THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF HEALTH AND SOCIAL WELFARE

DO NO HARM

INJECTION SAFETY
IN THE CONTEXT OF
INFECTION PREVENTION AND CONTROL

Participants' Manual

Draft 4

April 2006

Research & Training Institute, Inc.

PREFACE

An understanding of the relationship between infection prevention and control and safe injection practices is important in the prevention and management of bloodborne diseases such as HIV/AIDS, hepatitis B and hepatitis C.

DO NO HARM: *Injection Safety in the Context of Infection Prevention and Control, Participants' Manual,* is a document that will form the basis of standardizing injection safety practices in Tanzania. It is expected that users of the manual should be able to utilize appropriately the knowledge, skills, and attitudes in their respective health facilities.

The focus of this manual is on achieving safe and appropriate injection safety practices through changing behaviour of health workers and patients, safe injection practices, ensuring availability of equipment and supplies and managing healthcare waste safely and appropriately.

When injection safety practices becomes a professional and social norm among healthcare providers, there is an understanding of the relationship between infection prevention and control and safe injection practices. Once the behaviour of the health workers is changed accordingly, they will administer only necessary injections safely, using appropriate safe injection devices. The supplies will be managed properly and will be made available throughout the health system. Moreover, healthcare waste will be efficiently managed using methods that are safe for the community and the environment.

This manual provides information, strategies, and activities designed to emphasize key points for both providers and users of injections. It presents providers and users information required in the day-to-day practice and includes exercises to assist health workers in developing the required competence for the management of injection safety.

Capacity building in infection prevention and control and safe injection practices will help in prevention and management of bloodborne diseases. Use of the manual will help to ensure only safe and necessary injections become a professional and social norm within health systems; to improve the use and availability of safe injection equipment (syringes with re-use prevention and/or needlestick prevention features and safety boxes); to establish high quality services and reduce the risk of needlestick injury among healthcare personnel; and to establish the most effective, practical, and safe means of waste disposal in healthcare settings.

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ACKNOWLEDGEMENTS

DO NO HARM: *Injection Safety in the Context of Infection Prevention and Control, Participants' Manual* was developed by a team of national experts in injection safety and infection prevention and control. Their experiences in implementing different programs related to behaviour change communication (BCC), injection safety (IS), supplies management (Logistics), and healthcare waste management (HCWM) in Tanzania, were utilized in preparing this manual.

The experience brought by the World Health Organization (WHO), with headquarters in Geneva, the Regional Office for Africa (WHO/AFRO) and the Country Office in Dar es Salaam, in injection safety and infection prevention and control was utilized to ensure that the manual complies with international, regional and national quality standards.

The input from the Health Services Inspectorate Unit (HSIU, Ministry of Health and Social Welfare), the first practicing hospitals (especially the referral hospitals), and the selected regional and district hospitals, is highly acknowledged.

Moreover, the input from the training institutions: Muhimbili College of Health Sciences (MUCHS), The College of Engineering and Technology (CoET-UDSM), The Hubert Kairuki Memorial University (HKMU), is also highly acknowledged.

The development and production of this manual could not have been realized without the critical input and support of the following technical writing groups:

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ACRONYMS

AD	Auto-Disable
AED	Academy for Educational Development
AEFI	Adverse Event Following Injection
AMCR	Average Monthly Consumption Rate
BCC	Behavioural Change Communication
CDC	Centers for Disease Control and Prevention
CQI	Continuous Quality Improvement
FEFO	First Expiry First Out
FIFO	First In First Out
HBV	Hepatitis B Virus
HCF	Health Facility
HCV	Hepatitis C Virus
HCW	Healthcare Worker
HCWM	Healthcare Waste Management
TFDA	Tanzania Food and Drugs Authority
HLD	High Level Disinfection
ILO	International Labour Organization
IPC	Infection Prevention and Control
IPCC	Interpersonal Communication and Counseling
JSI	John Snow, Inc.
LMIS	Logistics Management Information System
M&E	Monitoring and Evaluation
MMIS	Making Medical Injections Safer
MOS	Month of Supply
NGO	Non-Governmental Organization
PATH	Program for Appropriate Technology and Health
PEP	Post-Exposure Prophylaxis
PEPFAR	President's Emergency Plan for AIDS Relief
PHR	Physicians for Human Rights
PLWHA	People Living with HIV/AIDS
POP	Persistent Organic Pollutant
PPE	Personal Protective Equipment
PVC	Polyvinyl Chloride
SIGN	Safe Injection Global Network
TP	Total Parts
UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
VVM	Vaccine Vial Monitor
WHO	World Health Organization
WHO/AFRO	World Health Organization Regional Office for Africa

