation
   a) Transport the contaminated devices to the decontamination area as soon as possible.
   b) Use a covered, fully enclosed, puncture-resistant container.
   c) Decontaminate the container after each use.
   d) Follow a designated route to avoid high-traffic and patient care areas.
   e) Clearly identify all contaminated carts and containers.

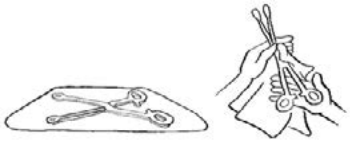
3) Cleaning and Decontamination
   a) Wear appropriate PPE (see Annex 20).
   b) Use a soft brush and detergent (liquid or powder) to remove organic matter.
   c) Soak the instruments in normal tap water containing a detergent.

   d) Scrub instruments and other items vigorously to completely remove all foreign material using a soft brush or old toothbrush, detergent, and water. Hold items under the surface of the water while scrubbing and cleaning to avoid splashing.
   e) Disassemble instruments and other items with

multiple parts, and be sure to brush in the grooves, teeth, and joints to items where organic material can collect and stick.

f) Rinse the devices thoroughly with clean water.

g) Air dry all the devices.



4) Preparation and packaging (If required)

Wear appropriate PPE (see Annex 20).

a) When the devices are cleaned and dried, inspect each device for:
- Cleanliness,
- Functionality/Damage,
- Defects such as breaks, chips or cracks.

c) Chemical Indicators are placed in each package.
d) Package is intact, no holes and allows sterilant penetration.
e) Hinged items are left open in the unlocked position.
f) Devices with removable parts are disassembled.
g) Instruments are double wrapped, secured with autoclave tape (or any other tape) and properly labeled. Make sure label wont erase during the process.

5) Using the autoclave

a) Follow the procedure (Appendix A)
b) Place Biological Indicators (Spore strips) in the first load of the day – If available
c) Place Chemical Indicators in each package in each load - if available
d) Complete the log sheet

6) Clean transportation and Storage.

a) Use an identified clean container or cart to transport sterilized items in storage area.
b) Storage area is clean, dry and free of dust.
c) Temperature is maintained at about 24oC.
d) If humidity increases such that sterile package become damp or wet (e.g.>70%) all devices are reprocess.
e) sterile supplies are stored at 20-25 cm from the soil, 45-50 cm from the ceiling and 15-20cm from the exterior wall.
f) Supplies are rotated according to the sterilization dates (First in = First out).
g) Unpacked supplies are used immediately, they are not stored.

6. Contingency measures

1) Equipment Malfunction
2) Incident Response
3) Spill Clean-up

1) Equipment malfunction

If the autoclave does not operate exactly as expected, do not attempt to fix the problem.

a) Place a notice on the autoclave indicating that it is not to be used until the problem is diagnosed and corrected.
b) Record the problem in the autoclave log sheet (Appendix B).
c) Report the problem to the supervisor.
d) Only qualified professionals are permitted to make repairs.

2. Incident response

a) All incidents, including a spill or release of bio hazardous materials must be reported to your supervisor.
b) If any injury occurs seek first aid or medical assistance.
c) If clothing is soaked in hot water/steam, remove clothing and place the injury in cool water.
d) Place a notice on the autoclave indicating that it is not to be used until the cause of the incident is determined, procedures enacted to prevent future incidents, and the autoclave is deemed safe for operation.

3) Spill clean-up

Spills may occur from a boil-over or breakage of containers.

a) No operation of the autoclave is allowed until the spill is cleaned up.
b) The operator is responsible for clean-up of spills.
c) Contain the spilled material using paper towels.
d) Wait until the autoclave and materials have cooled to room temperature before attempting clean-up.
e) Wear appropriate PPE and review spill clean-up and disposal protocols if necessary.
f) Dispose of the waste following the protocol (e.g., red biohazard bag).
g) If materials have been intermingled, follow the clean-

up and disposal protocol for the most hazardous component of the mixture.

h) Cracked glassware must be disposed of properly.

i) Record the spill and clean-up procedure in the autoclave log sheet

7. Resources required:

a) Indicators:
   - Chemical
   - Biological (spore strips), if available

b) Basic PPE
   - Gloves
   - Head cover
   - Gown

c) Equipment to protect against scalds and burns include:
   - lab coat,
   - safety glasses,
   - heat resistant gloves,
   - closed-toe shoes.

8. References

- Arizona State University. (2015). STANDARD OPERATING PROCEDURES Safe Autoclave Operations.
- CDC Biological and Infectious Waste: http://www.cdc.gov/nceh/ehs/etp/biological.htm
- Department of Public Health: http://www.mass.gov/eohhs/docs/dph/regs/105cmr480.pdf
- Environmental Health and Safety web site: http://www.uml.edu/EHS/
- Food and Drug Administration. (2016). Reprocessing Medical Devices in Health Care Settings: Validation Methods and Labeling.
- In, B. C. Best Practice Guidelines For Cleaning, Disinfection and Sterilization of Critical and Semi-critical Medical.

Appendix A to Autoclave SOP

Autoclave procedure

1. Place packs of wrapped items inside drum so steam can circulate.
2. Do not sterilize wrapped and unwrapped items at the same time.
3. Heat sterilizer at 121 ^{0} Celsius (250^{0}F) with pressure of kgf/cm (15 lbs / inches or 106kpa)
4. Once pressure valve starts steaming, sterilize for 20 minutes
5. Remove sterilizer from heat source
6. **IMPORTANT NOTE: ONLY OPEN THE STERILIZER AFTER RELEASING THE STEAM** and allow to cool for 15-30 minutes before opening.
7. Leave items in steam sterilizer until completely dry.
8. Remove items from steam sterilizer with sterile forceps
9. Place items on a surface padded with sterile paper or fabric
10. Only store after items reach room temperature.

Annex 22:

Steps in dry heat sterilization

Step 1: Ensure all medical equipment have been thoroughly cleaned and dried prior to performing sterilization.

Step 2: Put unwrapped instruments directly inside the autoclave.

Step 3: Place instruments and other items in the oven, and heat to the designated temperature. Once the oven reaches the designated temperature, start the timer. Do not open the door or add more instruments during the procedure. Once the desired time has been reached, turn off the oven.

Temperature:

- 170 degrees C: for 1 hour
- 160 degrees C: for 2 hours
- 150 degrees C: for 2.5 hours
- 140 degrees C: for 3 hours

Step 4: Leave items in the oven to cool before removing. When they are cool remove single items using sterile forceps, and use immediately or store.

Step 5: Store items inside a sterile container. Proper storage is as important as the sterilization process itself. For boxed instruments, store up to 24 hours

Annex 23:

Procedure for sorting soiled linen

Proper handling of dirty linen at hospitals is important for controlling health care-associated infection. It is the responsibility of the person disposing of the linen to ensure that it is segregated into the 3 correct categories below:

1. **Clean / Unused Linen:** Any linen that has not been used since it was last laundered and that has not been in close proximity to a patient or stored in a contaminated environment.

2. **Dirty / Used Linen:** All used linen other than infected linen that remains dry.

3. **Soiled/Infected linen:** Any used linen that is soiled with blood or any other body fluid or any linen used by a patient with a known infection (whether soiled or not).

Follow these guidelines when sorting dirty or potentially infectious laundry:

At the point of use, separate soiled linen and place in appropriate bags.

1. Always wear appropriate PPE (googles, gloves, rubber boots and plastic apron) when handling dirty linen to protect you from potential cross infection.
2. At the point of use, separate all linen based on the categories above and place in appropriate bags.
3. All dirty and soiled linen should be transported to the hospital Laundry room as soon as possible.
4. Handle dirty and soiled linen with minimum agitation and shaking to avoid contamination of the air, surfaces and persons.
5. All dirty and soiled linen should be held away from the body and uniform
6. Drop wet clothes in a laundry waterproof bag or a plastic garbage bag before dropping it in a cloth bag for dirty laundry.
7. Drop soiled linen with biological substances or other fluids in appropriate waterproof bags and close them safely. Carry the bag to prevent spills or drops of blood, body fluids, secretions or excretions.
8. The treatment area for dirty laundry should be separated from other areas, such as those used for folding and storage of clean linen.
9. Ensure adequate ventilation and a physical barrier between the clean and dirty linen areas.
10. Always wear googles, gloves, rubber boots and plastic apron when handling soiled linen.
11. Wash hands before and after removing PPE.
12. Cloth bags are sufficient for the majority of laundry patients care area. The bags require the same treatment as their content. This helps prevent the spread of microorganisms in the environment, to staff and other patients.

Bags must be color coded according to the type of linen they contain:

1. Red bags should be used for patients with infectious diseases laundry. Disinfect clothes before placing it in bags. To prevent leaks, put clothes in a plastic bag before placing it in the cloth bag.
2. Green bags should be used for laundry in special departments such as operating rooms and labor and delivery rooms.
3. Yellow bags must be used for dirty laundry.
4. White bags should be used for clean laundry.
5. The storage time for dirty laundry before washing, is linked to practical issues such as the available space.

Annex 24:

Procedure for washing soiled linen

There should be at least one laundry facility in each hospital and health center. Laundry facilities should be well-designed with enough space to allow sorting, washing and temporary storage of clean linen. Good drainage system should be in place and all laundry facilities should be kept dry to avoid the accumulation of moisture. Proper electrical wiring should be done in case laundering is done by machines. (Liberia WASH and Environmental Health Package in Health Facilities 2015)

The following recommendations concern routine laundering using a machine:

1. Wash heavily soiled linen separately from less soiled linen;
2. Wash the used linen (sheets, cotton blankets) in hot water (70 ° C to 80 ° C), disinfect, wash, rinse and dry preferably in a dryer or under the sun;
3. If low temperatures are used for washing, use the appropriate washing detergents/chemicals at the appropriate concentration;
4. Wash at high temperature (warmer than 71.1 ° C) if cold water detergents are not used;
5. Adjust machine cycle according to the manufacturer's instructions and detergent type;
6. Wash colored and white linen separately;
7. Wash clothes from a nursery separately;
8. When the wash cycle is complete, check if the linen is clean. Rewash if dirty or stained (Very dirty linen may require two wash cycles);
9. Do not remove the excrement by spraying with water;
10. Wash blankets in hot water and dry them in the sun or in dryers at cool temperatures.

The following recommendations apply to items that require additional sterilization:

- Surgical gowns and sheets which are used in sterile procedures after the wash cycle and normal drying must be steam sterilized to kill the remaining spores;
- Autoclave the linen to be used in operating rooms and delivery rooms.

When washing linen by hand, follow these instructions:

1. Wash heavily soiled linen separately from other gently used articles;
2. Pre-soak very dirty/soiled linen in bleach;
3. Wash all linen in water with soap to remove any dirt, even if no dirt is visible;
4. Use warm water and add bleach to facilitate cleaning and bactericidal action;
5. If available, add a little soft acetic acid to prevent yellowing the linen;
6. Rinse the linen with clean water;
7. Check items for cleanliness. Rewash if they are dirty or stained.

