AIDSFree NIGERIA TRAINING MANUAL

INFECTION PREVENTION AND CONTROL AND HEALTH CARE WASTE MANAGEMENT FOR HEALTH WORKERS

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Strengthening High Impact Interventions for an AIDS-free Generation

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AIDSFree

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CONTENTS

List of Figures

ACRONYMS

AD	auto disable
ADE	adverse drug effect
AIDSFree	Strengthening High Impact Interventions for an AIDS-free Generation
AIDSTAR-One	AIDS Support and Technical Assistance Resources Sector 1 Task Order 1
AMCR	average monthly consumption rate
BCC	behavior change communication
CDC	U.S. Centers for Disease Control and Prevention
CQI	quality improvement (CQI) program
EMMP	environmental mitigation and monitoring plan
FMOH	Federal Ministry of Health
HAI	hospital acquired infection
HBV	hepatitis B virus
HCV	hepatitis C virus
HCWM	health care waste management
HIV	human immunodeficiency virus
IEE	initial environmental examination
IPC	infection prevention and control
IPCC	infection prevention and control committee
IS	injection safety
IV	intravenous
LGA	local government area
MOS	months of supply

NACA	National Action Committee on AIDS
NAFDAC	National Agency for Food and Drug Administration and Control
NASCP	National AIDS Control and Prevention Program (),
NBTS	National Blood Transfusion Service (NBTS)
NIPCIP	National Infection Prevention and Control Program
NPHCDA	Nigeria National Primary Health Care Development Agency (NPHCDA)
NTBLCP	National Tuberculosis and Leprosy Control Programme
OPD	outpatient department
PEP	post-exposure prevention
PLA	participatory learning and action
PPE	personal protective equipment
SBCC	social and behavior change communication
SIGN	Safe Injection Global Network
SODIS	solar disinfection
SOP	standard operating procedure
TB	tuberculosis
TTI	transfusion-transmissible infections
USAID	U.S. Agency for International Development
WASH	water, sanitation, and hygiene
WHO	World Health Organization

INTRODUCTION

Each year an estimated 16 billion injections are administered worldwide. Around 90 percent are given in curative care. Immunization injections account for around 5 percent of all injections; the others include blood transfusions, intravenous administration of drugs and fluids, and injectable contraceptives (WHO 2015b). Injection practices worldwide and especially in low- and middle-income countries include unsafe practices that ultimately lead to large-scale transmission of bloodborne viruses among patients, health workers, and the community at large. These results are avoidable if safety precautions are taken.

Health care waste can cause serious harm if not managed properly. According to a 2014 World Health Organization (WHO) study, unsafe injections were responsible for as many as 33,800 HIV (human immunodeficiency virus) infections, 1.7 million hepatitis B infections, and 315,000 hepatitis C infections worldwide in 2010 (WHO 2015b). Patients and health facility staff—health workers, waste handlers, and housekeeping staff—are at risk of infection through needle injury.

With the increasing incidence of infectious diseases like HIV, hepatitis B and C, and tuberculosis (TB) in Nigeria, infection prevention and control (IPC) as a public health approach is necessary. IPC includes risk assessment, prevention of the spread of infections, and control of specific and common infections.

Health care waste also poses serious risks to public health and the environment, making management of such waste a critical issue. However, in part because of limited resources and lack of political will, health care waste management (HCWM) often does not receive sufficient attention. Medical waste is often handled, collected, and disposed of together with domestic waste without safeguards, posing a great risk to the health of waste handlers, the public, and the environment, including water resources.

This draft training manual on infection prevention and control—including HCWM and injection safety—is can be used by health workers in public and private health care settings and related educational institutions to increase appropriate knowledge, skills, and attitudes relevant to IPC/HCWM best practices.

Capacity building in IPC and proper HCWM are foundations for provision of safe and effective care as well as prevention and management of bloodborne diseases. An effective IPC program is fundamental to delivering quality health care. Such a program addresses key aspects of infection control in everyday practice, explores risk assessment, and describes how infection transmission can be minimized in a variety of settings. Thus it has the potential benefits of reducing disease burdens on patients, health institutions, and the nation as a whole. The manual can be used to train new employees or for continuing education and supportive supervision of health workers to ensure continuous quality of health care delivery and to help achieve the goal of an AIDS-free generation.

INFECTION PREVENTION AND CONTROL

An **infection** is the growth of a parasitic organism, or "germ," within the body. A parasitic organism is one that lives on or in another organism, such as a human body, from which it draws its nourishment.

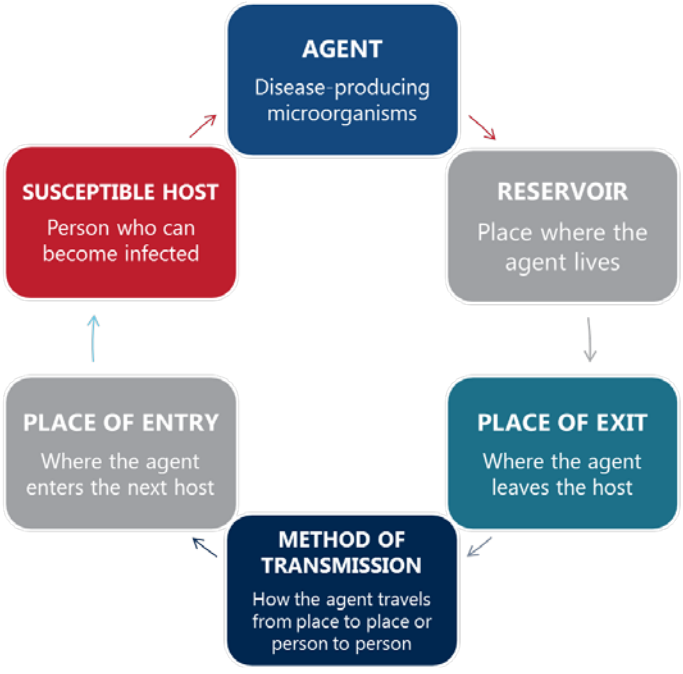
Hospital acquired infection (HAI) refers to infections acquired during the delivery of health care while receiving treatment from or visiting a health facility.

Infection prevention and control (IPC) refers to policies and procedures to reduce the occurrence and minimize the risk of spreading infections, especially in hospitals.

Methods of disease transmission—part of the transmission cycle in Figure 1 below—are:

- Inhalation
- Direct contact
- Inoculation
- Ingestion.

Figure 1. Transmission cycle



Standard precautions

Standard precautions are guidelines for creating a physical, mechanical, or chemical barrier between microorganisms and a person to prevent the spread of infection (that is, the barrier serves to break the disease transmission cycle).

Examples of barriers

- **Physical:** Personal protective equipment (PPE), for example, gloves, face masks, goggles, gowns, plastic or rubber aprons, and drapes
- **Mechanical:** High-level disinfection by boiling or steaming and sterilization by autoclaving or dry heat oven
- **Chemical:** Antiseptics such as alcohol-based antiseptic agents and high-level disinfectants such as chlorine and glutaraldehydes.

Standard precautions are implemented to reduce the risk of transmitting microorganisms from known or unknown sources of infection within the health care system. Applying standard precautions has become the primary strategy to preventing health care–associated infection. Application of standard precautions during patient care is determined by the nature of the health care worker's tasks, that is, level of patient interaction and the extent of anticipated exposure to blood, body fluids, or pathogens.

Standard precautions apply to:

- Blood
- All body fluids, secretions, and excretions—regardless of whether or not they contain visible blood
- Non-intact skin
- Mucous membranes.

Standard precautions are designed to reduce the risk of transmission of microorganisms from both recognized and unrecognized sources of infection in health care settings, and apply to all patients regardless of diagnosis or presumed infectious status.

Core components of standard precautions

Key elements of standard precautions

- Hand hygiene (wash hands with soap and water or use an antiseptic hand rub)
- PPE including: latex gloves, masks, apron, goggles, face shield, heavy duty gloves, boots)
- Injection safety
- Post-exposure prophylaxis (PEP)
- Patient placement
- Respiratory hygiene and cough etiquette
- Environmental control
- Housekeeping/soiled patient care equipment
- Textiles laundry and linen care
- Sharps management
- Appropriate health care waste management (HCWM).

Transmission-based precautions

Standard precaution guidelines are designed to reduce the risk of transmitting infections that are spread by **airborne, droplet**, or **contact routes** between hospitalized patients and health care providers.

Components of transmission-based precautions

- Identifying potentially infectious patients
- Airborne precautions
- Droplet precautions
- Contact precautions

Precautions include:

- Patient placement
- Patient transport
- Respiratory protection
- Gloving
- Hand hygiene
- Cough etiquette
- Post-patient contact
- Patient care equipment
- Donning, removal, and care of PPE.

Injection safety

What is a safe injection?

A safe injection, phlebotomy (drawing blood), lancet procedure, or intravenous (IV) device insertion is one that is given using appropriate equipment, does not harm the recipient, does not expose the provider to any avoidable risk and does not result in any waste dangerous to the community.

Relationship between infection prevention and control (IPC) and injection safety

Injection safety is:

- an integral component of IPC
- an element of standard precautions
- a key element of patient and health worker safety
- supported by IPC policies and procedures such as hand hygiene, housekeeping, and waste management

- critical for continuous quality improvement (CQI) program, managed by the health care team and specifically the IPC team in health facilities.

WHO/Safe Injection Global Network (SIGN) strategy for injection safety

- Changing behavior of health workers and patients
- Ensuring availability of equipment and supplies
- Managing health care waste safely and appropriately

Definition: a safe injection

- Is only given when there is no suitable alternative.
- Safety is assured when the right drug, which has been stored correctly and is in the right formulation, is given to the patient in the right dose, using the right needle and syringe, at the right anatomical site, by the right route at the right time.
- A skilled health worker should give a safe injection, and the waste from its use should not cause harm to the provider, the recipient, or the community.

Key steps of a safe injection

- Use a syringe and needle from a new, sealed, undamaged packet for every injection.
- Without recapping, dispose of syringe and needle in a safety box immediately after use.
- Manage injection waste safely and appropriately.

Unsafe injection practices

Unsafe injection practices could harm the recipient, the provider, or the community and may result in waste that is dangerous to any of these groups.

Unsafe Injection Practices That Cause Harm

Risks of harm to injection recipient:

- Contaminated drugs
- Partially opened vials are mixed together for one injection
- Multi-dose vials are used
- Needles are left in rubber cap of vial
- Expired drugs given
- Syringes loaded with incorrect medication
- Drugs and vaccines stored in same refrigerator
- Injections from the informal health sector

Risks of harm to health worker/injection provider:

- Carrying around used syringes and needles before disposal

- Placing syringes and needles on a surface prior to disposal
- Recapping needles (two-handed)
- Reaching into a container of used syringes and needles
- Manually detaching needles from syringes
- Manipulating used sharps (cleaning, changing, bending, breaking, or cutting needles)
- Passing sharp from one health worker to another
- Overfilling safety boxes
- Using a syringe and needle on an agitated patient without assistance

Risks of harm to community:

- Leaving syringes and needles in areas accessible to the public, especially children
- Sharing syringes and needles with family or community members
- Re-using syringes and needles

Risks associated with unsafe injection practices

Patients and health workers are at risk through needle injury. According to a 2014 WHO study, unsafe injections were responsible for as many as 33,800 HIV infections, 1.7 million hepatitis B infections, and 315,000 hepatitis C infections in 2010.