INTRODUCTION TO THE PARTICIPANTS' MANUAL

Rationale

According to the WHO, sixteen (16) billion injections are administered each year in developing and transitional countries[1]. Of, these injections, 70% are believed to be unnecessary, where oral medications could have been prescribed. Moreover, unsafe injections are very common worldwide. Due to the overuse of injections in many countries, unsafe injection practices transmit substantial proportion of bloodborne diseases[2].

Injection safety (IS) is an integral component of infection prevention and control (IPC), which is critical to healthcare services. The observation of safe injection practices will promote improved access to quality care and treatment for people living with HIV/AIDS (PLWHA) and other bloodborne diseases.

Surveys have indicated that injections are the preferred method of treatment for patients and clients in Tanzania. Therefore, it is imperative that injection safety be given priority as organizations attempt to reduce the spread of HIV/AIDS and other bloodborne diseases.

Purpose

The *Participants' Manual* is intended to be used as a generic document that will form the basis of standardizing injection safety practices in Tanzania.

Target Audience and the Focus of the Manual

The Participants' Manual is intended to be a resource book for all health workers in Tanzania.

The contents of the manual focuses on achieving safe and appropriate injection practices within the context of infection prevention and control through the following integrated strategies:

- Changing behaviour of health workers and patients;
- Ensuring availability of equipment and supplies;
- Managing healthcare waste safely and appropriately.

Content of the Manual

The manual introduces the concept of infection prevention and control and highlights injection safety as a key component. It further details how injection safety can be achieved, while emphasizing skills needed for effective

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[1] *Injection Safety, Guiding Principles to Ensure Injection Device Security*. WHO. 10 September 2003

[2] *Managing an Injection Safety Policy.* WHO. March 14, 2003, http: www.who.int /infection_safety/toolbox/en/Man

and appropriate communication so as to encourage changes in practice and behaviour and the reduction of the demand for injections.

This manual contains information, strategies and activities designed to emphasize key points for injection providers, as it presents the information required in day-to-day practice. The manual also includes exercises to assist health workers develop the required competence for the management of injection safety. It also suggests resources to supplement the content during the training sessions.

The manual is organized as follows:

Chapter 1: Introduction to Injection Safety

Chapter 2: Behavioural Change Communication for IS

Chapter 3: Infection Prevention and Control Practices

Chapter 4: Injection Safety Practices

Chapter 5: Supplies Management

Chapter 6: Healthcare Waste Management

CHAPTER 1

INTRODUCTION TO INJECTION SAFETY

Injection is one of the methods used to provide treatment to patients. However, this method has disadvantages, such as the risk of transmitting bloodborne infections. In order to avoid the associated dangers, it is important to learn how to avoid unsafe injections, how to control infection when injections are necessary and to observe injection safety practices in health facilities. According to WHO, a safe injection is defined as one that does not harm the recipient, does not expose the provider to any avoidable risks and does not result in any waste that is dangerous for other people.

The reference definition of a safe injection can be translated into a list of critical steps for which best practices should be followed. For example:

- In order not to harm the patient, the injection should be administered with a sterile syringe and needle, using the right medication, etc.;
- In order not to expose the provider to any avoidable risk, the needle should be placed in a puncture-proof receptacle immediately after use;
- In order not to result in any waste that is dangerous for other people, sharps waste should be disposed off appropriately.