Annex 25:

Cleaning small splashes and sprays and large body fluid spills

How to clean small splashes and sprays:

- Wear non-sterile gloves for this procedure.
- Wipe the area immediately with a paper towel/ absorbent cloth
- Discard paper towel/absorbent cloth immediately as clinical/infectious waste
- Disinfect using 0.5% chlorine solution
- Dry the surface with disposable paper towels
- Discard gloves and paper towels as clinical/infectious waste in accordance with local policy
- Wash hands with soap and water and dry hands immediately afterwards

How to clean larger spills and sprays of body fluids:

1. Use absorbent towels
2. Disinfect using 0.5% chlorine solution
3. POUR solution directly onto spillage it may cause splashing, and widen the area of contamination
4. If chlorine granules are available sprinkle the spill with chlorine granules, until the fluid is absorbed (if the quantity is small i.e. 30 ml). Leave on the spill for a contact period of about 3-5 min to allow for disinfection
5. Depending on the method used, either lift the soiled paper towels or scoop up the absorbed granules and discard into a plastic waste bag as clinical/medical waste
6. Wipe the surface area with fresh 0.5% chlorine solution to remove any remaining spillage and rinse with clean water as the chlorine solution may be corrosive
7. Dry the surface with disposable paper towels
8. Remove gloves and plastic apron and discard as clinical waste according to local policy
9. Wash hands with soap and water and dry hands immediately

Annex 26:

How to prepare chlorine solution for environmental cleaning

The formula for the manufacture of a solution diluted from concentrated solutions is as follows:

Number of part water = (% of concentrated bleach) / (% diluted) – 1

Calculation of chlorine solution concentrations:

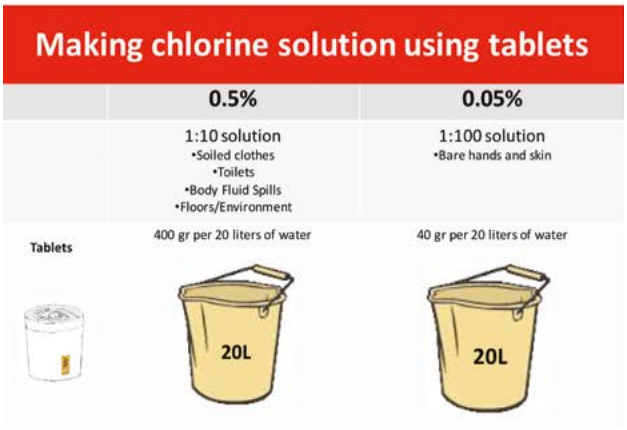
When using liquid chlorine solution:
Degrees is converted into percentage (1 chlorine = 0.3%) then applying the formula in the box. Thus, the forms of bleach sold on the market equivalent to the following percentages:

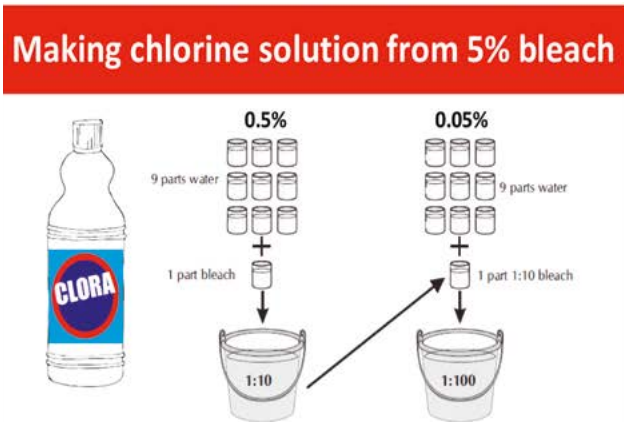
*8° chlorine = 8 * 0,3% = 2,4%*
*12° chlorine = 12 * 0,3% = 3,6%*
*15°chlorine = 15 * 0,3% = 4,5%*

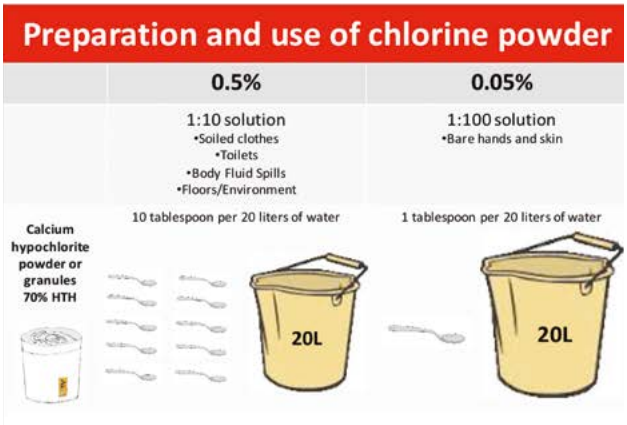
When using chlorine powder:
When it comes to the calcium hypochlorite powder or sodium 70% consider that 1 tablespoon = 14g. 14g hypochlorite in 2 liters of water = a 0.5% Cl

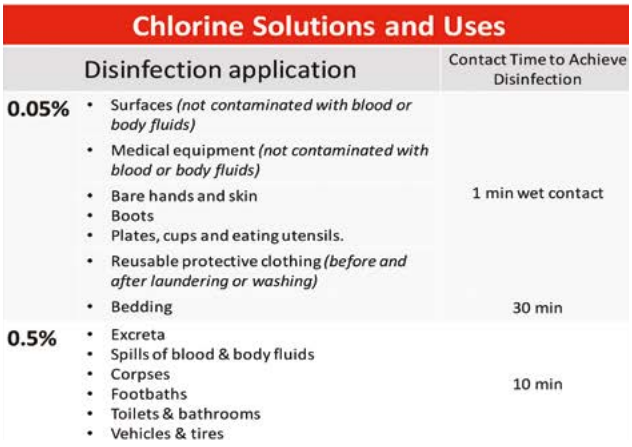
$$\text{Number of part water} = \frac{\text{(\% diluted)}}{\text{\% of concentrated bleach}} \times 1000$$

NOTE: Do not mix chlorine solution with an ammonia-based solution, this can cause the production of toxic gas.









Annex 27:

Specific cleaning procedures for the operating room

The cleanliness of the operating room has direct influence on the control of infection in the operation room and the outcome of the surgical intervention. Therefore, at the beginning of each day, all flat surfaces should be wiped with a clean, damp lint to remove dust and lint. The total cleaning is not required between each case for surgery. The total cleaning or terminal cleaning of the operating room should be done at the end of each day. All the operating room surfaces, handwashing sinks, dressing and storage areas, hallways and equipment should be cleaned completely, regardless of whether they were used or not during last 24 hours.

At the end of each day, perform the following:

1. Selecting the appropriate Personal Protective Equipment
2. Use a freshly prepared solution of 0.5% chlorine for decontamination.
3. Remove contaminated waste containers used and replace them with clean containers.
4. Close and remove sharps containers if they are three-quarters full.
5. Remove the dirty laundry in sealed waterproof containers.
6. Wipe all up and down surfaces with a disinfectant and cleaning solution.
7. Wipe all surfaces that may have been in contact with a patient or body fluids of a patient, then disinfect with a 0.5% chlorine solution. Once clean, use a disinfectant solution and allow to dry.
8. To reduce microbial contamination of environmental surfaces such as walls, ceilings and floors, scrubbing with a disinfectant cleaning solution. This is safer, faster and more effective than fumigation with a dilute solution of formaldehyde, which is inefficient, time consuming and release toxic fumes.

Between each case, clean using the following guidelines:

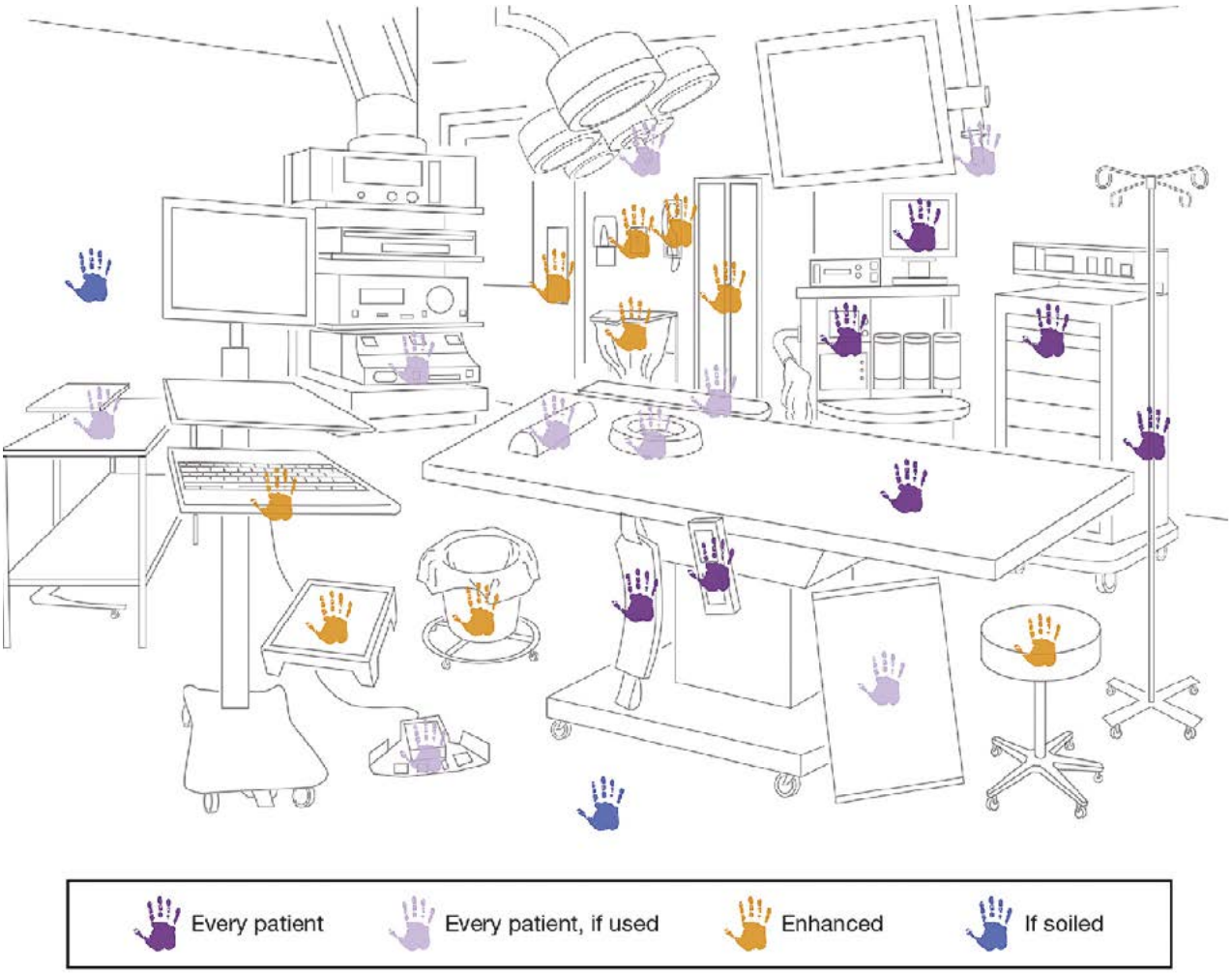
1. Clean up spills of body fluids with a 0.5% chlorine solution; if a significant amount of organic liquid is present on the surfaces of the room, flood the area with a solution of chlorine to 0.5%. Wait ten minutes, clean and disinfect again.
2. Wipe all surfaces and mattress with a cloth soaked in a disinfectant cleaning solution.
3. Wipe all flat surfaces that were in contact with a patient or body fluids of a patient with a cloth soaked in a disinfectant solution.
4. Blot the center of the operating room (around the operating table) with a disinfectant cleaning solution.
5. Collect all waste in the operating room in closed airtight containers.
6. Close and remove the operating room sharps containers when they are three-quarters full.
7. Change the instruments covered containers that have a 0.5% chlorine solution, clean the containers and add a new chlorine solution 0.5%.
8. Remove soiled linen in a container covered with a waterproof canvas.