Risks to patients and health workers

- **Transmission of infections:** Diseases/conditions transmitted or caused by unsafe injection practices: hepatitis B, hepatitis C, HIV, abscesses, hemorrhagic fevers, malaria, tetanus, and death
- **Paralysis**: Injection of a drug into a nerve, which can lead to nerve damage and can result in weakness of the limb (lameness) supplied by the nerve.
- **Drug reactions**: Abnormal response of the body to a drug; the most life threatening of these is anaphylaxis—sudden collapse of the circulatory system due to immunological response to the injected drug.

At-risk groups

- Patients/clients—especially immuno-compromised individuals
- Health workers
- Health care waste handlers and housekeeping personnel
- Communities.

Conditions causing injection safety risks to providers, patients, and communities

Providers

- Inadequate supply of appropriate safety boxes
- Unsafe practices that lead to needlestick injuries when:
  - Recapping needles
  - Manipulating used sharps (bending, breaking, or cutting hypodermic needles)
  - Passing sharps from one health worker to another
  - Sharps found in unexpected places like linens
  - Patient/client suddenly moves during administration of injection

Patients/Clients

- Injection when there are other treatment alternatives
- Reuse of injection equipment
- Self-medication
- Sharps found in unexpected places like linens
- Patient/client suddenly moves during administration of injection
- Contaminated drugs administered
- Aseptic technique is not observed by health worker
- Administration of drug at incorrect anatomical site
- Accidental switching of drugs
- Expired drugs
- Package is damaged or compromised

Community

- Unsafe waste disposal practices such as:
  - Non-secure waste site (no fence)
  - Improperly placed disposal site (too close to people, crops, water sheds)
  - Improperly disposed waste (pit too shallow, incinerator overflowing, open dumping)
- Reused syringes and needles
- Sharing syringes and needles

Best practices in injection safety

Select safe medicines

- Handle medicines properly, including keeping them in a clean environment.
- Label medicines clearly.

- Observe proper medicine storage conditions, including controlling temperature and humidity (as recommended by manufacturer).
- Check expiration dates and NAFDAC (National Agency for Food and Drug Administration and Control) number.

Use sterile injection equipment

- Use syringe and needle from a sealed package.
- Use syringes with reuse prevention features.

Avoid contamination of equipment and medication (observe aseptic technique)

- Wash hands or use alcohol-based hand rub.
- Prepare on a clean surface.
- Do not touch the part of the needle that will come in contact with patient's tissue.
- Do not leave the needle in the rubber cap of the vial.

Reconstitute drugs or vaccines safely

- Use a new sterile syringe and needle for each reconstitution.
- Use the correct diluent/water for injection.
- Reconstitute according to the manufacturer's specifications.

Dispose of injection wastes and sharps appropriately

- Prevent needlestick injuries by immediately disposing of syringe and needle in puncture and leak-proof safety box.
- Do not overfill safety boxes.

Eleven rights of injection safety

All health workers should ensure safe injections by ensuring the eleven 'rights' of injection safety.

Figure 2. Ensuring safe injections using the eleven rights

Rights	Standards *Always check and verify all "rights"*	Method of Verification	Verified by
Right patient	What is the name on the prescription? Is this the right patient?	Ask patient—or guardian—to repeat name.	Injection provider
Right drug	Is the name of the drug on the prescription the same as that on the injection you are about to administer?	Verify name of drug on prescription with injection to be administered. If unsure, verify with physician or pharmacist.	Injection provider
Right formulation	Could the medication be given orally instead of as an injection?	Discuss choices with patient.	Injection prescriber
Right injection equipment	Use only sterile, nonreusable syringe or dental cartridge.	Check to ensure syringe/needle package is unbroken.	Injection provider
Right dosage	Check dosage against patient's age, weight, and pharmacokinetics of the drug.	Read pharmaceutical recommendations for the drug. If unsure, verify with the physician/prescriber.	Injection prescriber and injection provider
Right time	Follow specific dose interval.	Be mindful of the action of the drug and why a time interval should be followed. Explain importance of this to patient.	Injection prescriber and injection provider
Right route	Use correct route of administration (intramuscular, intravenous, intradermal, or subcutaneous).	Observe directions of the prescriber. Check prescription or other related records.	Injection provider
Right storage	Store at right temperature; use vaccine vial monitor (VVM) shake test.	Check cold chain issues, including VVM.	Pharmacy, injection provider
Right method of disposal	Do not recap needle. Dispose of used syringe and needle immediately in safety box.	Check the safety box for correct method of disposal.	Injection provider
Right anatomical site	Inject in upper outer quadrant and upper outer third of thigh muscles (especially in children) for intramuscular; deltoid muscle for small doses (e.g., tetanus toxoid).	Determine exact site to avoid injury to the nerve.	Injection provider
Right trained personnel	Are you trained to give the prescribed injection?	Ask whether complication or adverse event that may arise can be handled by the provider.	Injection provider

Group work: busy Biodun in the outpatient department (OPD)

Biodun is a newly trained nurse who has just gone on duty at the treatment room of the Mutare Provincial Hospital Outpatient Department on a busy Monday morning. Outside the room is a long queue of patients waiting for treatment. While reading the prescription on the card for the next patient, he is called to answer the telephone.

Upon his return, the patient whose card he was reading before the phone call had left the line to use the restroom. He calls "next!" and the next patient in the queue walks in. Biodun washes his hands, checks the dose on the card, and draws the exact amount of 80mg Gentamycin into a newly opened 2mL Vanish Point retractable syringe from his clean injection trolley.

The patient tried to tell Biodun that he had not come for an injection but for a dressing, but because Biodun is in a hurry to clear the patients, he is not paying attention, and he asks the old man to get behind the screen for the injection the doctor has prescribed for him.

The injection is administered and the used syringe and needle is disposed of in a safety box supplied by the AIDSFree project. The patient begins immediately to sweat and shiver.

Discussion Questions

What did Biodun do right?

What did he do wrong?

Group activity—Mr. Ibrahim

Mr. Ibrahim sustained multiple injuries from a motor vehicle accident. He was rushed to the nearby health care facility.

Upon arrival he was seen by a physician who examined him and prescribed the following: Injection of anti-tetanus toxoid 0.5 mL subcutaneous stat, injection serum tetanus toxoid, antiseptic dressing daily for three days, and pain medication daily for three days.

Mr. Ibrahim went to an injection room for the serum tetanus toxoid and anti-tetanus toxoid where he was attended by a nurse who administered the prescribed injections.

While getting the injections, Mr. Ibrahim observed that the vials of the anti-tetanus toxoid and serum tetanus toxoid were taken from the fridge and were taped after having been opened. He also observed that the syringe and needle used were not taken from a sealed package and that all injections were administered using the same injection device.

After the injections he went to a wound dressing room where he was received by a nurse and asked to sit on a bench. The nurse dressed the wounds. While the nurse was dressing the wounds, the patient observed that the nurse neither washed her hands nor put on gloves. Moreover, the nurse did not open a new package for the dressing.

Discussion Questions

Who is at risk for infection?

What types of risk does this case study present?

What should have been done to prevent the risks?

ROLES AND RESPONSIBILITIES FOR IPC: POLICIES AND GUIDELINES

Policies, standards, and guidelines

Policy: course or principle of action adopted or proposed by a government, party, business, or individual outlining general goals and acceptable procedures that govern operation. Policies form the basis for action on infection prevention and control (IPC).

Standards: Minimum level of quality care

Guidelines: Procedures for performing a task to ensure safety

Components of a policy declaration

- Mission/policy
- Statement mission/policy statement
- Purpose
- Objectives
- Guiding principles
- Strategies to achieve objectives
- Scope of application
- Legal and regulatory framework
- Non-compliance and disciplinary measures.

Components of an ideal IPC policy

- Early detection of infections through active surveillance and monitoring
- Health worker safety
- Risk reduction through implementation of IPC guidelines
- Antimicrobial stewardship
- Addressing community IPC needs
- Public-private partnerships
- Blood and injection safety
- Addressing TB and other airborne infections
- Purchasing and introducing IPC equipment and logistics
- Research
- Monitoring and evaluation

Policies that relate to IPC practices

- National IPC Policy
- National health care waste management (HCWM) Policy
- National Injection Safety Policy
- WHO/SIGN Global Strategy for Safe Injection (three-prong strategy)
- WHO/United Nations Children's Fund/United Nations Population Fund Joint Policy
- WHO Health Care Waste Management Policy
- International Labor Organization (ILO) convention on occupational safety and health
- National Immunization Policy

Responsibilities for IPC

National level

Federal Ministry of Health (FMOH) in collaboration with stakeholders

- Formulates, reviews, and produces the National Policy on IPC
- Enacts, reviews, and harmonizes existing legislation on IPC
- Develops and ensures the implementation of the National Action Plan on IPC
- Collaborates with academia; research institutions; other relevant ministries, agencies, state government, nongovernmental organizations (NGOs); and private sector on IPC
- Supports capacity-building and human resource development
- Mobilizes resources both internally and externally for IPC activities.

National Infection Prevention and Control Programme (NIPCP)—domiciled in Department of Public Health

- Formulates policies and strategies and sets standards for IPC
- Provides technical support to IPC teams in the respective States
- Supports advocacy and resource mobilization
- Encourages development of appropriate systems for effective IPC practices in health facilities
- Conducts and publishes research
- Ensures that standards are adhered to in the design and construction of health facilities
- Liaises with relevant agencies/stakeholders on IPC training programs
- Provides information, education, and communication on IPC
- Encourages effective behavioral change and communication approaches on IPC.

National IPC Steering Committee

[This committee has representation from the National AIDS Control and Prevention Program (NASCP), National Action Committee on AIDS (NACA), Nigeria National Primary Health Care

Development Agency (NPHCDA), National Blood Transfusion Service (NBTS), National Tuberculosis and Leprosy Control Programme (NTBLCP). National Agency for Food and Drug Administration and Control (NAFDAC).

- Develops policy, guidelines, standard operating procedures (SOPs), and a National Plan of Action
- Provides support for teaching and training and skill and capacity-building of health workers on IPC activities
- Conducts relevant research and investigation to draw up guidelines and recommendations relevant to the prevailing health care burden of disease
- Advocates sustainable and mutually beneficial public-private partnerships for procurement of medical devices and supplies that support best practices
- Establish linkages with similar organizations across the globe.

State level

State IPC team/committee (with a state IPC focal person)

- Meets at least quarterly—provides feedback to the Commissioner of Health
- Provides technical support to IPC teams in their respective States and local government areas (LGAs)
- Provides training on IPC at the state level and ensures implementation
- Monitors and evaluates IPC activities at the State and LGA levels
- Advises on procurement of equipment and consumables for IPC
- Advocates for budgeting for IPC activities at the LGA and facility levels
- Conducts advocacy, operational research, and behavior change communication (BCC) and mobilizes resources for IPC activities at the state level.

Local government level

Primary Health Department with the LGA IPC focal person and Ward Development Committee

- Implements IPC activities in the primary health centers (PHC) and within the community
- Serves as a link between the ward development committee (WDC) and LGAs
- Monitors and conducts surveillance on IPC
- Provides regular feedback to all stakeholders on IPC.

Health facility level

Infection Prevention and Control Committee (IPCC)/IPC nurse

- Ensures that there are IPC policies and guidelines in place at facility level
- Procures equipment and consumables for IPC

- Ensures the maintenance of IPC equipment
- Monitors, supervises, and evaluates IPC activities
- Provides training on IPC at the facility
- Implements effective BCC approaches on IPC
- Conducts advocacy and mobilizes resources for IPC activities and a budget line
- Follows up on and manages reports of non-compliance.