General Objectives

At the end of this chapter, participants will be able to:

- Describe international and national perspectives of injection safety;
- Describe the problem of injection overuse in health facilities;
- Describe the risks associated with unsafe injection practices and poor infection prevention and control;
- Describe the challenging issues on IS;
- Understand the strategies for safe injection.

1.1 International and National Perspectives of Injection Safety

Specific Objectives

At the end of this topic, participants will be able to:

- Give the annual global estimated burden and proportions of bloodborne infections due to unsafe injection practices;
- Describe national information on the state of injection safety;
- Describe data on injection safety practices in Tanzania.

1.1.1 Global Impact

The global impacts of unsafe injections can be classified as health, socio-economic, and psycho-social impacts. The health impacts are discussed at length.

Bloodborne diseases transmitted via unsafe injections cause sickness and death to the hosts. When this happens to health workers, manpower is lost, while in the community, not only money is required for treatment but national productivity is also hampered. The annual estimates and total burden of infection attributable to unsafe injection practices in developing and transitional countries, in the year 2000 are shown in Table 1.1.

Table 1.1: Global Burden Of Infections Caused By Unsafe Injections[3]

Infections	Africa	North and South America	Middle East	Europe	South East Asia	Western Pacific	The World
HBV	10.9%	2.3-9.3%	58.3%	0.9%	22.4-53.6%	33.6%	31.9%
HCV	16.4%	0.9-9.2%	81.7%	0.9-21.2%	30.8-59.5%	37.6%	39.9%
HIV	2.5%	0.2-1.5%	7.1%	0.6%	7.0-24.3%	2.5%	5.4%

NB: Regions according to WHO

Table 1.1 shows that globally, viral hepatitis C (HCV) has a leading rate of infection, followed by hepatitis B (HBV) caused by unsafe injections. Although the rate of infections for HIV is low compared to the other bloodborne diseases, its global impact is huge in terms of safety of patients as well as health care workers and stigma related to it (especially for people living with HIV/AIDS).

The WHO estimates that every year unsafe injections and needlestick injuries via handling of needles, syringes, and safety boxes, causes at least 8-16 million hepatitis B, infections, 2.3 – 4.7 million hepatitis C infections, and 160,000 HIV/AIDS infections[4]. This is a significant burden for developing countries, like Tanzania, where the demand for healthcare services and health work force is increasing.

Most people are aware of the risks of contracting HIV, the virus that causes AIDS, from dirty needles and syringes. However, many health workers and patients are unaware of the high risks of contracting hepatitis B or C from the same dirty syringes and needles. Like HIV, hepatitis B and C are deadly

[3] Hauri, A., Armstrong, Gregory, Hutin, Yvan J. F. Extracted from "*The Global Burden of Disease Attributable to Contaminated Injections given in Healthcare Settings".* International Journal of STD & AIDS, 2004, 15: 7-16.

[4] Proper Handling and Disposal of Auto-Disable Syringes and Safety Boxes, Children Vaccine Program at PATH, May 2002.

infectious and can cause liver disease, cirrhosis and liver cancer. It should be noted that hepatitis B virus can remain infectious outside the body for at least one week.

It can be further stated that:

- Because infection with these viruses initially presents no symptoms, it is a silent epidemic, the consequences of which are increasingly recognized;
- However, this type of infection transmission can be prevented and controlled;
- HBV is highly infectious and causes the highest number of infections– unsafe injections account for 33% of new HBV infections in developing and transitional countries for a total of 21.7 million people infected each year[5];
- HBV, HCV, and HIV cause chronic infections that lead to disease, disability and death, a number of years after the unsafe injection;
- Those infected with hepatitis B virus in childhood will typically suffer from chronic liver disease by the age of 30, at the prime of their life. This has a dramatic effect on national economies;
- A recent study indicated that each year unsafe injections cause an estimated 1.3 million early deaths, a loss of 26 million years of life, and an annual burden of US$535 million in direct medical costs[6];
- Recurrent costs, or operating costs, include fuel for running sterilizers and incinerators, safety boxes for disposal of medical sharps, supervision and in-service training for updating skills (training workshops), transport costs, and contracts for the destruction of contaminated waste.