Cleaning soiled and contaminated cleaning equipment:

Wash cleaning buckets, rags, brushes and brooms with detergent and water daily or as needed if visibly soiled. Decontaminate cleaning equipment that has been contaminated with blood or body fluids by soaking for 10 minutes in a 0.5% chlorine solution. Rinse with clean water. Dry thoroughly before re-placing them upside down. Generally, wet cloths and mop heads are highly contaminated with microorganisms. If mops are not available, clean thick towels are preferable.

Example of cleaning frequencies in preoperative and postoperative care areas:

The colored handprints in the figure below show how often surfaces or items in an operating room should be cleaned.



Annex 28:

Specific cleaning procedures for the labour and delivery room

At the beginning of each day, all flat surfaces should be wiped with a clean, damp cloth to remove dust and lint. The total cleaning is not necessary between each delivery. All instruments must be decontaminated, washed and sterilized after each use. The delivery table and the floor will be cleaned at the end of each delivery. The total cleaning or terminal cleaning of the delivery room must be made at the end of each day. All sectors in the delivery room, including sinks, bed and its components, the bedside table and equipment will be fully cleaned daily, regardless of whether they were used in the last 24 hours.

At the end of each day, perform the following:

1. Prepare a freshly solution of 0.5% chlorine for decontamination;
2. Remove contaminated waste containers used and replace them with clean containers;
3. Close and remove sharps containers if they are three-quarters full;
4. Remove the dirty laundry in sealed waterproof containers;
5. Wipe all surfaces with a disinfectant and cleaning solution;
6. Wipe all surfaces that may have been in contact with a patient or body fluids of a patient, then disinfect with a 0.5% chlorine solution. Once clean, use a disinfectant solution and allow to dry.
7. To reduce microbial contamination of environmental surfaces such as walls, ceilings and floors, scrubbing with a disinfectant cleaning solution. This is safer, faster and more effective than spraying with a dilute solution of formaldehyde, which is inefficient, time consuming and release toxic fumes.

Between each case, clean using the following guidelines:

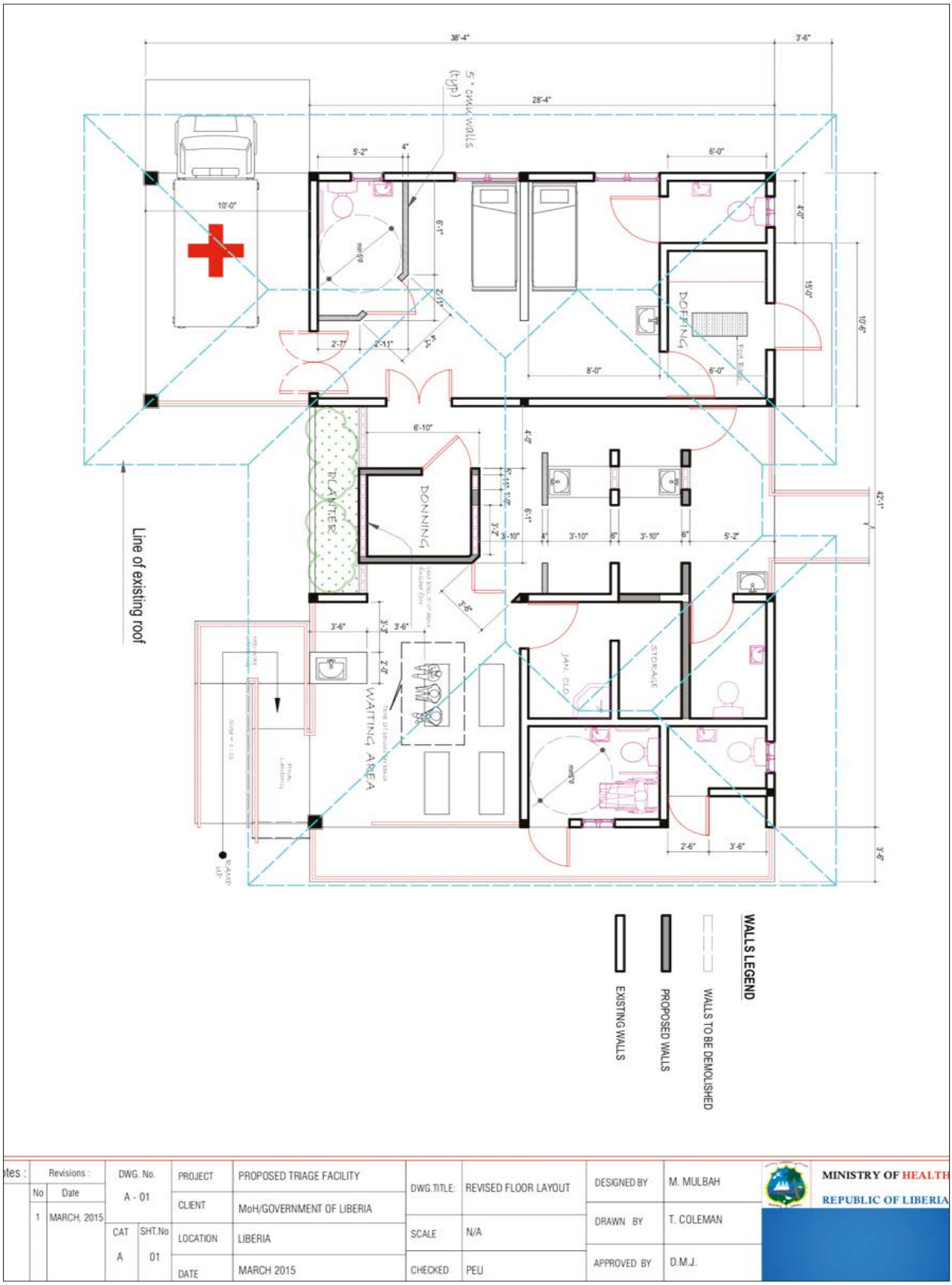
1. Clean up spills of body fluids with a 0.5% chlorine solution; if a significant amount of organic liquid is present on the surfaces of the room, flood the area with a solution of chlorine to 0.5%. Wait ten minutes, clean and disinfect again.
2. Wipe all surfaces and mattress with a disinfectant cleaning solution.
3. Wipe all flat surfaces that were in contact with a patient or body fluids of a patient with a disinfectant solution.
4. Blot the center of the delivery room (around the delivery table) with a disinfectant cleaning solution.
5. Collect all waste in the delivery room in closed airtight containers.
6. Close and remove sharps containers in the delivery room when they are ¾ full.
7. Change the instruments covered containers that have a 0.5% chlorine solution, clean the containers and add a new chlorine solution 0.5%.
8. Remove soiled linen in a container covered with a waterproof canvas.

Cleaning soiled and contaminated cleaning equipment:

Decontaminate cleaning equipment that has been contaminated with blood or body fluids by soaking for 10 minutes in a 0.5% chlorine solution. Wash cleaning buckets, rags, brushes and brooms with detergent and water daily or as needed if visibly soiled. Rinse with clean water. Dry thoroughly before re-placing them upside down. Generally, wet cloths and mop heads are highly contaminated with microorganisms. If mops are not available, clean thick towels are preferable.

Annex 29:

Standard design for triage and isolation structure



Revisions: No 1	Date: MARCH, 2015	DWG. No. A - 01	PROJECT	PROPOSED TRIAGE FACILITY	DWG.TITLE:	REVISED FLOOR LAYOUT	DESIGNED BY	M. MULBAH	MINISTRY OF HEALTH
			CLIENT	MoH/GOVERNMENT OF LIBERIA			DRAWN BY	T. COLEMAN	REPUBLIC OF LIBERIA
		CAT A / SHT.No 01	LOCATION	LIBERIA	SCALE	N/A			
			DATE	MARCH 2015	CHECKED	PEU	APPROVED BY	D.M.J.	

Annex 30:

Non-outbreak screening form and flow chart

Non-outbreak Screening Form

Date: _____ /_____ /_____ Time: _____ Patient Name: _____
Day Month Year

Temperature:

Contact Number: _____ Sex: ☐ Male ☐ Female Age: _____

Location: _____ Next of Kin: _____ Admitted to: _____
Number of next of Kin: _____

1. Have you been having fever (skin hot) or is the temp >37.5°C? ☐ Yes ☐ No *If No to both = Send the patient to the waiting area*
2. Do you have running stomach (≥3 pu-pu in a day)? ☐ Yes ☐ No *If Yes to either question = Ask the following:*

AND

A

1 or more of the following

Symptoms:
- ☐ Rash
- ☐ Red eyes
- ☐ Stiff neck
- ☐ Bloody/slimy pu-pu with stomach pain

OR

B

2 or more of the following

Symptoms:
- ☐ Blood in stool
- ☐ Weak in body
- ☐ Headache
- ☐ Yellow eyes
- ☐ Red eyes
- ☐ Vomiting
- ☐ Person bitten by a dog / other animal