Clinic staff

- Advocate patient compliance with IPC
- Adhere to policies and standard procedures
- Keep abreast of IPC technology.

Supervisors and managers

- Monitor and evaluate staff performance
- Ensure availability of adequate equipment and supplies for IPC.

Logistics/supply officer

- Manage IPC equipment and supplies

Waste management officer/environmental health officer

- Trains staff on the collection, storage, transport, and disposal of sharps and other wastes
- Ensures staff compliance with these rules.

Housekeeping supervisor

- Provides training in housekeeping, monitors compliance, and keeps clean designated areas for injection preparation.

Community level

NPHCDA, States, and LGAs in collaboration with village development committees and ward development committees

- Create awareness and provide capacity building on effective and appropriate methods for preventing infections in the community
- Conduct advocacy as a strong instrument to enrich the knowledge and skills of communities to drive home IPC
- Strengthen the Ward Health System through orientation and participatory learning and action (PLA) to carry out community surveillance
- Implement effective advocacy communication and social mobilization activities on IPC
- Ensure functionality of planned preventive maintenance (PPM) centers within the PHCs.

HAND HYGIENE

From a review of water, sanitation, and hygiene (WASH) services in health facilities including data in 54 low- and middle-income countries, WHO concluded that 38 percent of health facilities lack access to even rudimentary levels of water, 19 percent lack sanitation, and 35 percent do not have water and soap for hand hygiene (WHO 2015b).

Hand hygiene refers to:

- Handwashing using soap/skin cleanser
- Decontamination using alcohol hand rub
- Decontamination using 4 percent chlorhexidine.

Transmission of microorganisms by direct contact

Microbes can be spread by touching:

- Patients
- Shared patient equipment
- IV lines and devices
- Bed linen and patient furniture.

Why hand hygiene?

- To protect patients against harmful pathogens carried on heath workers' hands
- To protect patients against harmful organisms from entering his/her body during any procedure
- To protect health workers and the environment from harmful pathogens.

WHO five moments for hand hygiene

A "moment" is when there is a perceived or actual risk of pathogen transmission from one surface to another via the hands.

Moment 1: Before patient contact (e.g., shaking hands, assisting with mobilization, taking pulse/blood pressure, bathing a patient, repositioning in bed)

Moment 2: Before a procedure (e. g., wound dressing, venipuncture, contact with non-intact skin or mucous membranes, handling tablets/capsules or eye drops, IV medication preparation and administration)

Moment 3: After a procedure or body fluid exposure risk when moving from a contaminated body site to a clean body site (e.g., after contact with body fluids including after removing gloves)

Moment 4: After patient contact (e. g., after patient contact, where contact is not related to a procedure listed in Moment 2)

Moment 5: After contact with patient's surroundings (e.g., bed, bedside locker, table, chair, IV pole, call button, TV remote, light switches); changing bed linen; contact with patient's personal belongings—books, clothing, toys, walkers or other equipment.

Figure 3. WHO five moments for hand hygiene

Results from a baseline health facility assessment conducted by AIDSTAR-One Nigeria showed only 12% of health workers observed washed their hands using soap and water or alcohol-based

hand rub at the appropriate time. And at follow-up in 2008—though handwashing observance did increase—only 25% of health workers observed washed their hands appropriately.

Factors health workers cite for poor hand washing adherence rates

- No (running) water
- No soap
- Heavy workload (too busy)
- Hand wash area is dirty
- Sinks are poorly located
- Hands don't look dirty
- Handwashing takes too long
- Skin irritation caused by frequent exposure to soap and water

Discussion Questions

Why is adherence of health workers to recommended handwashing so poor?
How can we overcome problems associated with poor hand hygiene?

Alcohol-based hand rubs

Advantages of alcohol-based hand rubs

- Take less time to use
- Can be made more accessible than sinks
- Cause less skin irritation and dryness
- Are more effective in reducing the number of bacteria on hands

Making alcohol-based hand rubs readily available to personnel has led to improved hand hygiene practice.

How and when to perform hand hygiene

When

- Immediately upon arrival at work
- After touching blood, body fluids, secretions, excretions, contaminated items—whether or not gloves are worn
- Before putting on gloves for invasive procedures
- Before and after removing gloves
- Before and after each patient contact
- Between procedures on the same patient to prevent cross-contamination

- Any time microorganisms might be transferred to other patients, staff, or environments.

How

Equipment and supplies required

- Liquid soap
- Running water from a tap or kettle/goblet (basin for collecting and disposing of dirty water)
- Disposable paper—preferably towel, individual pieces of paper, small square towels, or clothing for each section

Clean Hands Save Lives—Let us therefore develop a culture of cleaning our hands! Let us protect patients and protect ourselves!

Photo courtesy of Prof. Sade Ogunsola

Figure 4. WHO how to handwash guidelines

LABORATORY PRACTICES

Phlebotomy

Phlebotomy—also known as venepuncture—is a method by which blood is withdrawn from the circulatory system. In phlebotomy a needle is used to pierce the skin and to access a vein so that a quantity of blood can be removed for various purposes (e.g., diagnosis, analysis, blood transfusion)

Phlebotomy is an invasive procedure that includes blood sampling and blood collection.

Risks of phlebotomy

Phlebotomy has the potential to:

- Expose health workers and patients to blood from other people, putting them at risk from bloodborne pathogens such hepatitis B virus (HBV), hepatitis C virus (HCV), human immunodeficiency virus (HIV), and viral hemorrhagic fevers
- Result in poor blood sample collection leading to inaccurate results from hemolysis, contamination, and inaccurate labeling
- Result in adverse events such as bruising, pain, hematoma, injury to nerves; a vasovagal attack (a disorder that causes a rapid drop in heart rate and blood pressure), can occur as a result of a phlebotomy.

Best practices in phlebotomy

- Proper planning
- Use of an appropriate location
- Quality control
- Standards for quality care for patients and health workers include:
  - Availability of appropriate supplies and protective equipment
  - Availability of post-exposure prophylaxis (PEP)
  - Avoidance of contaminated phlebotomy equipment
  - Appropriate training in phlebotomy
  - Cooperation of patients.
- Quality of laboratory sampling.

Practical guidance on best practices in phlebotomy

Provision of an appropriate location

- In an outpatient department/clinic, provide a dedicated phlebotomy cubicle containing:
  - A clean surface with two chairs (one for phlebotomist, one for patient)
  - A hand wash basin with soap, running water, and paper towels
  - Alcohol hand rub.
- In a blood-sampling room for an outpatient department or clinic, provide a comfortable reclining couch with an armrest. In inpatient areas and wards:
  - Close the bed curtain to offer privacy
  - Ensure that blood sampling is done in a private and clean area

Provision of clear instructions

Ensure that the indications for blood sampling are clearly defined, either in a written protocol or in documented instructions (e.g., in a laboratory form).

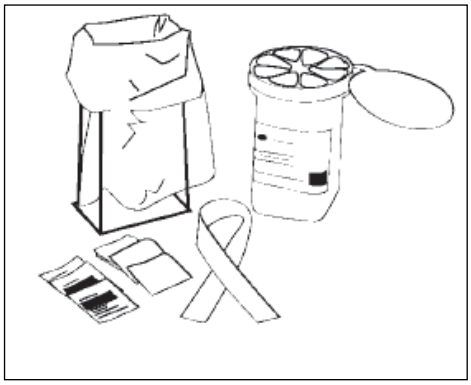
Procedure for drawing blood (eleven steps for drawing blood) follows:

Eleven steps for drawing blood

Step 1. Assemble equipment

- Sharps container
- Non-sterile disposable gloves
- Biohazard bag with stand
- Gauze pad
- Plastic holder
- 70 percent alcohol swabs
- Double-pointed needle
- Tourniquet
- Evacuated (vacuum) sample tubes
- Writing equipment
- Laboratory forms

Figure 5. Phlebotomy equipment



Source: *WHO Guidelines on Drawing Blood: Best Practices in Phlebotomy*, 2010

Step 2. Identify and prepare patient

- Check that laboratory form matches patient's name
- Check for adverse events in medical history
- Discuss test with patient
- Get patient's verbal consent.

Step 3. Select the site

- Select a visible, straight, clear vein of a good size in the antecubital fossa or forearm
- Apply tourniquet about 4-5 finger widths above site.

Step 4. Perform hand hygiene and put on gloves

Step 5. Disinfect the entry site

- Use 70 percent alcohol swab for 30 seconds
- Allow to dry 30 seconds—start from center and work downwards and outwards
- Do not touch cleaned site.

Step 6. Take blood

- Anchor vein
- Ask patient to form fist
- Enter vein at 30 degree angle or less
- Withdraw needle and apply gentle pressure to site with clean dry gauze
- Do not bend arm.

Step 7. Fill the laboratory sample tubes

- Place tube in rack before filling tube
- Inject extremely slowly into tube to reduce risk of hemolysis
- Remove the needle and **DO NOT** recap it
- Invert tubes the required number of times.

Step 8. Draw samples in the correct order to avoid cross-contamination of additives between tubes

Step 9. Clean contaminated surfaces and complete patient procedure

- Discard used needle/syringe or blood sampling device into a safety box
- Check label and forms for accuracy
- Discard used items into appropriate category of waste
- Perform hand hygiene again
- Check on patient.

Step 10. Prepare samples for transportation

Step 11. Clean up spills of blood or body fluids

Figure 6. What to remember when drawing blood

Do	Do NOT
DO carry out hand hygiene (use soap and water or alcohol rub). Wash carefully, including wrists and spaces between the fingers for at least 30 seconds (follow WHO "My 5 Moments for Hand Hygiene").	**DO NOT** forget to clean your hands.
DO use one pair of non-sterile gloves per procedure or patient.	**DO NOT** use the same pair of gloves for more than one patient. **DO NOT** wash gloves for reuse.
DO use a single-use device for blood sampling and drawing.	**DO NOT** use a syringe, needle, or lancet for more than one patient.
DO disinfect the skin at the venepuncture site	**DO NOT** touch the puncture site after disinfecting it
DO discard the used device (a needle and syringe is a single unit) immediately into a robust sharps container. Where recapping of a needle is unavoidable, **DO** use the one-hand scoop technique.	**DO NOT** leave an unprotected needle lying outside the sharps container **DO NOT** recap a needle using both hands.
DO seal sharps container with a tamper-proof lid.	**DO NOT** overfill or decant a sharps container.
DO place laboratory sample tubes in a sturdy rack before injecting into the rubber stopper.	**DO NOT** inject into a laboratory tube while holding it with the other hand.
DO immediately report any incident or accident linked to a needle or sharp injury and seek assistance; start post-exposure prevention (PEP) as soon as possible, following protocols.	**DO NOT** delay PEP after exposure to potentially contaminated material; beyond 72 hours, PEP is NOT effective.

Blood safety

Blood safety ensures that donated blood causes no harm—blood and blood products being used for transfusion should be screened prior to infusion for bloodborne virus and for other microorganisms if required. Blood transfusions are life-saving and are required daily in health facilities.

Blood bank and transfusion services

- Screening donors and ensuring that they have given informed consent
- Collecting blood from screened donors
- Testing for blood components, antibodies, and infectious diseases
- Storing and transporting blood
- Pre-transfusion testing of patient's blood
- Transfusing patients.