The profile of a country's financial commitment to safety of injections and other parenteral procedures depends on advocacy and behavioral communication factors and on the efficiency and effectiveness of injection safety practices and its operations management.

What Is The Risk Of Infection Following A Needlestick Injury?

The estimated risk of infection following a needlestick injury varies depending on the virus being transmitted. The risk of infection after exposure to hepatitis B is about 20% to 30%, while the risk is 3% to 10% after exposure to hepatitis C and about 0.4% after exposure to HIV[7]. The risk of infection

[5] Battersby, A., R. Feilden and B. Stilwell, "Vital to Health?", a Briefing Document for Senior Decision Makers, USAID, December, 1998.
[6] www.childrensvaccine.org/fi les/Nepal-Inject-Practices-RA.pdf
[7] http://www.engenderhealth.org/ip/sharps/ns2.html

from unsafe injections is high, with only 0.04 microlitres of contaminated blood required to infect a person with bepatitis B (BMA, 1992).

Summary Of Global Health Burden Of Unsafe Injection Practices

- About sixteen (16) billion injections are given each year in developing and transitional countries;
- Approximately 90 to 95% of injections are therapeutic; 5-10% is given for immunization;
- Seventy percent (70%) of these injections are unnecessary; oral medications could have been prescribed;
- Consequences of unsafe injections lead to death and disability;
- WHO (2003) estimates that 501,000 deaths have occurred because of unsafe injection practices.

Among unsafe practices, the reuse of syringes and needles are common. Injection-associated transmission of bloodborne pathogens can be prevented through the development of a national strategy to reduce injection overuse and achieve injection safety and its implementation through a national coalition, as discussed later in this chapter.

Frequently Asked Questions on Behavioural Change for Injection Safety

What are the reasons for injection overuse?

Patients and health care workers often believe that injections are more effective and act faster than oral medication. In addition, health care workers can charge an increased fee for injections.

Are health workers not aware of the risks of unsafe injection practices?

In many cases trained health care workers, such as physicians, nurses and paramedical staff, have not been trained in safe injection practices. Often, they lack the awareness of the risks associated with unsafe practices. In addition, in some communities, untrained lay persons administer injections outside the formal health care sector.

Is it difficult to make injections safe?

The strategies to make injections safe are straightforward. They include community behaviour change encouraged through communication activities in a supportive environment, ensuring availability of injection equipment in sufficient quantities, and reliable waste disposal. Many success stories suggest that this is an achievable goal.

Why are syringes re-used in the developing world?

Widespread re-use of syringes and needles in developing world (like Tanzania) is due to several factors:

- A lack of awareness regarding the risks associated with syringe re-use;

- cultural resistance to dispose of used syringes and needles when resources are scarce;
- A lack of supplies of syringes and needles;
- Absence of infrastructure for the safe collection and destruction of used injection equipment, allowing for scavenging and parallel market development.

What Constitutes Safe Syringe Disposal?

Safe syringe disposal requires that syringes and needles be placed in puncture-proof receptacles (safety box) immediately after use. These boxes must then be collected for incineration or other forms of destruction.

Recommendations for Safe Injections

(1) Minimize the prescription of unnecessary injections by:

- Reducing demand for injections: broad awareness campaigns aimed at educating the communities, dispelling myths that injections are more effective, and perhaps weighing the risks associated with injections and the benefits derived from them;
- Reduction of prescriptions for injections via influencing the national drug policy, recommendations clearly stipulating cases and conditions where injections are indicated, and the preferred mode of medication for specific drug types, especially for drug groups where injections are frequently prescribed.