OR

C

☐ Cough

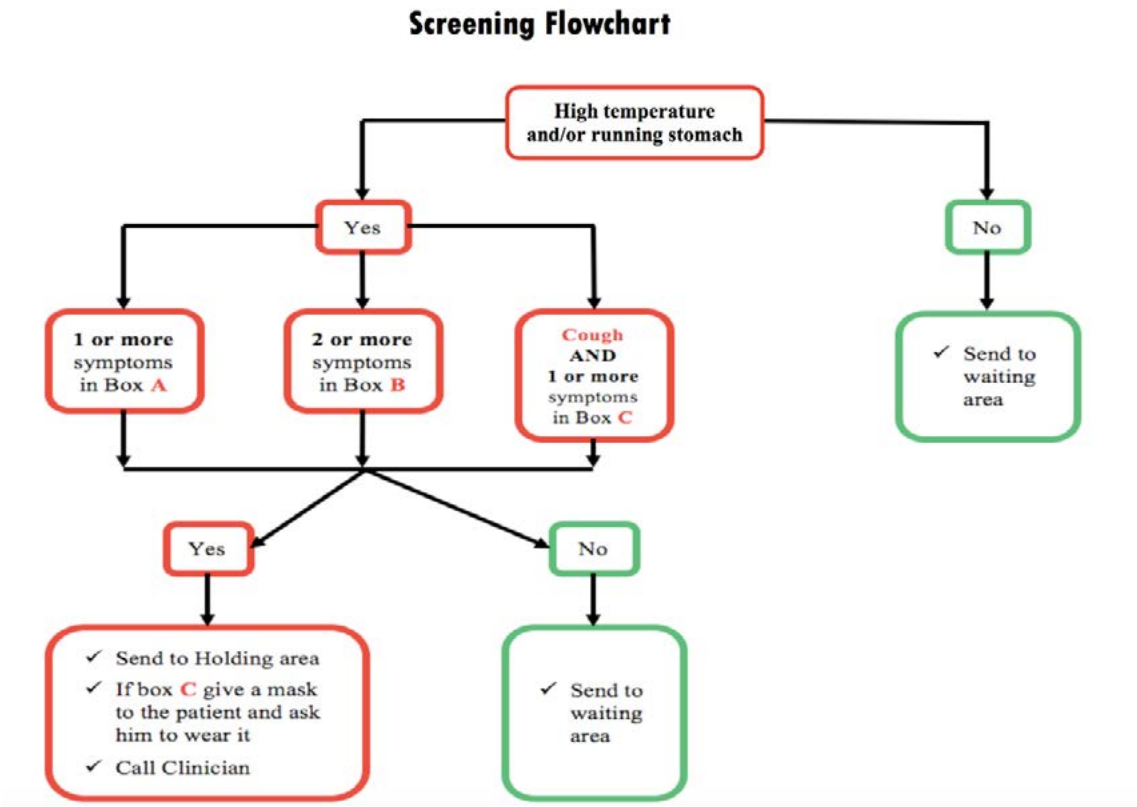
AND

1 or more of the following

Symptoms:
- ☐ Sore throat
- ☐ Runny nose
- ☐ Difficulty breathing or short breath
- ☐ Chills
- ☐ Headache
- ☐ Weak in the body
- ☐ Body aches

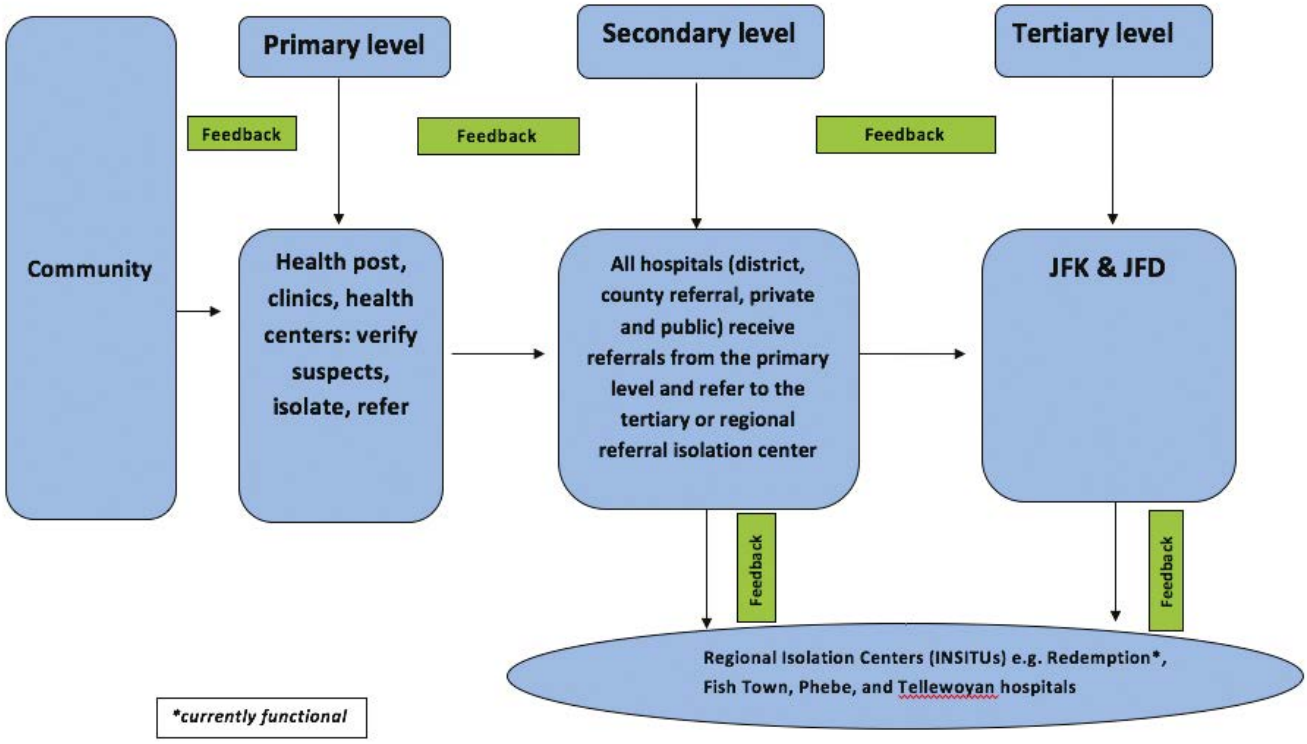
☐ **If fever or running stomach + A or B = Send the patient to isolation/holding area and call the clinician.**
☐ **If fever + C = Send the patient to isolation area, ask him to wear a mask and call the clinician**
☐ **If fever but NO other symptoms = Send the patient to the waiting area**

Signature of the screener: _____ **Date:** _____ **Time:** _____


Screening Flowchart
High temperature and/or running stomach
Yes
No
1 or more symptoms in Box A
2 or more symptoms in Box B
Cough AND 1 or more symptoms in Box C
✓ Send to waiting area
Yes
No
✓ Send to Holding area
✓ If box C give a mask to the patient and ask him to wear it
✓ Call Clinician
✓ Send to waiting area

Annex 31:

Referral pathway for patients with priority infectious diseases



Annex 32:

Triage and Isolation Unit SOP

Introduction
Triage and isolation units are available at specified referral facilities (mainly hospitals). This SOP is to be used as the standard procedure for this unit, addressing admission criteria to the isolation unit, medical management and unit referral/discharge.

Definition
Isolation is the additional precautions that are taken in a health care facility to prevent the spread of an infectious disease from an infected to susceptible patients, health care worker, and/or visitor. Isolation should be done in a user friendly, well-accepted way that interferes as little as possible with patient care, patient discomfort, and avoids unnecessary use.

Steps:
1. Ensure patients undertake hand hygiene at entrance of triage and isolation unit (this does not apply to unconscious patients)
2. At triage, they will be individually screened using the Non-outbreak screening form (if in outbreak setting the non-outbreak screening form may be revised to an outbreak screening form)
3. If patient is cleared (of any suspicion of being infectious) they will be referred to appropriate department/ward
4. If the patient is suspected of being infectious they will be admitted to the 2-bedded isolation room in the triage unit
5. They will be reviewed by a clinician who will define if the patient fits any of the suspect IDSR case definition criteria:
   - If yes, blood samples will be taken, and case management initiated until lab results received
   - If no, patient will be discharged or referred to appropriate ward/department within hospital
6. For those admitted to the 2-bedded isolation unit, once lab results received and diagnosis confirmed, depending on results the following will take place:
   - If IDSR disease positive – continue case management where capacity is available, if referral to next level (in most cases regional isolation unit) is required this must be determined in collaboration with the CHO
   - If IDSR disease negative – discharge or transfer to other ward in the hospital

Patient Information
Staff must ensure the patient is provided with a full explanation of their infection, the reason for isolation, what the facility isolation procedures are and what treatment will be required. This ensures the patient has a complete understanding of the situation and also to promote psychological well-being.

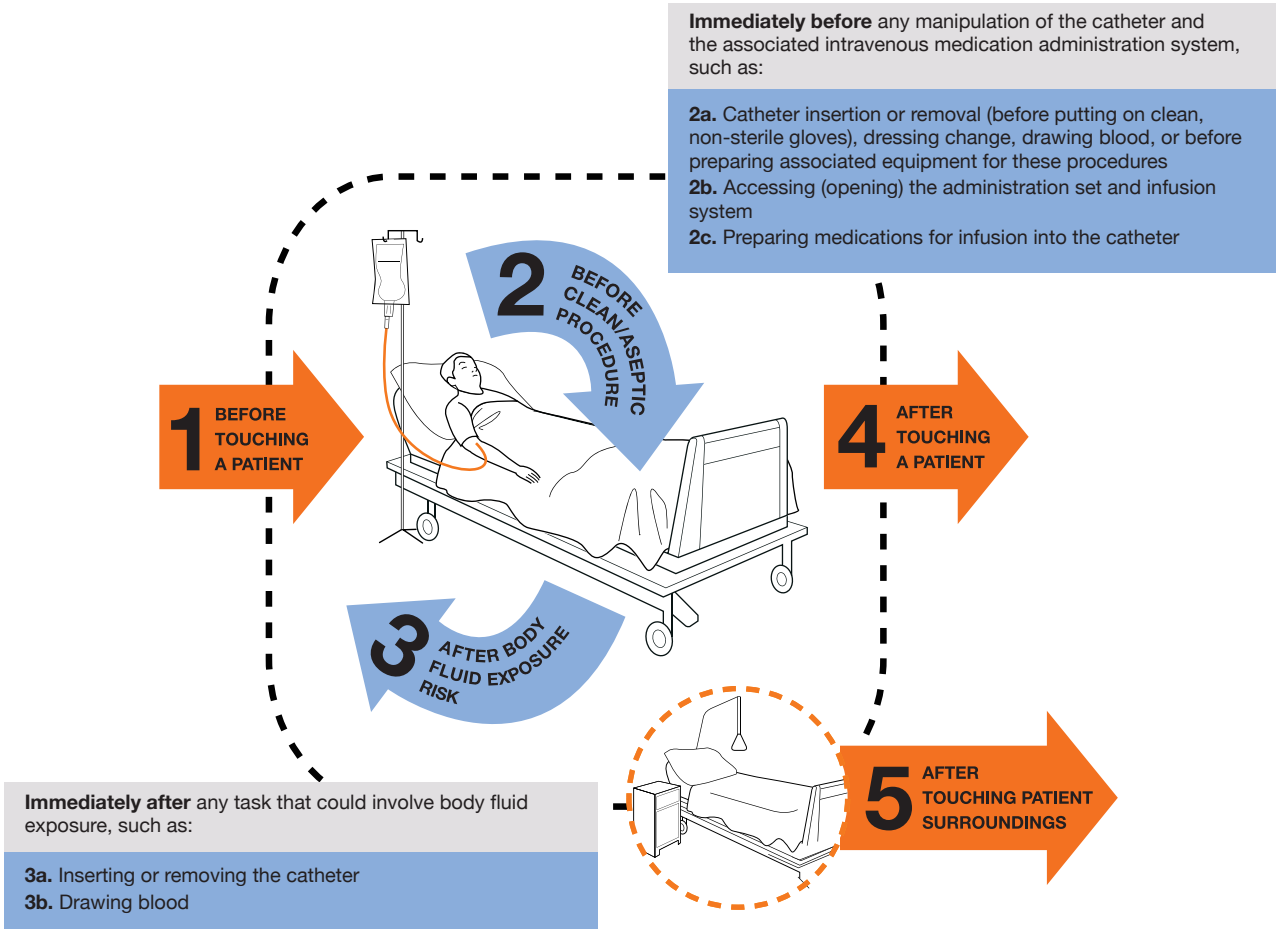
Visitations
Visitation is discouraged during admission.