Transfusion-transmissible infections (TTI)

Infectious diseases that may be transmitted through blood transfusions include:

- Viruses—HBV, HCV, HIV, herpes
- Bacteria—*Treponema pallidum*, *Brucella melitensis*, *Salmonella spp*.

- Protozoa—*Plasmodium spp., Trypanosoma cruzi, Toxoplasma gondii*, and *Babesia microti*
- Rickettsia—includes *Rickettsia rickettsii*, *Coxiella burnetii*

Note: only HIV, HBV, HCV, and syphilis are tested for in Nigeria.

Preventing complications and TTIs

To prevent complications and TTIs in patients:

- Avoid unnecessary transfusions
- Screen donated blood for HIV, HBV, HCV, and syphilis
- Collect donor blood aseptically into a closed system to minimize contamination; follow all steps in processing the blood within closed system
- Store blood and blood products at correct temperature, ensure unit is within expiration date
- Ensure donor and patient blood compatibility (ABO, Rh, cross-matching)
- Verify all information matching blood with intended recipient
- Use aseptic techniques to establish peripheral IV line for giving transfusion
- Monitor patient's vital signs regularly and check for any adverse reactions
- Stop transfusion immediately in the event of adverse reactions.

Before blood donation

- Donor selected according to national guidelines
- Donor given pre-donation information and counseling
- Donor's informed written consent required
- Relevant history of the donor should be taken including history and high-risk behavior
- Prior mastectomy—blood should be taken from the arm opposite the site of surgery
- Current and recent medications or chronic infections
- Prolonged bleeding or a past diagnosis of bleeding disorders
- History of previous donations, ensure waiting period is respected
- Preliminary physical check-up of donor, including weight, blood pressure, signs of infection or scarring at potential sites
- Donor should be offered fluids to reduce risk of fainting after blood donation.

Laboratory services

Microbiology is key in prevention of infections associated with health—or hospital-acquired infections (HAI)—especially as new or antibiotic-resistant pathogens emerge, and new diagnostic technologies are developed. Laboratories should perform as follows:

- Laboratories should be able to diagnose most common infectious agents, especially those causing HAIs, and determine susceptibility to antibiotics for bacteria and fungi

- Laboratory staff may be exposed to viruses spread through blood and body fluids (HIV, HBV, HCV) and other pathogenic organisms
- Laboratory workers must take preventive measures.

Exposure risks for laboratory staff

Laboratory infections from pathogenic organisms occur by:

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

Requirements for safe laboratory practice

- Appropriate laboratory design (i.e., layout, furniture, and space)
- Adequate light, water, sewage, ventilation, and electrical facilities
- Proper waste disposal facilities
- Appropriate storage facilities
- Use of safety devices and biosafety cabinets
- Restricted access to laboratories.

General biosafety and IPC guidelines

- Wear new examination gloves when handling blood, body fluids, or specimens containing pathogenic microorganisms
- Eating, drinking, or smoking should not be permitted in laboratory
- No food storage in refrigerators used for clinical or research specimens
- No mouth pipetting permitted (aspiration of fluids by applying suction with mouth); use proper mechanical devices (e.g., suction bulbs)
- Do not open centrifuges while in motion
- Always cover end of blood collection tubes with cloth or paper towel, or point them away from anyone's face when opening
- Decontaminate work surfaces daily or when contaminated, such as after spills, with 0.5 percent chlorine solution
- Wear protective face shields or masks and goggles if splashes and sprays of blood, body fluids, or fluids containing infectious agents are possible
- Wear heavy-duty or utility gloves when cleaning laboratory glassware
- Use puncture-resistant, leak-proof containers for immediate disposal of all sharps
- Place infectious waste materials in plastic bags or containers
- Immunize against highly infectious agents such as HBV.

Group Work: Yakubu, the poorly trained phlebotomist

Hadiza and Abubakar are married with three children—a girl and two boys. From their interactions with members of the National Orientation Agency (NOA) and *Know Your Status* NGO, they want to contribute to the fight against HIV. As respected community leaders, they want to encourage community members to know their HIV status and also work against the stigma of AIDS. They went to Mambulu Clinic to explain why they came.

The doctors filled out the relevant forms, and included a full blood count and blood pregnancy test for Hadiza, as she appeared a little pale and had been complaining of being tired and having just missed her period; thus it was an opportunity to check her. The doctor then sent them to the HIV counseling and testing (HCT) unit. After the pre-testing counseling was done they were sent to the laboratory where they met a phlebotomist, Yakubu. He collected their forms, asked Hadiza to sit in the chair opposite his own, put on gloves and applied a tourniquet to Hadiza's left arm, about 3–4 fingerbreadths above the elbow. Yakubu then cleaned the venipuncture site with up and down strokes using an alcohol swab, threw the swab into an empty Lux carton on the table, uncapped a 21G, needle, then threw the cap into the Lux carton, assembled the vacuum collection device, and proceeded to draw blood from Hadiza's median cubital vein.

When the tube was filled, he inserted another tube and collected some more blood. He removed the needle before removing the tourniquet, gave Hadiza an alcohol swab (as he had forgotten to get dry ones out that morning) to place on the venipuncture site and asked her to fold her arm at the elbow. He then dismantled the vacuum tube holder and threw the needle into a safety box which the clinic has just procured from First Medical Sterile Products, Calabar. Abubakar then sat down as Hadiza got up. Yakubu connected another vacuum collection needle into the same holder and proceeded to carry out the same procedure as he had done for Hadiza. After he finished with Abubakar, he removed his gloves, checked the forms, and labeled the three tubes. However, what he did not realize was that he mislabeled the tubes.

When the doctor checked the results, he was shocked to discover that Abubakar was pregnant.

Discussion Questions

What was done right in this laboratory by Yakubu?

What was done wrong?

What should Yakubu have done to ensure safe phlebotomy?

Adverse events and medication safety

An adverse event is an incident that harms a person receiving health services that is caused by poor injection practices rather than the underlying condition of the patient.

Common adverse events

- Transmission of bloodborne infection (e.g., HBV, HCV, HIV)
- Injection abscesses
- Paralysis
- Trauma
- Shock
- Allergic reactions.

Causes of adverse events

Provider

When drug, diluent, injection equipment, or injection site is contaminated:

- Wrong dosage
- Error resulting in injection into the nerve
- Unsafe or unsterile equipment
- Use of wrong diluents
- Wrong drug administered
- Inadequate screening
- Injecting agitated patient who is not sitting still.

Program

- Poor quality control of drugs at manufacturer level

Client/Recipient

- Not observing contraindications

Prevention and management of adverse events

Prevention

- Take appropriate previous drug and medical history
- Proper reconstitution of drug
- Observe the proper protocol—the “rights” of injection safety
- Ensure adequate staff training.

Management

- Have emergency drugs on hand (e.g., post-exposure prophylaxis)
- Correct treatment *(see table below)*
- Logistics—adequate and appropriate supplies for treatment
- Supervision—monitoring of situation and feedback
- Communication—Public education on injection safety.

Figure 7. Management of adverse events

Categories	Management
Shock/anaphylaxis	Adrenaline, hydrocortisone—consider intravenous rehydration
Convulsions	Diazepam
Paralysis	Physiotherapy
Fever	Paracetamol
Abscess	Drainage and antibiotics
Local swelling	Observation, cold compression, aspirin
Skin rash	Observation, chlopheniramine
Sepsis	Antibiotics

Monitoring of adverse events

Every health facility should have a system of monitoring adverse events that includes the following practices:

- Identify, record, and report events
- Investigate event
- Manage the events
- Refer where necessary
- Follow-up of patient to ensure compliance with treatment
- Follow-up with injection provider to provide required training/supervision.

Medication safety

Medication use has become increasingly complex—medication error is a major cause of preventable patient harm.

Steps in medication use

- Prescription
- Transcription
- Administration
- Monitoring.

Types of errors

- **Prescription Errors:** Inadequate communication—illegible writing or simple misunderstanding verbal communication. Not considering individual patient factors such as allergies, pregnancy, comorbidities, or other medications
- **Transcription Errors:** Confusing drug names (look or sound alike), similar strengths, similar packaging
- **Administration Errors:** Drug given to wrong patient, by wrong route, at wrong time, in wrong dose, or wrong drug used. Not giving a prescribed drug
- **Monitoring Errors:** Duration of prescribed medication not completed, medication not ceased once course is complete or clearly not helping patient.

Best practices in safe medication

- Use generic drug names
- Medication history
- Tailor prescribing for each patient
- Know high-risk medications and take precautions
- Know the medication you prescribe well
- Use memory aids—looking things up if unsure is a marker of safe practice, not incompetence!
- Encourage patients to be actively involved
- Develop checking habits
- Remember the 5 Rs: Right **drug**, Right **dose**, Right **route**, Right **time**, Right **patient**.

PREVENTION AND MANAGEMENT OF EXPOSURES

An **exposure** incident is the contact of eye, mouth, or other mucous membrane, non-intact skin, or parenteral with blood or other potentially infectious materials. Types of exposure include:

- **Parenteral contact**: Piercing mucous membranes or the skin barrier through such events as needlesticks, human bites, cuts, and abrasions
- **Non-intact skin**: Dermatitis, abrasions, wounds, cuts, hangnails, chafing, and chapped skin
- **Direct injection of infectious blood** may occur in less apparent ways—a preexisting lesion on hand from injury that occurred at workplace or home or from dermatitis may provide a route of entry for bloodborne pathogens
- **Transfer of contaminated blood** via objects or environmental surfaces can also cause infection. The importance of training, personal protective equipment (PPE), and other work practice controls to help prevent exposure should not be underestimated
- **Sharps injury**: Injury caused by puncture of the skin by a sharp object/instrument including an injection needle
- **Needlestick injury:** A type of sharps injury involving unintended puncture of the skin caused by an injection needle.

Practical ways of preventing exposure

Control measures are actions taken to prevent the introduction and transmission of bloodborne pathogens in the workplace. Methods to help reduce risk of exposure include:

- Elimination of hazards
- Universal precautions
- Administrative and engineering controls
- Work practice controls
- Personal protective equipment (PPE).

Elimination of hazards

Completely remove a hazard from the work area whenever possible (the most effective control method) by:

- Eliminating all unnecessary injections
- Removing sharps and needles when possible (using needleless intravenous systems)
- Eliminating unnecessary sharps such as towel clips.

Universal precautions

See previous chapter on Universal Precautions.

Administrative controls

- Policies, such as SOPs, that aim to limit exposure to hazard
- Allocation of resources demonstrating a commitment to health worker safety
- Needle stick injury prevention committee (infection prevention and control, or IPCC)
- Exposure control plan
- Removal of all unsafe devices
- Consistent training on the use of safe devices.

Engineering controls

If there is an engineering control available that will reduce employee exposure either by removing, eliminating, or isolating the hazard, it should be used.

Engineering controls include: sharps disposal containers, self-sheathing needles, needle-less systems, plastic (instead of glass) capillary tubes, and other controls that isolate or remove the bloodborne pathogen hazard from the workplace.

Work practice controls

Alter how you conduct a task to minimize the risk of exposure. Controls to change the behavior of workers, and reduce exposure include:

- Emptying trash by holding the liner
- Using a dustpan and brush to pick up broken glass or other sharp material
- Using a "no hands" procedure in handling contaminated sharps
- Taking waste out immediately after cleanup.

Personal protective equipment

PPE is considered a last resort because the hazard has not been removed and therefore the health worker is still exposed. PPE will only act as a barrier between the worker and the hazard, but it will not reduce or eliminate it—like an engineering control would. PPE procedures are as follows:

Removing contaminated gloves

This procedure takes practice. First practice this procedure using a clean pair of gloves until you can perform the procedure without touching the outer surface of the glove with your unprotected skin.