(2) Ensuring safe injection practices when injections are necessary, which can be attained by:

- Training for all health worker groups, including waste handlers. The key considerations for training include: training modules should address both safe injection practices and healthcare waste management practices; pre- and in-service training of health workers, using existing structures; focused training for waste handlers before service resumes, and continuous training in post exposure procedures;
- Hospital management training: requirements to ensure that facilities are ”injection safe” facilities, specifically addressing policies, guidelines and procedure to be followed, as well as supply management and capacity building for all workers concerned;
- Ongoing monitoring of injection practices: Facilities to develop capacity to continuously monitor injection practices, and implement corrective measures where necessary. Standard monitoring tools should be made available to assist facilities with this task;
- Use of safe injection equipment: Explore the use of safer technologies to minimize exposure by negating the human element of poor practices.

(3) Ensure correct management of healthcare waste through:

- Building capacity at facility level to ensure waste management procedures are adhered to;
- Ensuring that management of supplies is efficient; ensuring standards are adhered to;
- Implementing continuous monitoring of waste handling.

1.1.2 Determinants of Good Injection Safety Practices in Tanzania

Among other factors, injection safety practices incorporate the following:

- Handling of the injections by qualified personnel (i.e. nurses);
- Washing hands before and after administering an injection;
- Disposing sharps immediately after use;
- Avoid recapping the needles;
- Proper use of safety boxes.

In Tanzania, a study was conducted to identify factors contributing to poor and good injection practices among 120 healthcare providers in consultant hospitals. The study was done in the following five consultant hospitals: Muhimbili National Hospital, Bugando Medical Centre, Kilimanjaro Christian Medical Centre, Mbeya Referral and Mnazi Mmoja Hospital (in Zanzibar). The main findings are summarized in Table 1.2.

Table 1.2: Indicators Of Injection Safety Practices In Tanzania[8]

Indicator	Percent
Proportion of injection practices performed mainly by nurses	95%
Handling without washing hands	50%
Poor disposal of sharps immediately after use	54.2%
Recapped needles	45.8%
Did not use safety boxes	50.0%

1.1.3 Injection Safety and Needlestick Injuries Data in Tanzania

(a) Factors contributing to unsafe injections

Data on injection safety is very important for decision making and for infection prevention purposes. While the data is still limited, surveys on injection types, injection preparation practices, and hand-washing practices

[8] A study to identify determinants of poor and good injection practices among healthcare providers in Consultant Hospitals in Tanzania, JSI-MMIS, September 2004.

before and after injection administration, have been collected in few health facilities in Tanzania, as summarized in Table 1.3.

Table 1.3: Sampled Health Facility Data On Injection Safety Practices In Tanzania[9]

Factor	Observation	Percentage
Purpose of giving injection	Curative Diagnostic Family Planning Vaccination	71.9% 14.5% 1.0% 12.6%
Injection preparation done on clean dedicated table	YES NO	71.9% 28.1%
Injection provider washed hands with soap/running water	YES NO	34.3% 65.7%
Patients bring own syringe	YES NO	46.0% 54.0%
Needle/syringe taken from a sterile pack	YES NO	89.6% 10.4%

Among the observed purposes for giving injections, 71.9% were curative, 14.5% diagnostic, 1.0% family planning, and 12.6% vaccination.

For safe injection handling, the preparation of injections must be done on a clean dedicated table. It has been observed that about 71.9% of the injections were observed to have been prepared on dedicated tables, while 28.1% were not.

To minimize infections, injection providers are recommended to wash hands before and after attending patients. It is interesting to observe that only 34.3% of the injection providers washed their hands with soap and running water before and after giving the injections, while 65.7% did not.

It was further observed that about 90% of all injections observed were administered with disposable devices. Also, 46% of patients came with their syringes from private pharmacies, which makes it difficult to verify sterility. Community opinion obtained through focus group discussion revealed that they were unaware of the risks due to injections and that the syringes were costly. However, more research in Tanzanian health facilities is required.

[9] Report on Assessment of Injection Safety Practices in Sampled Health Facilities in Tanzania, JSI-MMIS, 2005.