IPC considerations for isolation area
- Ensure the proper communication (i.e. STOP signage on the door) is made clear and visible to all those entering the isolation area;
- Ensure that all personnel assigned to the patient are qualified, trained and familiar with IPC protocols;
- The room will be kept as free of extraneous items as possible i.e. keep any notes or paper work associated with monitoring the patient out of the isolation area;
- A supply of the necessary essential medicines and protective equipment will be kept in another area;
- Fans should not be used in an isolation area;
- Waste bins and sharp containers will be placed inside the isolation area;
- All medical equipment and devices (e.g. stethoscopes, blood pressure cuffs and thermometers) should be dedicated to patients under isolation whenever possible. If equipment needs to be shared among patients, clean and disinfect it between each patient use;
- All utensils (these should be disposable) and personal items used by patients in isolation for VHF or cholera should be discarded using appropriate waste management procedures. Personal items used by patients in isolation for diseases not spread by contact transmission may be taken home with the patient upon discharge;
- Ensure adequate routine and terminal cleaning of the patient environment; establish a daily cleaning schedule and maintenance of the isolation area;
- Place used equipment and soiled linen and waste directly into containers or bags in the isolation area.

Patient transport
Limit patient movement and when being referred ensure that they wear surgical masks when appropriate given their symptoms.

Annex 33:

5 moments for hand hygiene for a patient with a PVC



Key additional considerations for peripheral intravenous catheters

1. **Indication:** Ensure that a peripheral venous catheter is indicated. Remove the catheter when no longer necessary/clinically indicated.
2. **Insertion/maintenance/removal**

2.1 Prepare clean skin with an antiseptic (70% alcohol, tincture of iodine, an iodophor, or alcohol-based 2% chlorhexidine gluconate) before catheter insertion.

2.2 Wear clean, non-sterile gloves and apply an aseptic procedure (with non-touch technique) for catheter insertion, removal, and blood sampling.

2.3 Replace any dry gauze-type dressings every 2 days.

2.4 Consider scheduled catheter change every 96 hours.

2.5 Change tubing used to administer blood, blood products, chemotherapy, and fat emulsions within 24 hours of infusion start. Consider changing all other tubing every 96 hours.

3. **Monitoring:** Record time and date of catheter insertion, removal and dressing change, and condition (visual appearance) of catheter site every day.

Source – WHO. Available at http://www.who.int/gpsc/5may/HH15_PeripheralCatheter_WEB_EN.pdf

Annex 34:

Standard operating procedure for the prevention of bloodstream infections associated with use of a PVC

Purpose

To provide guidance on how to insert, maintain and remove peripheral venous catheters.

Objectives

To prevent bloodstream infections due to peripheral venous catheters (PVC).

Steps:

1. Order for insertion:

- This is done by a trained clinician

2. Insertion:

- Confirm patient identity
- Explain the procedure to the patient and obtain consent
- Have an assistant available if needed
- Ensure you have required materials at the point of care:
  - Right size PVC
  - ABHR
  - Examination gloves
  - Antiseptic solution (2 % aqueous chlorhexidene gluconate or 10 % povidone-iodine)
  - Pieces of gauze/swab
  - Tourniquet
  - Sterile needle and syringe
  - Normal saline/sterile water
  - Transparent adhesive tape
  - Sharps container
  - Waste bag
- Always perform hand hygiene and use examination gloves when inserting peripheral venous catheter
- Always perform skin antisepsis at the site of insertion. If site of insertion is visibly dirty, wash first then dry before applying skin antiseptic. Site should be dry before inserting PVC
- Always use sterile equipment and follow aseptic non-touch technique
- Use sterile plaster (ideally transparent) to cover the site and fix PVC accordingly
- For PVC lines use the upper limbs (avoid using the lower limbs if possible, as these are more likely to become infected)
- Document the procedure:
  - Time and date of PVC insertion
  - Size of PVC

2. Maintenance:

- Perform hand hygiene, inspect daily, and remove PVC immediately if signs of infection are observed or the device is no longer necessary
- If dressings are removed to inspect the site, discard appropriately and use a new dressing
- Keep site dry, free from contamination, and secure
- If dressing becomes soiled, loosened or wet, change immediately
- Close injection ports that are not needed with sterile stopcocks (spigot)
- Ensure that infusion fluid is free from contamination – no cloudiness, no sediments, and not expired
- Administration sets should be changed:
  i. Immediately after using blood/blood products
  ii. Within 24hrs after using lipids/parenteral nutrition
  iii. Any time there are signs of infection or after 96 hours
- Routine change of PVC more frequently than every 72-96 hours is not necessary provided that there is no evidence of infection and there is no resistance to injection or fluid administration
- Dispose of PVC and any remaining fluid when infusion is replaced or discontinued
- Needle and catheter should be disposed of using sharps containers
- Always document clinical observations and/or interventions

3. Removal:

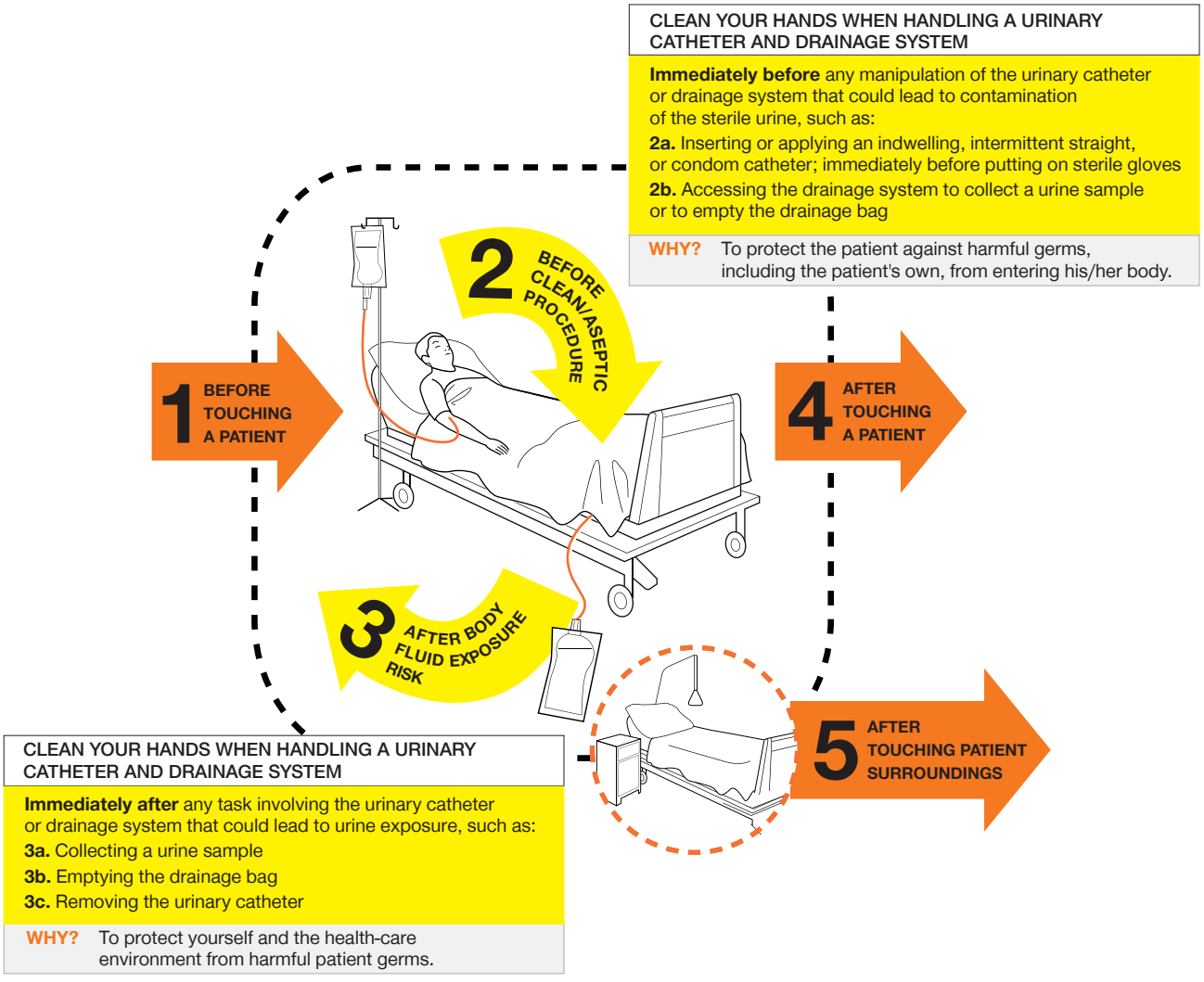
- Explain the procedure to the patient
- Practice hand hygiene
- Put on examination gloves
- Check the patient's PVC site for phlebitis or other evidence of infection – if positive signs of infection proceed with PVC removal
- Ensure you have required materials at the point of care:
  - ABHR
  - Examination gloves
  - Pieces of gauze/swab
  - Sharp container
  - Waste bag
- Carefully remove the PVC with one hand and with the other hand cover the insertion site with sterile gauze
- Press the insertion site firmly for about a minute and cover it with a sterile plaster
- Dispose of waste appropriately, remove gloves, and perform hand hygiene
- Document clinical observations of PVC site (ex. Intact without signs/symptoms of infection, warm, erythema, pus, etc.) and/or intervention in patient record

References:

1. HICPAC/CDC Guidelines for Prevention and Control of Peripheral Venous Catheter (2009)
2. Liberia National Infection Prevention and Control Guidelines (2018)

Annex 35:

5 moments for hand hygiene for a patient with a urinary catheter



5 KEY ADDITIONAL CONSIDERATIONS FOR A PATIENT WITH A URINARY CATHETER

- Make sure that there is an appropriate indication for the indwelling urinary catheter.
- Use a closed urinary drainage system, and keep it closed.
- Insert the catheter aseptically using sterile gloves.
- Assess the patient at least daily to determine whether the catheter is still necessary.
- Patients with indwelling urinary catheters do not need antibiotics (including for asymptomatic bacteriuria), unless they have a documented infection.