1. Use your dominant (i.e., right- or left-handed)—and still gloved—hand to remove the contaminated gloves by gripping the outside of the other glove near the wrist or cuff
2. Pull the glove down over the hand, turning the glove inside out
3. Hold the removed glove in the palm of your gloved hand
4. Now with your ungloved hand, tuck two fingers inside the cuff of your other glove
5. Pull the glove down over your hand, turning the glove inside out and over the other glove
6. With the glove inside out, dispose of the gloves in an appropriate biohazard waste container—never reuse gloves.
7. Wash your hands immediately, and before touching anything.

Prevention of exposures

This is usually the safest and the cheapest form of management. Procedures are as follows:

- Blood and other potentially infectious materials (OPIM), including sharps, are handled with care
- Avoid eating and drinking where exposure could occur in order to prevent indirect exposure
- Use mechanical means—brush and dustpan, pliers, or tongs—to pick up broken glassware or other sharps that may be contaminated—do not pick them up directly with your hands
- **DO NOT** recap or manipulate (bend, break, shear) used needles.

Cleaning blood and other potentially infectious materials in the work place

Since some blood borne pathogens can survive for at least one week dried at room temperature on work surfaces, disinfecting and sterilization techniques must be adequate to prevent the spread of these viruses. Any sterilization or disinfecting procedure or sterilizing agent or high-level disinfectant will kill the virus if used as directed. Disinfectants should be used as follows:

- First and foremost, make sure you put on appropriate PPE
- Make a **fresh** (no older than 24 hours) bleach solution
- Lay down absorbent material over spill area
- Apply disinfectant cleaner (i.e., bleach solution) to the absorbent material (careful to avoid splashing) and let it set. Allow the disinfectant to remain in contact with the spill area for the time period indicated on the label. If a bleach/water mixture is used, it should be allowed to remain in contact for 20 minutes
- Gently pick up material and place into a biohazard disposal bag
- Clean spill area with disinfectant cleaner (fresh bleach solution or a tuberculocidal)
- Place waste in proper containers
- Disinfect or properly dispose of all PPE
- Wash your hands.

Populations at risk for needlestick injuries

- Nurses
- Physicians
- Medical laboratory technologists
- Housekeeping staff
- Laundry workers
- Waste collection personnel
- Patients/clients
- General community

Post-exposure prophylaxis (PEP)

PEP is an intervention—such as vaccination, immunotherapy, or chemotherapy—to mediate the risk of acquiring a new infection caused by a bloodborne pathogen following an exposure.

PEP is not always effective; it does not guarantee that someone exposed to HIV will not become infected with HIV. If started soon after exposure, PEP can reduce the risk of HIV infection by over 80 percent. Adherence to full 28-day course is critical to effectiveness.

Short-term antiretroviral treatment (ART) to reduce the likelihood of HIV infection after potential exposure should be started as soon as possible—within 72 hours post-exposure. Two to three drugs are usually prescribed and must be taken for 28 days.

Management of exposures and injuries (first-aid care)

Intact skin

Wash with soap and water.

Cut or non-intact skin

Wash with chlorhexidine soap and water or wash with any soap and water, then pour 3 percent hydrogen peroxide over exposed area.

Mouth

Spit. Rinse mouth with 3 percent hydrogen peroxide or copious water.

Eyes

Remove contact lenses (if any). Rinse eyes with tap water or saline.

All blood exposures must be reported immediately to supervisor

Management of needlestick injuries

- Providing post-exposure prophylaxis (PEP)
- Monitoring and reporting of injuries through injury register
- Evaluating injuries
- Conducting follow-up

If you sustain a needlestick injury, do the following:

1. Allow the wound to bleed freely
2. Wash with soap and running water
3. Alert your supervisor
4. Identify source patient
5. Immediately report to designated person/facility
6. Document the incident
7. Get pre- and post-test counseling
8. Get post-exposure prophylaxis (PEP) within 72 hours (preferably within 2 hours if possible)
9. Evaluate injuries
    - Immediately
    - After six weeks
    - At three months
    - At six months
10. Conduct follow-up on a six-monthly basis.

Group discussion: Ekaete, the diligent laundry worker

Ekaete is a young woman working in the Naija Hospital laundry for the past 12 years. She is married with two children both in primary school. The husband works as a gardener at the Sheraton Hotel. They just moved to the city from the village so that they could find jobs and fend for their children.

She is a very diligent worker—always punctual and willing to do extra work whenever the need arises. On this fateful day just after 5:00 P.M. when she is about to change to go home, a laundry bag from the medical ward was brought into the laundry. The supervisor asked Ekaete to help sort the laundry before putting it in the washing machine as the wards were running out of clean linen.

Unfortunately, a nurse had left a syringe and needle used for injecting a terminally ill AIDS patient among the sheets to be sorted. While sorting the linen, Ekaete was pricked by this needle.

She continued and finished sorting the linen then took the syringe and needle to her supervisor. The supervisor advised her to wash her fingers and gave her a note to see a doctor immediately.

Ekaete went to the outpatient department where the queue for the doctor was very long. Since she was in a hurry to get home and cook for her family, she just ignored the injury and rushed home.

Ten years later, during a program for HIV counseling and testing (HCT), Ekaete decided to get tested and she tested positive for HIV.

Discussion Questions

What did Ekaete do right?

What was done wrong?

Describe the PEP she would have initiated within two hours after the needlestick.

LOGISTICS FOR IPC AND HCWM COMMODITIES

Good logistics ensure the continued availability of supplies and equipment, thus meeting customers' needs, a positive effect for a program or service. As part of the WHO/SIGN three-prong approach to injection safety, a full supply of commodities for injection safety and health care waste management (HCWM) must be available at all service delivery points.

Six rights of logistics

A good logistics system ensures the following six rights of logistics are achieved:

1. Right Goods

- Based on quantification
- Based on what really suits the customers

2. Right Quantity

- Enough to serve the customers

3. Right Condition

- The right quality
- Stored according to specifications

4. Right Place

- Accessible to the client at the facility when needed

5. Right Time

- Available when needed

6. Right Cost

- Affordable by both client and program

7. *Plus—the Right Customer*

- Given to the appropriate client

Management of IPC and HCWM commodities

As managers in our various workplaces we should be able to manage the stock of commodities in our work place. We should know how much of each type of syringe (1mL, 2mL, 5mL, etc.) is consumed by our units over a specified period of time and also the quantity of color-coded bin liners (black, yellow, and red) that are needed based on waste generation. We should know how long a given quantity of commodity would last so that we could make informed decisions for requisition from the stores or pharmacy.

To manage stock effectively managers need to be conversant with the following:

- Average monthly consumption rate
- Months a given quantity of a commodity will last
- Minimum and maximum stock level
- Amount of commodity to order.

Average monthly consumption rate (AMCR)

This is the average number of each commodity that is dispensed to clients (patients) in a given month. If a unit weekly consumes 100 pieces of 2mL syringes, that equals 400 pieces per month. Consider the figure below which shows the quantities of 2mL syringe consumed in a pediatric ward of a hospital:

Figure 8. Quantities of 2mL syringe consumed in pediatric ward, January–March

Month	Amount Consumed
January 1–31	120 pieces
February 1–28	80 pieces
March 1–31	100 pieces

From the table above we calculate the average monthly consumption rate (AMCR) of 2mL syringe for this ward is calculated as follows:

$$\text{AMCR} = 120 + 80 + 100/3 \text{ months} = 300/3 = 100 \text{ pieces}$$

Months of supply (MOS)

This is the actual quantity of commodity that is expected to last your unit over a given period of time—usually expressed in months.

From the above AMCR calculation we already know how much 2mL syringe is consumed on the average by the pediatric ward. Assuming the pharmacy department decided to send 400 pieces of 2mL syringes to the pediatric ward, it means that this quantity of syringes will last for four months since on average the ward consumes 100 pieces per month.

MOS = Quantity of Stock at Hand / Average Monthly Consumption Rate

Months of Supply for this quantity will be **4 months** = 400 / 100

Minimum and maximum stock level

Minimum stock level is the level of stock of a commodity a store/warehouse should not fall below under normal circumstances.

Maximum stock level is the level of stock of a commodity a store/warehouse should not rise above under normal circumstances.

From the above example, the pharmacy may decide to supply the pediatric unit for three months, which means that a supply of 300 pieces of 2mL syringe is involved. If the pharmacy unit now decides to supply 100 pieces it means it will last the unit 1 month.

Therefore, the **maximum stock level** that will last 3 months is 300 pieces of 2mL syringe and the **minimum stock level** for this unit is 100 pieces (one month supply).

Amount of commodity to order

If your unit is expected to stock commodities for three months it means that the maximum stock level is 300 pieces of 2mL syringes. It is expected that midway from the initial time you receive this supply you are expected to order quantities that will make up for another three months.

Consider the following example:

Your pharmacy has just supplied you 300 pieces of 2mL syringe, expected to last three months based on average monthly consumption. Assume you received the supplies on January 2 and by February 14 you discover that the unit consumed 180 pieces of this commodity. What is the amount of this 2mL syringe you are expected to reorder to make up your maximum stock level?

Solution

First you need to consider the following

- It is expected that midway after collection of these commodities you should reorder to make up your maximum stock level.
- Since the supply is for three months and, from the above example, we were supplied on January 2. By February 14, we are halfway through the three-month supply.
- Our maximum stock level is 300 pieces and, from the example, we consumed 180 pieces, and there are 120 pieces left.
- Thus, the amount of commodity to reorder = 300–120= 180 pieces.

Bundling

The term bundling in the context of injection safety is the process of matching the quantities of syringes ordered with an equal number of safety boxes to be used for disposal. Matching high-quality injectables with appropriate diluents where applicable is also considered bundling. When requesting injection safety commodities you should bundle the supply with the appropriate number of safety boxes and the appropriate amount of diluents.

As a policy we dispose of **80 syringes in one safety box**. Therefore, if you are supplied with the 300 pieces of 2mL syringes and 500 pieces of 5mL syringes, the number of safety boxes to order bundled with the total number of syringes = 300+500 = 800; then divide by 80 = 10. This means that bundling the syringes with the safety boxes would require an order of 10 safety boxes.

For further reading on logistics, see the Logistics Handbook: A Practical Guide for the Supply Chain Management of Health Commodities, published by the USAID | DELIVER PROJECT: http://deliver.jsi.com/dlvr_content/resources/allpubs/guidelines/LogiHand.pdf

HEALTH CARE WASTE MANAGEMENT

Health care waste, according to the World Health Organization, is the total waste stream from a health care or research facility—including both potential risk and non-risk waste materials.

WHO core principles on HCWM

- Safe and sustainable management of health care waste is a public health imperative and a responsibility of all.
- Improper management of health care waste poses a significant risk to patients, health care workers, the community, and the environment.
- Right investment of resources and commitment will result in a substantive reduction of the disease burden and corresponding savings in health expenditures.