Source – WHO. Available at http://www.who.int/gpsc/5may/hh-urinary-catheter_poster.pdf

Annex 36:

Standard operating procedure for the prevention of catheter-associated urinary tract infections (CAUTI)

Purpose

This SOP provides guidance on how to insert, maintain and remove urinary catheters.

Objective

To prevent catheter associated urinary tract infections.

Steps

1. Order for CAUTI insertion:

- This is done by a trained clinician

2. Insertion

- Confirm patient identity
- Explain the procedure to the patient and obtain consent
- Have an assistant available (if possible)
- Ensure you have required materials at the point of care:
  - sterile indwelling urinary catheter and bag (single-use) – ensure appropriate size for patient
  - sterile drape
  - sterile syringe filled with sterile water
  - Examination gloves and sterile gloves
  - antiseptic solution (2 % aqueous chlorhexidine gluconate or 10 % povidone-iodine)
  - sterile gauze or sponge-holding forceps
  - single use lubricant
- Practice aseptic non-touch technique
- Perform hand hygiene and put on clean examination gloves
- Clean with soap and water and rinse the uretheral area and external genitals carefully and thoroughly
- Separate and hold the labia apart or hold the head of penis with the non-dominant hand and prepare the urethral area with the antiseptic solution using sterile gauze or sponge forceps with sterile gauze
- Remove examination gloves, perform hand hygiene and put on sterile gloves
- Grasp the catheter about 5 cm from the catheter tip with the dominant hand and place the other end in the urine collection bag
- Gently insert the catheter until urine flows, then for a further 5 cm. Inflate the balloon accordingly to instructions.
- All procedures involving the catheter and drainage system should be documented in the medical or nursing notes. These should include:
  - Time and date of catheter insertion
  - Type and size of catheter
  - Volume of water in the balloon

3. Maintenance

- Daily review of the need for urinary catheter. If no longer required, perform hand hygiene and remove as soon as possible (preferably within 24 hours)
- Daily cleaning of the periurethral area. The urine bag should be attached to the side of the bed - the urine bag should not be resting on the bed nor on the floor
- Urine flow through the catheter should be checked several times a day to ensure that the catheter is not blocked
- Avoid raising the collection bag above the level of the bladder. If it becomes necessary, clamp the tubing beforehand
- Before the patient stands up, drain all urine from the tubing into the bag
- Perform hand hygiene and put on clean examination gloves then remove the urine
- To avoid contamination, the collection bag should be emptied into a clean bucket, without the tip touching
- If a sample is required, collect the urine from needleless sampling port with sterile needle
- Unless obstruction is anticipated, bladder irrigation is not recommended
- Always document clinical observations and/or interventions

4. Removal

- Indwelling urinary catheters should be removed as soon as possible to reduce CAUTI risk

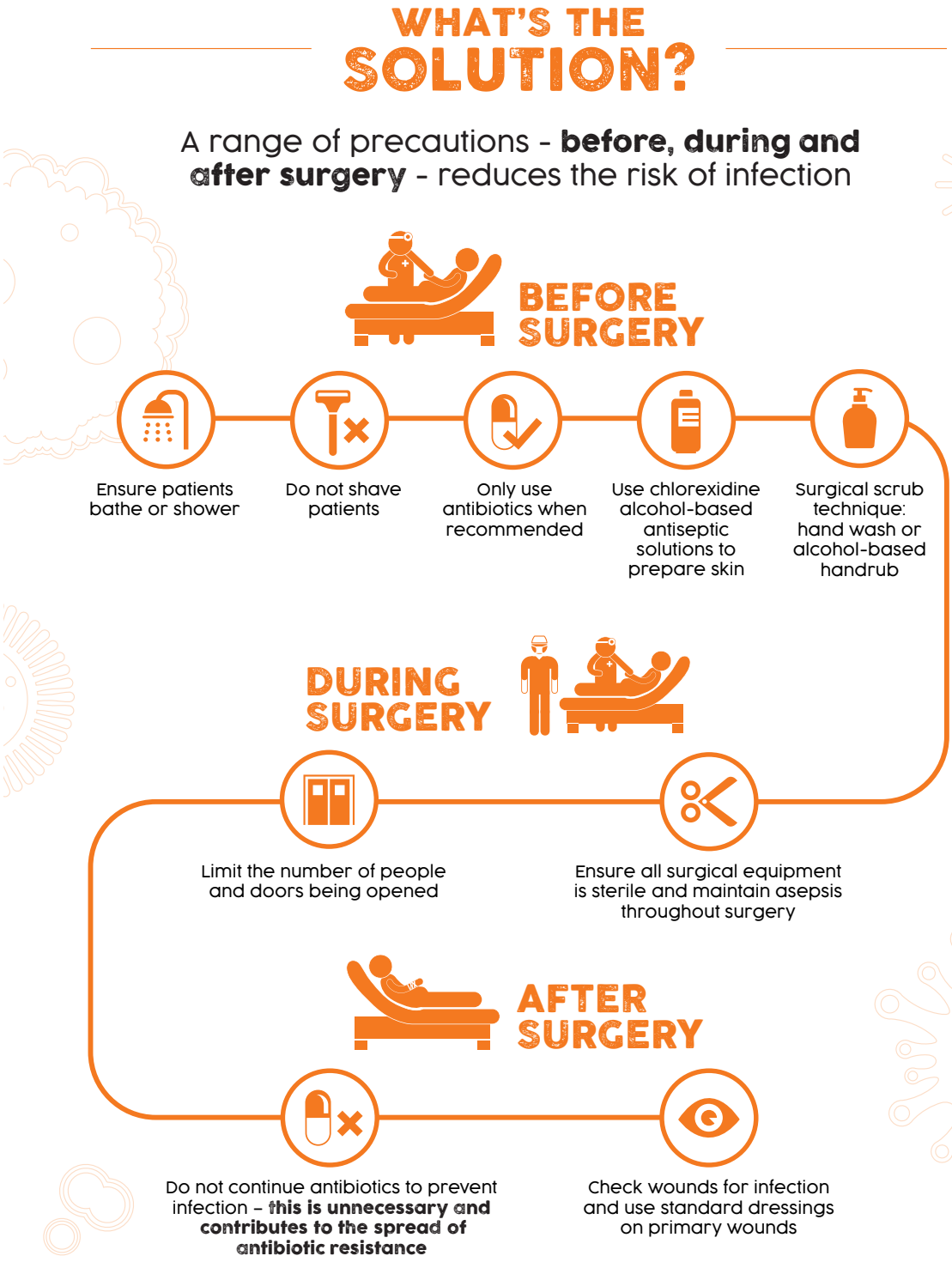
- Explain the procedure to the patient
- Before removing the catheter, ensure that all necessary materials are available at the point of care (clean examination gloves and syringe)
- Perform hand hygiene and put on clean gloves
- Empty the catheter balloon using a syringe, compare the volume removed to that inserted. It should be the same volume.
- Swab the urethra two times with an antiseptic solution using forceps with sterile gauze
- Gently remove the catheter
- Dispose of all waste appropriately
- Remove gloves and perform hand hygiene
- Record procedure in the medical/nursing notes

References:

1. HICPAC/CDC Guidelines for Prevention and Control of Catheter-Associated UTIs (2009)
2. Liberia National Infection Prevention and Control Guidelines (2018)

Annex 37:

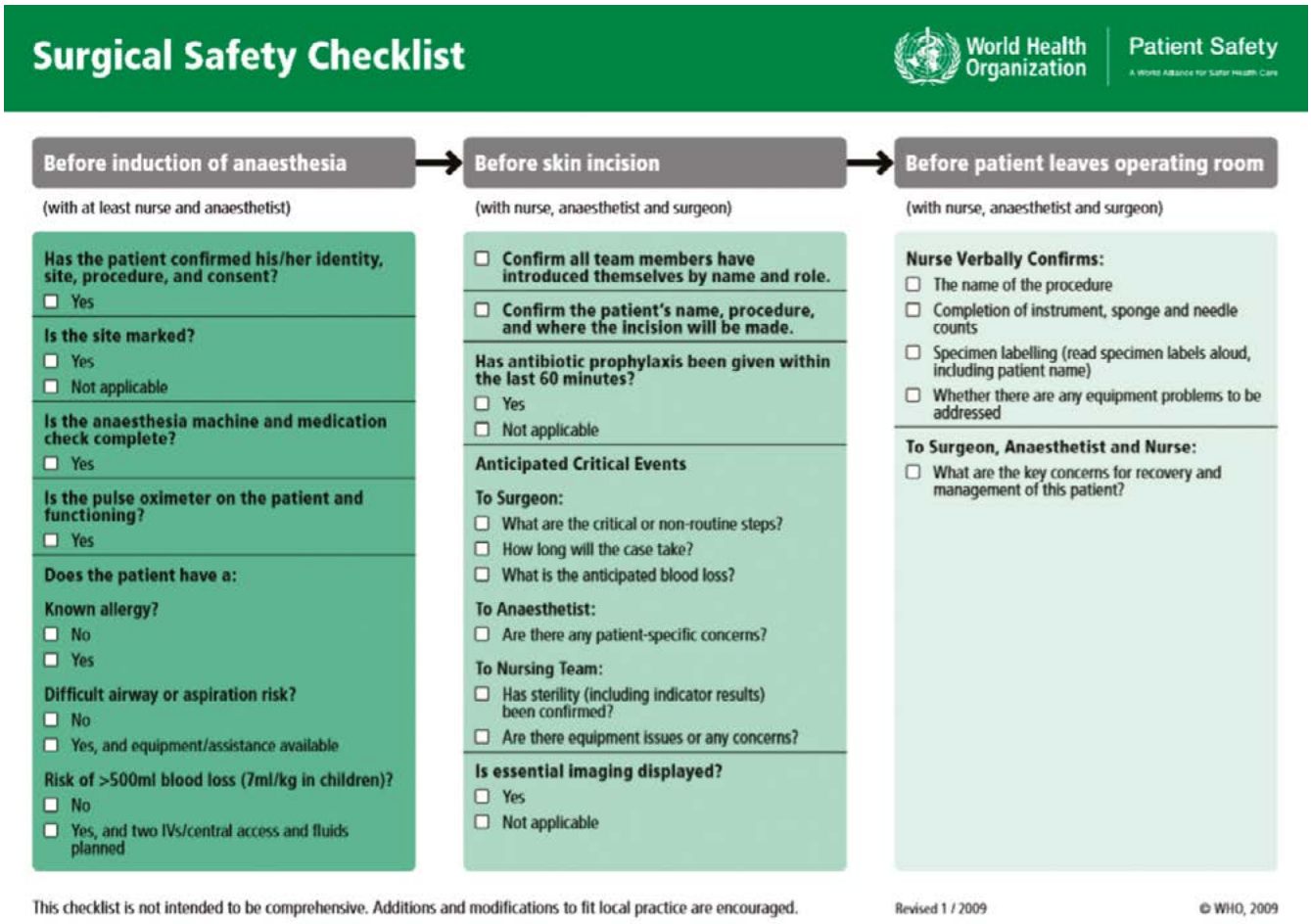
Priority recommendations for the prevention of surgical site infections