International principles of waste management

Widely recognized international principles for the effective management of waste are as follows:

- ***Polluter pays principle:*** All waste producers are legally and financially responsible for:
  - Safe handling of waste
  - Environmentally sound disposal of waste
  - Creating an incentive to produce less waste.
- ***Precautionary principle:*** Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing cost-effective measures to prevent environmental degradation (Rio Declaration 1992, [UNCED 1992]). If the hazard is unknown, presume the worst.
- ***Duty of care principle:*** Stipulates that any person handling or managing hazardous substances or related equipment is ethically responsible for applying the utmost care.
- ***Proximity principle***: Recommends that treatment and disposal of hazardous waste take place as near as possible to the point of production, thus it is technically and environmentally possible to minimize risks involved in transportation.
- ***Prior informed consent principle:*** Requires that affected communities and other stakeholders be aware of the hazards and risks involved in the transport of wastes and the siting and operation of waste treatment and disposal facilities.

Nigeria HCWM laws

- Injection Safety and Health Care Waste Management Policy (2007)
- National Health Care Waste Management Policy (2013)
- National Health Care Waste Management Guidelines (2013)
- NESREA Gazette (National Environmental Standards and Regulations Enforcement Agency)
- National Infection Prevention and Control Policy (2013)

HCWM at the health facility

Proper management of health care waste depends largely on good administration, organization, and trained and informed staff—as well as legislation and financing for these programs.

- Management of waste must be consistent from point of generation (cradle) to point of final disposal (grave).
- A well-drafted, thoroughly shared, well-coordinated, and rigorously implemented waste management plan is needed for every hospital, involving every staff member, and drawn up under authorization of the IPCC.

Components of health facility HCWM plans

- Facility name
- Staff responsible for overall supervision of HCWM
- Supervision structure organogram
- Goals and objectives of plan
- Staff responsible for performing waste disposal for each area (indicate name and area covered)
- Current HCWM status at facility and HCWM practices used
- Outline of ideal practices—establishing standards
- List improvements needed
- Monitoring schedule
- Date for introduction of plan.

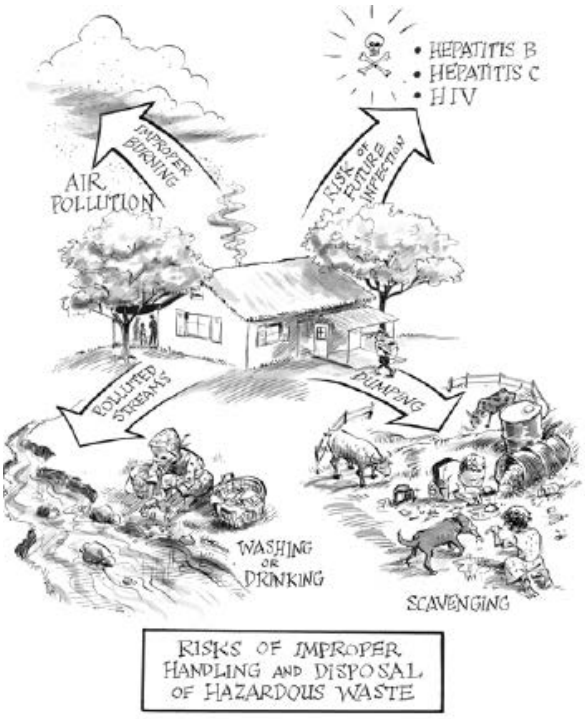
Benefits of proper health care waste disposal

- Minimizes the spread of infections and reduces the risk of accidental injury to staff, patients, visitors, and the community
- Reduces the likelihood of contamination of the soil or ground water with chemicals or microorganisms
- Attracts fewer insects and rodents and does not attract animals
- Reduces odors
- Helps provide an aesthetically pleasing atmosphere.

Risks and hazards of health care waste

- Needlestick injuries
- Transmission of infections or disease (e.g., cholera, dysentery, hepatitis, HIV)
- Reuse of some types of wastes, (e.g., syringes and needles—accidental or intentional)
- Environmental pollution or degradation (e.g., air, water, soil)
- Exposure to radiation
- Public nuisances (offensive smells, unsightly debris)
- Fires

Figure 9. Risks of improper handling and disposal of hazardous waste



Source: USAID | DELIVER PROJECT

Classification of health care waste

- Approximately **75–90 percent** of waste from health facilities is general waste (low-risk waste), and not harmful.
- Approximately **10–25 percent** of health care waste can be hazardous (dangerous), and thus is referred to as "risk waste."
- Approximately **1 percent** of risk waste is sharps waste.

Figure 10. Categories of waste

Categories	Types of Waste
Risk waste	***Infectious Waste:*** Blood and blood products and other body fluids; items contaminated with blood, serum, or plasma; cultures and stocks of infectious agents from diagnostic and research laboratories and items contaminated with such agents; isolation wastes from highly infectious patients (including food residues); discarded live and attenuated vaccines; waste, bedding, bandages, surgical dressings, and other contaminated material infected with human pathogens. ***Anatomical Waste:*** Human tissues, body parts, fetus, placenta, and other similar wastes from surgeries, biopsies, autopsies; animal carcasses, organs, and tissues infected with human pathogens. ***Sharps Waste (used or unused):*** Needles, syringes, scalpel blades, suture needles, razors, infusion sets, contaminated broken glass, specimen tubes, and other similar material. ***Chemical Waste:*** Solid, liquid, or gaseous chemicals such as solvents, reagents, film developer, ethylene oxide, and other chemicals that may be toxic, corrosive, flammable, explosive, or carcinogenic. The types of hazardous chemicals used most commonly in the maintenance of health facilities and most likely to be found in waste include formaldehyde, photographic chemicals, solvents, organic chemicals, and inorganic chemicals. ***Pharmaceutical Waste:*** Outdated medications of all kinds, as well as residuals of drugs used in chemotherapy that may be cytotoxic, genotoxic, mutagenic, teratogenic, or carcinogenic. Items contaminated by or containing pharmaceutical bottles or boxes. ***Radioactive Waste:*** Any solid, liquid, or pathological waste contaminated with radioactive isotopes of any kind. ***Genotoxic Waste:*** Highly hazardous and may have mutagenic or carcinogenic properties—genotoxic waste may include certain cystostatic drugs, vomit, urine, or feces from patients treated with cytotoxic drugs, chemicals, or radioactive material. ***Pressurized Containers*:** Cylinders containing gases or aerosols, which could explode if accidentally punctured or incinerated. ***Waste with High Contents of Heavy Metals*:** Batteries, broken thermometers, blood pressure gauges, or other measuring devices using heavy metals.
Low-risk waste	***Communal/General Waste:*** All solid waste that does not contain high-risk waste types (e.g., infectious, chemical, or radioactive). Communal wastes from medical treatment or research centers include uncontaminated wastes such as bottles, office paper, boxes, and packaging materials.

Figure 11. Eight steps in waste management

1.	Waste minimization
2.	Generation
3.	Segregation
4.	Handling and storage
5.	Internal collection and transportation
6.	Central storage and weighing
7.	Offsite collection and transportation
8.	Treatment and disposal

Minimization

Waste minimization is the best way to reduce health care waste quantities, costs, and environmental impact on the atmosphere (air pollution) and landfill capacity. Effective minimization requires that all purchases of materials and supplies be made with waste reduction in mind.

Segregation

Segregation is separating waste by type at the place where it is generated. Waste should be separated by the persons generating the waste immediately according to its type and sorted items placed in a bin with an appropriate colored bin liner or a sharps container. Waste handlers should never sort through waste after it has been placed in the bin. One of the useful aspects of segregation is that some items can be reprocessed and recycled into other plastic products.

Segregation of sharps

All sharps should be disposed of immediately after use. Used syringes and needles should be placed into a sharps container. Syringes with needle attached are placed into a safety box or other approved sharps container (an ideal sharps container is puncture-resistant, liquid-proof, and has an opening that is small enough that a hand cannot fit into it). Needles must never be recapped.

Safety box

Safety boxes are puncture-resistant, liquid-proof boxes produced for the receipt and disposal of sharps including syringes and needles.

How to use a safety box

- A safety box must be placed at each injection station and within easy reach of the injection provider (arm length)

- Follow the assembling instructions on the side of the box, if assembly is required
- Do not recap needles
- Place used syringe and needle in the safety box immediately after injection is given
- Fill the box to ¾ then close
- Mark and seal the box and remove from injection room to secure storage area or disposal site immediately to prevent or minimize the risks of injuries to health care workers
- Do not empty or reuse safety boxes.

Figure 12. Sharps safety box

(Source: USAID | DELIVER PROJECT)

What goes into a safety box?

- Syringes with needles
- Scalpels
- Blades
- Broken glass (e.g., pipettes, ampoules, vials)

Do not put other waste in the safety box. Infusion sets should be disposed of in an infectious waste bin.

Waste bin

All other waste should be placed in a waste bin with the appropriate color-coded bin liner, according to its risk level.

Characteristics of an ideal waste bin

- A well-fitting lid
- Leak-proof
- Made of noncorrosive material (e.g., plastic)
- Washable
- Portable (e.g. have handles)
- Lined with color-coded plastic bags
- Placed at convenient locations for use
- NOT used for any other purpose in the health care facility
- Decontaminated, cleaned, and disinfected after each use.

Color-Coding

Waste bins should be lined with appropriately colored plastic bin liners. It is very important that both providers and waste handlers understand the color-coding system and handle waste accordingly.

Figure 13.Color-coding for waste segregation

Category	Examples	Bin Liner	
Non-infectious	Paper, packaging materials, plastic bottles, food, cartons	**BLACK**	
Infectious	Gloves, dressings, blood, body fluids, used specimen containers	**YELLOW**	
Highly infectious	Anatomical waste, pathology waste	**RED**	
Chemical	Formaldehyde, batteries, photographic chemicals, solvents, organic chemicals, inorganic chemicals	**BROWN**	
Radioactive	Any solid, liquid, or pathological waste contaminated with radioactive isotopes of any kind.	**YELLOW** with radioactive label	

If different colored bin liner bags are not available, a bio-hazard label may be placed on black bags to indicate their hazardous content.

Figure 14. Radioactive and biohazard symbols

Radioactive Symbol **Biohazard Symbol**

Handling and storage

Handling and storage refers to steps taken to manage waste during containment and storage while waiting for collection or transportation to a treatment plant or disposal site. Safe handling and storage of health care waste will protect the health worker, waste handlers, clients, and the community from transmission of infection. **For proper storage:**

- Needles and syringes are placed into a safety box which must be ¾ full, then sealed.
- Infectious waste is placed into a yellow/red lined bin which must be ¾ full, then tied.
- Non-infectious waste is placed into a black lined bin which must be ¾ full, then tied.

Filled safety boxes must be stored:

- With their lids closed
- In a dry location
- In a secure location, away from medical supplies and out of reach
- No more than one week, or according to facility guidelines.

Safe handling of bin liners and safety boxes

- Seal safety box when it is two-thirds full and replace with a new safety box immediately
- Store full and sealed safety boxes in a protected area, out of reach of all except those concerned with handling them
- Use heavy gloves when handling infectious waste. Filled bags should be picked up by the neck only—they should be put down in such a way that they can again be picked up by the neck for further handling
- To avoid puncture or other damage, waste bags should not be thrown or dropped
- Use protective eyewear: such as face masks, eye shields, goggles, visors
- When necessary, use protective shoes or boots.

Proper storage of waste

- Waste must be disposed of as soon as possible.
- If stored, keep away from reach of children, animals, and the general public.

Collection and transport

Collection and transport refers to an organized system for removing waste from the point of generation or temporary storage to a treatment or disposal site. Waste may be transported within the health facility (on-site) or to an off-site treatment plant and disposal site.