Source – World Health Organization. Available at http://www.who.int/gpsc/ssi-infographic.pdf

Annex 38:

WHO surgical safety checklist



Surgical Safety Checklist

World Health Organization | Patient Safety

Before induction of anaesthesia

(with at least nurse and anaesthetist)

Has the patient confirmed his/her identity, site, procedure, and consent?
- ☐ Yes

Is the site marked?
- ☐ Yes
- ☐ Not applicable

Is the anaesthesia machine and medication check complete?
- ☐ Yes

Is the pulse oximeter on the patient and functioning?
- ☐ Yes

Does the patient have a:

Known allergy?
- ☐ No
- ☐ Yes

Difficult airway or aspiration risk?
- ☐ No
- ☐ Yes, and equipment/assistance available

Risk of >500ml blood loss (7ml/kg in children)?
- ☐ No
- ☐ Yes, and two IVs/central access and fluids planned

Before skin incision

(with nurse, anaesthetist and surgeon)

- ☐ **Confirm all team members have introduced themselves by name and role.**
- ☐ **Confirm the patient's name, procedure, and where the incision will be made.**

Has antibiotic prophylaxis been given within the last 60 minutes?
- ☐ Yes
- ☐ Not applicable

Anticipated Critical Events

To Surgeon:
- ☐ What are the critical or non-routine steps?
- ☐ How long will the case take?
- ☐ What is the anticipated blood loss?

To Anaesthetist:
- ☐ Are there any patient-specific concerns?

To Nursing Team:
- ☐ Has sterility (including indicator results) been confirmed?
- ☐ Are there equipment issues or any concerns?

Is essential imaging displayed?
- ☐ Yes
- ☐ Not applicable

Before patient leaves operating room

(with nurse, anaesthetist and surgeon)

Nurse Verbally Confirms:
- ☐ The name of the procedure
- ☐ Completion of instrument, sponge and needle counts
- ☐ Specimen labelling (read specimen labels aloud, including patient name)
- ☐ Whether there are any equipment problems to be addressed

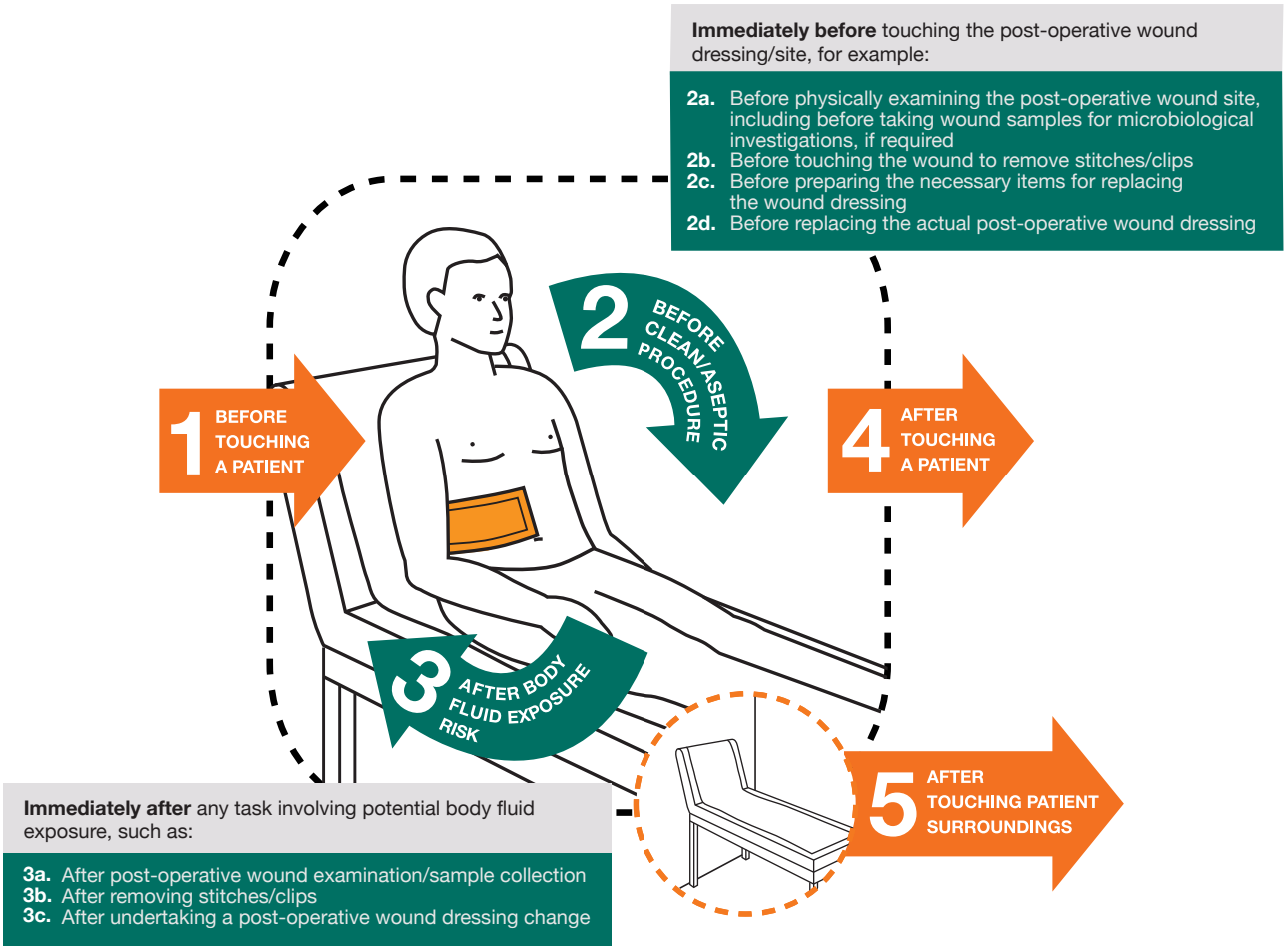
To Surgeon, Anaesthetist and Nurse:
- ☐ What are the key concerns for recovery and management of this patient?

This checklist is not intended to be comprehensive. Additions and modifications to fit local practice are encouraged.

Revised 1 / 2009

Annex 39:

5 Moments for hand hygiene for a patient with a post-operative wound



Key additional considerations for post-operative wounds

- Avoid unnecessary touching of the post-operative wound site, including by the patient.
- Wear gloves if contact with body fluids is anticipated; the need for hand hygiene does not change even if gloves are worn, as per the WHO 5 Moments.
- Follow local procedures regarding use of aseptic non-touch technique for any required dressing changes/wound procedures.
- Don't touch dressings for at least 48 hours after surgery, unless leakage or other complications occur.
- Routine post-operative wound dressings should be basic dressing types (e.g. absorbent or low adherence dressings).
- When approaching a patient for the examination of a wound, the health worker may also perform other tasks (e.g. accessing a venous catheter, drawing blood samples, checking urinary catheter). Hand hygiene may be needed before and after these specific tasks, to once again fulfill Moments 2 and 3, for example (refer to WHO dedicated 5 Moments posters for line or catheter management).
- When indicated, pre-operative surgical antibiotic prophylaxis (SAP) should be administered as a single parenteral dose 2 hours or less before the surgical incision, while considering the half-life of the antibiotic. Do not prolong administration of SAP after completion of the operation.
- Antibiotic therapy for any proven surgical site infection should ideally be administered based on wound sample culture and sensitivity results.
- Common signs and symptoms of wound infection are: pain or tenderness; localized swelling; erythema; heat, or purulent drainage from the superficial incision.
- This guidance does not include information on *complicated* post-operative wound care, when specific treatments or therapies may be required.

Source – World Health Organization. http://www.who.int/gpsc/5may/5moments-EducationalPoster.pdf

Annex 40:

Restrictions for health care workers exposed to or infected with infectious diseases

Disease/problem	Work restriction	Duration	Category**
Conjunctivitis	Restrict from patient contact and contact with the patients' environment	Until eye discharge ceases	II
Cytomegalovirus infection	No restriction		II
Diarrheal diseases:			
Acute stage (diarrhea with other symptoms)	Restrict from patient contact, contact with the patients' environment, or food handling	Until symptoms resolve;	1B
Convalescent stage (Salmonella spp.)	Restrict from care of high-risk patients, such as immunocompromised patients	Consult with employee health	1B
Diphtheria	Exclude from duty	Until antimicrobial therapy is completed and 2 cultures obtained >24 hours apart are negative	1B
Enteroviral infections	Restrict from care of infants, neonates, and immunocompromised patients and their environments	Until symptoms resolve	II
Hepatitis A	Restrict from patient contact, contact with the patients' environment, and food handling	Until 7 days after the onset of jaundice	1B
Hepatitis B	Refer to specific MOH recommendation in policy		
Hepatitis C	Refer to specific MOH recommendation in policy		Unresolved issue
Herpes simplex:			
Genital	No restriction		II
Hands (herpetic whitlow)	Restrict from patient contact and contact with the patients' environment	Until lesions heal	1A
Orofacial	Evaluate for need to restrict from care of high- risk patients	Consult with Employee Health	II
Measles:			
Active	Exclude from duty	Until 7 days after the rash appears	1A
Post-exposure (susceptible personnel)	Exclude from duty	From the 5th day after the 1st exposure through the 21st day after the last exposure and/or 7 days after rash appears	1B

Meningococcal meningitis	Exclude from duty	Until 24 hours after the start of antibiotic therapy	1A
Mumps:			
Active	Exclude from duty	Until 9 days after the onset of parotitis	1B
Post-exposure (susceptible personnel)	Exclude from duty	From the 12th day after the 1st exposure through the 26th day after the last exposure or until 9 days after the onset of parotitis	II
Pediculosis (lice)	Restrict from patient contact	Until treated and observed to be free of adult and immature lice	1B
Pertussis:			
Active	Exclude from duty	From the beginning of catarrhal stage through the 3rd week after onset of paroxysms or until 5 days after start of effective antimicrobial therapy	B
Post-exposure (asymptomatic personnel)	No restriction, prophylaxis recommended		II
Post-exposure (symptomatic personnel)	Exclude from duty	Until 5 days after the start of effective antimicrobial therapy	1B
Rubella:			
Active	Exclude from duty	Until 5 days after rash appears	IA
Post-exposure (susceptible personnel)	Exclude from duty	From the 7th day after the 1st exposure through the 21st day after the last exposure and/or 5 days after rash appears	IB
Scabies	Restrict from patient contact	Until cleared by medical evaluation	IB
Staphylococcus aureus:			
Active, draining skin lesions	Restrict from contact with patients, the patients' environment, and food handling	Until lesions have resolved	IB
Carrier state	No restriction, unless personnel are epidemiologically linked to transmission of the organism		IB
Group A Streptococcal infection	Restrict from patient care, contact with patients' environment, or food handling	Until 24 hours after adequate antimicrobial therapy	1B
Tuberculosis:			
Active disease	Exclude from duty	Until proven noninfectious by physician	1A
Latent TB infection	No restriction	Treatment for latent TB infection	1A

Varicella:			
Active	Exclude from duty	Until all lesions are dry and crusted over	1A
Post-exposure (susceptible personnel)	Exclude from duty	From the 10th day after the 1st exposure through the 21st day (28th day if VZIG given) after the last exposure	1A
Zoster (shingles):			
Localized, otherwise healthy	Cover lesions; restrict from care of high-risk patients+	Until all lesions are dry and crusted over	II
Zoster (shingles):			
Generalized or localized in an immunosuppressed person	Restrict from patient contact	Until all lesions are dry and crusted over	IB
Post-exposure (susceptible personnel)	Restrict from patient contact	From the 10th day after the 1st exposure through the 21st day (28th day if VZIG given) after the last exposure or, if varicella occurs, until all lesions are dry and crusted over	IA
Viral respiratory infections, acute febrile	Consider excluding from the care of high-risk patients++ or from contact with their environment during community outbreaks of RSV and influenza	Until acute symptoms resolve	IB

**Category IA: Strongly recommended for all hospitals and strongly supported by well-designed experimental or epidemiologic studies.
Category IB: Strongly recommended for all hospitals and reviewed as effective by experts in the field and a consensus of Hospital Infection Control Practices Advisory Committee members on the basis of strong rationale and suggestive evidence, even though definitive scientific studies have not been done.
Category II: Suggested for implementation in many hospitals. Recommendations may be supported by suggestive clinical or epidemiologic studies, a strong theoretic rationale, or definitive studies applicable to some but not all hospitals.
No recommendation; unresolved issue: Practices for which insufficient evidence or consensus regarding efficacy exists.
+ Those susceptible to varicella and those who are at increased risk of complications due to varicella, such as neonates and immunocompromised persons of any age
++ High-risk patients as defined by the ACIP for complications due to influenza

Source: Sierra Leone National Infection Prevention and Control Guidelines, SL Ministry of Health and Sanitation, 2015

Annex 41:

Recommendations for health care worker immunizations

Vaccines	Recommendations
Hepatitis B Vaccine	If you don't have documented evidence of a complete blood test that shows you are immune to hepatitis B (i.e., no serologic evidence of immunity or prior vaccination) then you should • Get the 3-dose series (dose #1 now, #2 in 1 month, #3 approximately 5 months after #2). • Get anti-HBs serologic tested 1–2 months after dose #3.
Flu (Influenza)	• Get 1 dose of influenza vaccine annually.
MMR (Measles, Mumps & Rubella)	• If you were born in 1957 or later and have not had the MMR vaccine, or if you don't have an up-to-date blood test that shows you are immune to measles or mumps (i.e., no serologic evidence of immunity or prior vaccination), get 2 doses of MMR (1 dose now and the 2nd dose at least 28 days later). • If you were born in 1957 or later and have not had the MMR vaccine, or if you don't have an up-to-date blood test that shows you are immune to rubella, only 1 dose of MMR is recommended. However, you may end up receiving 2 doses, because the rubella component is in the combination vaccine with measles and mumps. • For HCWs born before 1957: Acceptable evidence of measles, rubella, and mumps immunity, health-care facilities should consider vaccinating unvaccinated personnel born before 1957 who do not have laboratory evidence of measles, rubella, and mumps immunity; laboratory confirmation of disease; or vaccination with 2 appropriately spaced doses of MMR vaccine for measles and mumps and 1 dose of MMR vaccine for rubella. Vaccination recommendations during outbreaks differ from routine recommendations for this group (see section titled Recommendations during Outbreaks of Measles, Rubella, or Mumps).
Varicella (Chickenpox)	If you have not had chickenpox (varicella), if you haven't had varicella vaccine, or if you don't have an up-to-date blood test that shows you are immune to varicella (i.e., no serologic evidence of immunity or prior vaccination) get 2 doses of varicella vaccine, 4 weeks apart.
Tdap (Tetanus, Diphtheria & Pertussis)	Get a one-time dose of Tdap as soon as possible if you have not received Tdap previously (regardless of when previous dose of Td was received). Get Td boosters every 10 years thereafter. Pregnant HCWs need to get a dose of Tdap during each pregnancy.
Meningococcal disease	Those who are routinely exposed to isolates of N. meningitidis should get one dose.

Health care workers include physicians, nurses, emergency medical personnel, dental professionals and students, medical and nursing students, laboratory technicians, pharmacists, hospital volunteers, and administrative staff.

Source: Sierra Leone National Infection Prevention and Control Guidelines, SL Ministry of Health and Sanitation, 2015

References

Adams J, Bartram J, and Chartier Y, editors. (2008). *Essential Environmental Health Standards in Health Care.* Geneva: World Health Organization.

Allegranzi B, Nejad SB, Combsecure C, et al. (2011). *Burden of endemic health-care-associated infection in developing countries: systematic review and meta-analysis.* The Lancet 377(9761), 228-241.

Association for Professionals in Infection Control and Epidemiology. (2010). *Guide to the Elimination of Methicillin-Resistant Staphylococcus aureus (MRSA) Transmission in Hospital Settings, 2nd Edition.* Washington, DC: APIC.

Association for Professionals in Infection Control and Epidemiology. (2014). *Guide to Preventing Catheter-Associated Urinary Tract Infections. Washington, DC: APIC.*
Association for Professionals in Infection Control and Epidemiology. (2015). *Guide to Preventing Central Line-Associated Bloodstream Infections. Washington, DC: APIC.*

British Columbia Ministry of Health. (2011). *Best Practice Guidelines for Cleaning, Disinfection and Sterilization in Health Authorities.* Victoria, BC: BC Health Authorities.

Carrico R, editor. (2005). *APIC Text of Infection Control and Epidemiology, 2nd Edition.* Washington, DC: APIC.

Centers for Disease Control and Prevention. (2007). *Workbook for designing, implementing and evaluating a sharps injury prevention program.* Retrieved from CDC website: https://www.cdc.gov/sharpssafety/pdf/sharpsworkbook_2008.pdf.

Friedman C and Newsom W. (2011). *IFIC Basic Concepts of Infection Control.* Portadown: International Federation of Infection Control.

Gaynes R. (1997). *Surveillance of nosocomial infections: a fundamental ingredient for quality.* Infection Control and Hospital Epidemiology 18(07), 475-478.

Haley RW, Culver DH, White JW, et al. (1985). *The efficacy of infection surveillance and control programs in preventing nosocomial infections in US hospitals.* American Journal of Epidemiology 121(2), 182-205.

Isaacs D, Dickson H, O'Callaghan C, et al. (1991). *Handwashing and cohorting in prevention of hospital acquired infections with respiratory syncytial virus.* Archives of Disease in Childhood 66(2), 227-231.

Mayhall G. (2004). *Hospital Epidemiology and Infection Control, 3rd Edition.* Philadelphia: Lippincott, Williams & Wilkins.

O'Boyle C, Jackson M, and Henly SJ. (2002). *Staffing requirements for infection control programs in US health care facilities: Delphi project.* American Journal of Infection Control 30(6), 321-333.

Ontario Ministry of Health and Long-Term Care and the Provincial Infectious Diseases Advisory Committee. (2010). *Best Practices for Cleaning, Disinfection and Sterilization in All Health Care Settings.* Toronto: PIDAC.

Republic of Liberia Ministry of Health. (2009). *Guidelines for the Safe Management of Health Care Waste in Liberia.*

Schyve, PM. (2000). *The evolution of external quality evaluation: observations from the Joint Commission on Accreditation of Healthcare Organizations.* International Journal for Quality in Health Care 12(3), 255-258.

Shah H, Bosch W, Thompson KM, and Hellinger WC. (2013). *Intravascular catheter-related bloodstream infection.* The Neurohospitalist 3(3), 144-151.

Siegel JD, Rhinehart E, Jackson M, and Chiarello L and the Healthcare Infection Control Practices Advisory Committee. (2007). *2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings.* Retrieved from CDC website: https://www.cdc.gov/infectioncontrol/pdf/guidelines/isolation-guidelines.pdf.

Storr J, Twyman A, Zingg W, et al. (2017). *Core components for effective infection prevention and control programmes: new WHO evidence-based recommendations.* Antimicrobial Resistance and Infection Control 6(6).

Wenzel RP. (2003). *Prevention and Control of Nosocomial Infections, 4th Edition.* Philadelphia: Lippincott, Williams & Wilkins.

World Health Organization. (2016). *Decontamination and Reprocessing of Medical Devices for Health-Care Facilities.* Geneva: World Health Organization.

World Health Organization. (2016). *Global Guidelines for the Prevention of Surgical Site Infection.* Geneva: World Health Organization.

World Health Organization. (2016). *Guidelines on Core Components for Infection Prevention and Control Programmes at the National and Acute Health Care Facility Level.* Geneva: World Health Organization.

World Health Organization. (2014). *Infection Prevention and Control of Epidemic- and Pandemic-Prone Acute Respiratory Infections in Health Care.* Geneva: World Health Organization.

World Health Organization. (2004). *Laboratory Biosafety Manual, 3rd edition.* Geneva: World Health Organization.
World Health Organization. (2009). *Natural Ventilation for Infection Control in Health-Care Settings.* Geneva: World Health Organization.

World Health Organization. (2004). *Practical Guidelines for Infection Control in Health Care Facilities.* Geneva: World Health Organization.

World Health Organization. (2002). *Prevention of Hospital-Acquired Infections: a Practical Guide, 2nd Edition.* Geneva: World Health Organization.

World Health Organization. (2010). *Prevention and Management of Wound Infection.* Geneva: World Health Organization.

World Health Organization. (2012). *The Evolving Threat of Antimicrobial Resistance: Options for Action.* Geneva: World Health Organization.

World Health Organization. (2006). *The Global Patient Safety Challenge – Clean Care is Safer Care.* Geneva: World Health Organization.

World Health Organization. (2010). *WHO Best Practices for Injections and Related Procedures Toolkit.* Geneva: World Health Organization.

World Health Organization. (2009). *WHO Guidelines on Hand Hygiene in Health Care.* Geneva: World Health Organization.

World Health Organization. (2009). *WHO Policy on TB Infection Control in Health-Care Facilities, Congregate Settings and Households.* Geneva: World Health Organization.