On-site transport

This refers to moving waste from one point to another **within** the health care facility. During on-site transport:

- Waste should be moved in a designated trolley or wheeled barrel.
- The trolley or wheelie bin should be easy to clean, load, and unload, with a leak-proof body and no sharp edges. It should not be used for anything other than waste transportation.
- The waste transportation route within the facility should be clearly highlighted.

Off-site transport

Transportation of HCW to an **off-site** treatment facility should be done if there is no on-site disposal of waste. Proper transportation equipment is required (e.g., protected transport means and receptacles) if off-site transportation is necessary.

- Managers of health care facilities should identify opportunities for proper HCW disposal, including availability of incinerators, health care waste pits, and placenta pits.
- When waste is stored for transport outside the health facility, containers and safety boxes must be kept upright, secure, dry (i.e., protected against rain), and out of direct contact with other supplies.
- The person responsible for waste disposal must be aware of the schedule for pick-up and delivery of waste.
- It is preferable that the vehicle should be designated for waste transport only. It is also preferable to have a covered vehicle.
- During transportation, waste should be secure, so that it does not litter streets and highways. The vehicle must be cleaned and sanitized at the end of each day.

Treatment

Waste **treatment** is the rendering of infectious or hazardous HCW safe for handling and final disposal. Some of the methods used include autoclaves, incinerators, microwaves, and chemical disinfection. Non-infectious waste does not need to be treated and can be disposed of with general domestic waste.

Incineration

Incineration is high-temperature burning to reduce the volume of the waste and eliminate pathogens (see Figure 3). Large-scale incinerators that can reach very high temperatures (800–1000^{0}C) are preferred to small-scale, lower-temperature incinerators such as waste disposal units. Incineration produces fewer pollutants than open-air burning and is preferable, if a good quality incinerator with a well-trained operator is available.

Figure 15. Examples of an incinerator and a waste disposal unit

For an incinerator to be used properly, it must have the following:

- Clear operation procedures posted near the incinerator
- Trained operators
- Reliable segregation system to ensure that only infectious and non-polluting materials are incinerated
- Reliable transport system to get waste to the incinerator
- Ash pit to safely dump the incineration ash
- Regular maintenance and repairs
- Adequate supply of fuel.

Waste that should *not* be incinerated:

- Polyvinyl chloride (PVC) plastics such as blood bags and intravenous (IV) lines
- Syringes made of PVC plastics
- Mercury thermometers (must be landfilled only)
- Batteries
- X-rays or photographic materials
- Aerosol cans or gas containers
- Glass vials (they can explode or melt, blocking the incinerator grate).

Disposal

Disposal is the final discharge of waste and residues or by-products from the treatment of waste. It entails releasing treated health care waste into the air, soil, or water. Incineration is not a disposal method, because the ash residue must be disposed of either in a protected ash pit or municipal landfill. Some of the common methods of disposal are:

- Municipal landfill: This is a designated site for controlled disposal of municipal waste to minimize pollution to ground water, land, and air.
- Burial in protected pits: This can include infectious waste pits, placenta pits, ash pits.

When building and using a waste burial pit:

- Choose an appropriate site that is at least 50 meters away from any water source to prevent contamination of the water source.
- Choose a site with proper drainage, located downhill from any wells, free of standing water, and in an area that does not flood—the site should not be located on land that will be used for agriculture or development.

- Keep waste covered—every time waste is added to the pit, cover it with a 10- to 30-cm layer of soil.
- When the level of waste reaches to within 30 to 50 cm of the surface of the ground, fill the pit with soil and dig another pit.
- Ensure that the area where the pit is located is fenced off (see Figure 16).

Figure 16. Secured burial pit

(Source: USAID | DELIVER PROJECT)

Dangers of open burning on ground or pit

Burning waste in an open pit or on the ground is a form of low-temperature burning and leads to:

- Release of dioxins and furans, which cause cancer
- Release of noxious fumes into the environment
- Incomplete burning of waste
- Leaching of infectious waste into ground water (contaminating the ground water).

Figure 17. Minimum package for HCWM

Observations	Minimum Requirements
Waste segregation	Safety boxes (for sharps)
Storage	Lockable room—not accessible to unauthorized personnel—for storing filled safety boxes prior to treatment/transportation
Treatment (One of the following)	• Double-chamber incinerator (above 800°C) • Emptying waste in a protected pit (with or without burial)* • Use of autoclave (with or without use of a shredder) • New technology that becomes an internationally accepted standard • Secure confinement until transportation off-site to a facility for final disposal
Disposal	Ash pits (if final disposal is on-site) using a high-temperature incinerator

** Protected pit refers to a well-dug pit lined with concrete at the sides and base with a cover preventing rain or groundwater from entering. The area may be fenced in to keep unauthorized persons from accessing the pit.*

Key messages for the health care provider

- **Minimize the handling of used injection equipment—this is key to preventing injuries**
- **Put used syringes and needles directly and immediately into safety boxes**
- **Do not remove contaminated needles from syringes or from the waste bin**
- **Do not walk around carrying used syringes and needles**
- **Always use appropriate waste bins and color-coded liners**
- **Do not recap needles.**

Quiz: How to segregate waste correctly

Put a tick in the box to show the type of waste for segregation.

Types of Waste				
	Infectious waste	**Infectious anatomical waste**	**Sharps waste**	**General waste**
Surgical/latex gloves				
Razor blades				
Leftover food				
Blood stained masks				
Surgical blades				
Soiled gauze				
Suturing needles				
Spatulas				
Suction tubes				
Syringe packaging				
Newspaper				
Soiled nappies				
Amputated legs				
Placenta				
Soiled sanitary towels				
Flowers				
Intravenous bag				
Left over sutures (thread) after surgery				
Vomitus				
Soda/drink can				

	Infectious waste	Infectious anatomical waste	Sharps waste	General waste
Glass slides from laboratory				
IV cannula				
Foley catheters				
Blood bags				
Broken glass vials				
Ampoules				
Urine from infected patient				
Dusting cloth				
Food packaging				
Used sample bottle				
Unviable fetus				
Plasma				
Kitchen greens/food peelings				
Soiled swabs				

ANTIMICROBIAL STEWARDSHIP

Antimicrobial stewardship promotes the optimal selection, dosing, and duration of therapy for antimicrobial agents throughout the course of their use.

Antimicrobial drugs are the only drugs that do not directly affect the patient but instead affect the growth and ecology of invading pathogens and commensal microorganisms. Antimicrobial therapy is based on both the characteristics of a patient and a drug, and the microorganisms causing the infection and the colonizing flora.

Antimicrobial drugs have played an important role in the dramatic decrease in mortality and morbidity due to infectious diseases. While the absolute number of antibiotic (antimicrobial) drugs is large, there are few unique antibiotics. What you should know about antimicrobial drugs:

- 30–50 percent of antimicrobial use in hospitals is unnecessary or inappropriate
- Antimicrobial misuse contributes to the growing problems of *Clostridium difficile* (bacterium that causes diarrhea and more serious intestinal symptoms) infection and antibiotic resistance in health care facilities
- Improving appropriate antimicrobial use is a medication-safety and patient-safety issue
- Antimicrobial resistance is a growing public health problem in the world today.

Untoward effects of antimicrobials

- Antibiotic resistance
- Adverse drug events (ADEs)
- Hypersensitivity/allergy
- Drug side effects
- *Clostridium difficile* infection
- Antibiotic-associated diarrhea/colitis
- Increased health care costs

Purpose of antimicrobial stewardship

- Limit inappropriate and excessive antimicrobial use
- Improve and optimize therapy and clinical outcomes for the individual infected patient
- Pertinent to inpatient, outpatient, and long-term care settings
- Practiced at the level of the patient, health facility or system, or network
- Should be a core function of the medical staff (i.e., doctors and other health care providers)
- Utilizes the expertise and experience of clinical pharmacists, microbiologists, infection control practitioners, and information technologists.

Goals of antimicrobial stewardship

- Reduce antibiotic consumption and inappropriate use
- Reduce *Clostridium difficile* infections
- Improve patient outcomes
- Increase adherence/utilization of treatment guidelines
- Reduce adverse drug events
- Decrease or limit antibiotic resistance.

Common antimicrobial resistant organisms

- MRSA—Methicillin/oxacillin-resistant *Staphylococcus aureus*
- PRSP— Penicillin-resistant *Streptococcus pneumoniae*
- MDR-TB—Multidrug-resistant tuberculosis
- MDRSP— Multidrug-resistant *Staphylococcus pneumoniae*
- VRSA— Vancomycin-resistant *Staphylococcus aureus*

RESPIRATORY INFECTIONS AND TUBERCULOSIS

When is tuberculosis infectious?

TB can be infectious when it occurs in the lungs or larynx. In general, a person with pulmonary or laryngeal TB should be considered infectious until the person:

- Has had three consecutive negative sputum smears on two different days
- Has completed at least two weeks of anti-TB therapy, preferably with directly observed treatment, short-course (DOTS), administered by a TB treatment supervisor, and has improvement in symptoms.

Note: Someone suspected of being infected with TB should be assumed infectious until a diagnostic evaluation is completed and laboratory results confirm/deny infection.

TB transmission in health care settings

- People who have TB in their lungs or larynx (throat) can release tiny particles containing *Mycobacterium tuberculosis* (*M. tuberculosis*) into the air by coughing, talking, singing, or sneezing.
- These particles are called droplet nuclei—invisible to the naked eye—about one-millionth of a meter long; they can remain airborne in ambient air for many hours until they are removed by natural or mechanical ventilation.
- For TB to spread, there must be a source (e.g., person with TB) and others to inhale droplet nuclei containing M. tuberculosis.
- Anyone who shares air with a person with pulmonary or laryngeal TB in an infectious stage is at risk. When another person inhales one or more of the droplet nuclei, he or she can develop a TB infection.

Transmission factors

- Infectiousness of a patient
- Environmental conditions
- Duration of exposure

Note: Most exposed persons do not become infected.

Reduction of TB transmission in health facilities

Facility-level IPC Plan

The plan should include the following:

- Identification of risk areas
- Assessment of TB among health workers (where feasible)
- Assessment of HIV prevalence in the patient population (where feasible)
- Assessment of health worker training needs
- Area-specific IPC recommendations
- Timeline and budget (e.g., material and personnel costs)
- Essential that one individual (IPC officer) be assigned responsibility and accorded authority to monitor the implementation of IPC plan.

Facility-level administrative prevention

- Promptly identify people with TB symptoms (triage)
- Separate infectious patients
- Control spread of pathogens (cough protocol and respiratory hygiene)
- Provide package of prevention and care interventions for health workers, including HIV prevention, antiretroviral therapy (ART), and isoniazid preventive therapy for HIV-positive health workers

Facility-level environmental prevention

- Maximize natural ventilation and control the direction of air flow to reduce the concentration of droplet nuclei in air
- Controlled natural ventilation (e.g., opening windows and use of fans to control the direction of air flow) can be used to reduce the risk of spreading M. tuberculosis in resource-poor settings
- Ventilation systems
- Ultraviolet germicidal irradiation fixtures when adequate ventilation cannot be achieved
- PPE (including face masks and gloves)
- Tissues and no-touch waste receptacles for disposing of used tissues
- Use particulate respirators
- Hand hygiene including provision of alcohol-based hand rub dispensers.

Facility-level airborne precautions

- Should be initiated for any patient who has symptoms/signs of TB or who has documented infectious TB and has not completed anti-TB treatment

- May be discontinued for patients placed in separate rooms because of suspected infectious TB when infectious TB disease is considered unlikely, and when either:
  - Another diagnosis is made that explains clinical syndrome, or
  - Patient has three consecutive, negative acid-fast bacillus sputum smear results—each of the three sputum specimens should be collected in 8– to 24–hour intervals—at least one specimen should be an early morning specimen as respiratory secretions pool overnight.

Cough etiquette

Most organisms that cause coughing and sneezing have the ability to spread easily via transmission of germs carried on droplets through the air. If dispersal of droplets can be prevented, then infection transmission can be reduced. Cough etiquette can help to contain infectious respiratory droplets at the source. Following is a series of actions to take if one is coughing or sneezing, designed to reduce spread of organisms to others

Cough etiquette steps

- Sneeze, blow nose, or cough into a disposable tissue—discard tissue immediately into bin
- If tissues is not available—cough/sneeze into upper arm or sleeve, avoiding using the hands
- Turn away from other people when coughing/sneezing
- Move away from other people who are coughing/sneezing
- Always wash your hands after coughing/sneezing/blowing nose
- If there is no access to soap and water, alcohol-based rub may be used
- Keep hands away from eyes, nose, and mouth
- If you have cold/flu and visit a health facility, you may be asked to wait in a separate area and to wear a mask, in order to protect others.

Disposable tissues

- Disposable tissues are preferred over cloth handkerchiefs for covering coughs and sneezes
- A cloth handkerchief can act as a breeding ground for the germs that are causing the infection—carrying a used handkerchief around when you are sick may spread the organisms
- Carry a small plastic bag to put used tissues in until they can be disposed if you have to go out when you have a cold/flu, and no bin is convenient to dispose of your used tissues properly.

FOOD AND WATER SAFETY

Nosocomial diarrhea is common in hospitals—the main causes include:

- Poorly trained food handling staff
- Use of unsafe practices involving the storage, preparation, and handling of raw meat, chicken, fish, eggs (and some vegetables)
- Use of unsafe drinking water

Nosocomial transmission of fecal organisms by contaminated food or water can be reduced considerably by improving sanitation, food handling, and staff hygiene.

Food handlers

Hand hygiene is a crucial safety measure. Food handlers should wash their hands or use alcohol-based hand rubs at critical times (before cooking/serving food, after blowing nose/covering a sneeze, and after using the toilet). Procedures for food safety should include the following:

- Health and hygiene of food service staff should be supervised by knowledgeable person certified in food safety
- Food handlers should undergo quarterly medical checkups
- Food handlers should report any gastrointestinal problems or skin lesions, especially on hands
- Food handlers with diarrhea should be immediately removed from handling foods—they should not return to food handling or work with immunocompromised patients in intensive care or with transplant patients until all symptoms are over for 24–48 hours
- Food handlers are instructed to properly inspect, prepare, and store foods handled, and to properly deal with waste
- Food handlers should know how to clean and correctly operate equipment they are using, such as slicers, blenders, and dishwashers.
- Kitchen staff should use face masks, hair covers, and plastic aprons at a minimum.

Cooking

Food should be cooked thoroughly. Frozen foods should be thawed before cooking to avoid the presence of cold spots in the interior.

Holding temperatures

- Hold hot foods above 60°C (140°F)
- Hold cold foods below 7°C (45°F)
- Check thermometers for food storage periodically
- Warm perishable foods cooled before storage

Kitchen and equipment

- Cleanliness must be monitored and verified daily
- Kitchen should be cleaned at end of each day
- Important to ensure equipment is being cleaned and disinfected, especially cutting boards used for preparing raw meat, fish, or poultry
- Utensils used to cater food and cups for drinking must be properly washed/sanitized using proper dishwashing methods.

Water Safety

It is crucial to know the biological quality of the health facility water source. From data from 54 low- and middle-income countries, WHO concluded that 38 percent of health facilities worldwide lack access to even rudimentary levels of clean and safe water (WHO/UNICEF).

Standards for water safety

- Monitoring/inspection of water quality used by health facilities, including sources, collection, and storage, should be done regularly
- Microbial water quality (total coliform and *Escherichia coli* [*E. coli*] count based on WHO guidelines or country water quality standards, if available) of source should be monitored quarterly
- If feasible, verify chemical quality
- Proper collection, transportation, storage, and handling of water to avoid risk of contamination
- Use washed/sanitized containers to collect and store water
- Separate containers for drinking and other purposes by clearly marking containers.

Making water safe

If water supply is from a questionable/unsafe source, it is possible to make it safer using the following methods:

Boiling

At boiling point, 100°C, most microbes that can cause intestinal diseases are eliminated, but have the disadvantage that chemical and other contaminants are not removed.

- Water boiled for 1-5 minutes is considered safe to drink
- Water boiled for 20 minutes is considered high-level disinfected
- Water can also be disinfected to be safe for drinking with sodium hypochlorite or ultra-violet rays.

Distillation

Water can be purified by boiling it and then condensing the steam—an energy-intensive method that is costly.

Solar disinfection (SODIS)

To use SODIS fill 0.3-2L plastic soda bottles with low-turbidity water, shake to oxygenate, and place bottles on roof or rack for six hours (if sunny) or two days (if cloudy); combined effects of UV light, induced DNA damage, thermal inactivation, and photo-oxidative destruction inactivate disease-causing organisms.

Ozonization

Ozone, a powerful oxidizing agent that is toxic to most waterborne organisms, can be made by passing oxygen through UV light or "cold" electrical discharge.

Chlorination

Adding chlorine to drinking water disinfects it and kills germs.

Sodium hypochlorite

Dissolved in water, sodium hypochlorite becomes bleach, which offers the best mix of low cost, ease-to-use, safe, and effective disinfection in areas where there is enough water to drink and the water is not excessively turbid.

Filtration

Water passes through filters of varying compositions (sand, gravel, charcoal) and pore sizes, in order to remove dissolved particles, such as dust, parasites, bacteria, viruses, and chemicals.

Reverse Osmosis

Impure water is forced through a semipermeable (partly porous) membrane which traps impurities, resulting in clean water—method is often combined with UV light for maximum water purity.

BEHAVIOR CHANGE COMMUNICATION FOR SAFE IPC AND HCWM PRACTICES

Behavior is the way in a person acts or conducts him/herself through concrete actions, activities, and mannerisms, which can be observable or hidden.

Communication is the expression of thoughts and ideas or making known ones ideas or feelings to another person or group of persons. It is a process of transmitting and receiving information on a particular topic between two or more people.

Communication process

- M—Message
- S—Source
- C—Channel
- R—Receiver
- E—Effect
- F—Feedback

Behavior change communication (BCC)

Behavior change communication is the art of improving the knowledge, attitude, practices (KAP) of health workers and patients through communication strategies on best practices in injection safety. Behavior change communication for injection safety is the art of helping health workers to develop skills for administering only safe and necessary injection and promoting oral medications as suitable alternative.

Social and behavior change communication (SBCC)

SBCC is the use of communication to change behavior—including service utilization—by positively influencing knowledge, attitudes, and social norms. SBCC for health is a research-based consultative process. It uses communication to promote and facilitate behavior change and support the requisite social change for the purpose of improving health outcomes.

Figure 18. Core elements and strategies of SBCC

Core Elements	Key Strategies
Communication should use channels and themes that fit a target audience's needs and preferences	**Advocacy** is the political process by an individual or group that aims to influence decisions within political, economic, and social systems and institutions.
Behavior change is effected through efforts to make specific health actions easier, feasible, and closer to an ideal that will protect or improve health outcomes	**Social Mobilization** raises awareness and motivates people to demand change or a particular development
Social change actions are intended to achieve shifts in the definition of an issue, people's participation and engagement, policies, and gender norms and relations	**BCC** is the process of understanding people's situations and influences, developing messages that respond to the concerns within those situations, and using communication processes and media to persuade people to increase their knowledge and change the behaviors and practices that place them at risk. It is also a tool for promoting and sustaining risk-reducing behavior change in individuals and communities by distributing tailored health messages in a variety of communication channels

Figure 19. Steps for behavior change

Types of Behavior	Steps for Behavior Change
Unaware	Needs to be provided information
Informed/ Knowledgeable	Learns new behavior—recalls message, understands, can name issues and source of information
Approval of new behavior	• Responds favorably to messages • Discusses information with personal network • Thinks personal network approves of new behavior
Intention	• Believes behavior is beneficial and intends to adopt it • Recognizes that new behavior can meet a personal need • Intends to practice new behavior at some time
Modified behavior	Chooses to practice new behavior
Advocacy (practicing sustained change)	• Experiences and acknowledges personal benefits of new behavior • Promotes new behavior among personal network

Behavior change is not automatic—it is a process and takes time.

Communication skills

To be a good advocate of infection prevention control and health care waste management, you need to develop and improve your communication skills. Interpersonal communication (a vital tool) is the face-to-face verbal and nonverbal exchange of information, ideas, or feelings between individuals or groups by one or more of the following methods:

- **Verbal communication:** Exchange of ideas through expression in spoken words.
- **Non-verbal communication:** Expression of ideas, thoughts, or feelings without the spoken word, generally expressed in the form of body language that includes gestures and facial expressions.
- **Counseling:** A person-to-person interaction between the counselor and the client during which the counselor provides accurate information to enable the client to make an informed choice/decision about the course of action best for him/her.

Counseling skills

- Active listening
- Effective questioning
- Reflecting
- Paraphrasing
- Summarizing

Attributes of a good counselor

- Empathy
- Nonjudgmental
- Patient
- Informed
- Respectful

Outcome of counseling

- Counselor helps the client define his/her feelings
- Counselor provides unbiased information
- Client is empowered to make an informed decision/choice.

Client education

Client education is transmission to the patient, family, caregiver, and community of the knowledge, skills, and attitudes that empower them to actively participate in the promotion of their health.

Health workers and patient education

Health workers must understand and embrace the idea that their role is very important in patient/client education. They must recognize the contributions of patients and their families to the healing process and be receptive to patient input.

Principles for providing patient education

- Speak slowly
- Use simple everyday language—avoid "medicalese"
- If possible show or draw pictures
- Limit amount of information
- Repeat
- Teach-back technique
- Create comfortable learning environment—allow and encourage questions.

Group activity—role play

As a doctor in your health facility you have been trained on injection safety and now prescribe injections only when necessary. However, you have noticed that one of your colleagues, also a doctor in your unit, prefers to prescribe injections—necessary and unnecessary. The nurses are complaining and even regular patients have noticed this. You walk into the doctors' lounge and meet some of your colleagues discussing the new auto-disable (AD) syringes that have been supplied to the hospital. Two of them have determined not to use them again as one said that it breaks whenever he tries to flush an intravenous line or a catheter. The other, says she had problems when she tried to bleed a patient and ended up wasting about three needles and syringes.

Discussion Question

How would you talk to, or counsel, this doctor on reducing unnecessary injections?

What advice can you give these doctors concerning the use of AD syringes?

How can you convince them to continue using AD syringes?

Effective use of BCC materials

Posters

- Display the posters in places where many people will see them in the hospitals or clinics
- Display messages targeting:
  - **Promotion of oral medications—**in waiting rooms, doctors' offices, and pharmacies
  - **Prevention of needlestick injuries**—in nurses' station and injection and dressing rooms
  - **Waste management posters**—in appropriate areas such as stores where waste materials are kept before final disposal and other identified areas for waste; they may be placed in sitting areas for waste managers to remind them of necessary steps for waste disposal
  - **Storeroom guidelines**—in stores for hospital consumables and pharmacy stores.
- Place posters in places protected from rain and wind
- Always obtain permission from management before displaying your posters to avoid removal

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