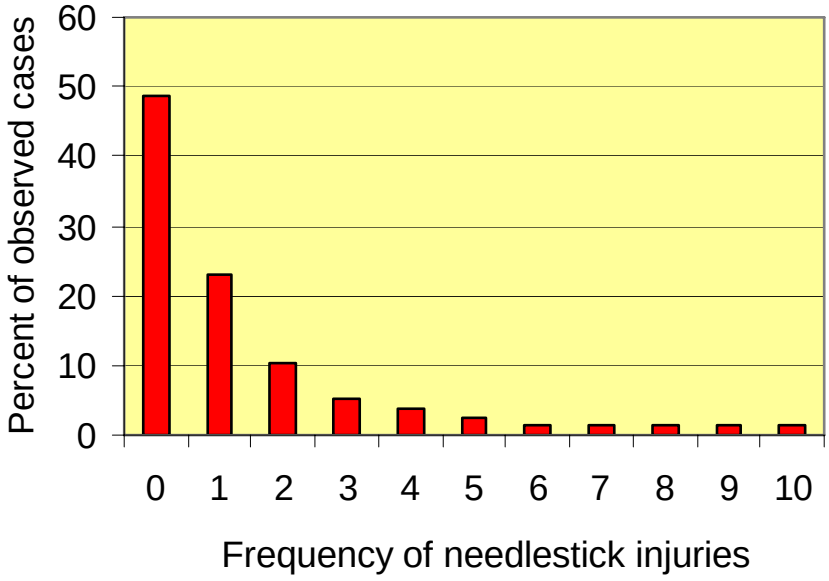
(b) Needle-stick injuries

Needlestick injuries are percutaneous exposure by sharp object, (i.e., needle, blades, etc.) by a health worker. This accidental occurrence places the health worker and patients at risk of transmission of bloodborne pathogens, including HBV, HCV, and HIV.

Needlestick injuries are one of the most common types of accidents that occur in health facilities everyday, not only in Tanzania, but worldwide. These occupational hazards have long been a concern to many health workers. Needlestick injuries are caused by poor handling of needles that have been contaminated, (i.e., any needle that have been used to treat one patient and comes in contact with open skin of another person).

Figure 1.2 shows the number of accidental needlestick injuries for the six month period in the sampled health facilities in Tanzania. The horizontal axis shows the number of times a health worker got needlestick injuries, while the vertical axis shows the fraction of the workers who got the injuries (expressed as a percentage).

Figure 1.2: Distribution of needlestick injuries in sampled health facilities in Tanzania



Despite the fact that 48% of the workers are reported to have not sustained needlestick injuries, results show that 52% of health workers suffered at least one needlestick injury. This is a situation that leads to infectious disease

transmission. Needlestick injuries can, however, be prevented by following standard procedures described in the IPC and IS guidelines.

1.2 Injection Overuse in Health Facilities

Specific Objectives:

At the end of this topic, participants will be able to:

- Describe the factors leading to injection overuse;
- Understand prescribers' reasons for the overuse of injections;
- Describe the misconceptions about injections among prescribers;
- Describe the misunderstanding between patients leading to injection overuse.

1.2.1 Factors Leading to Injection Overuse

The reported injectable medicines commonly used include: antibiotics, anti-inflammatory agents/analgesics, and vitamins.

The reported factors leading to injection overuse include:

- Prescriber-associated factors;
    - Wrong perceptions regarding injections;
    - Wrong assumptions about patients' expectations;
- Patient-associated factors;
    - Misinformed perceptions regarding injections;
    - Therapeutic expectation;
- System issues;
    - Lack of effective oral medications;
    - Financial implications.

1.2.2 Prescribers' Reasons for the Overuse of Injections

Reported prescribers' reasons for the overuse of injections include:

- Pharmacokinetics;
    - "Strength" of injectables;
    - Rapid onset of action;
    - Poor intestinal absorption of oral medications;
    - Absence of effective oral medications;
- Patient care issues;
    - Inability of patient to take medications by mouth;
    - Patient's desire for injection;
    - Chronic condition of patient (illness, malnutrition or alcohol abuse);

- Other reasons;
    - Recommendations by professors/ministry of health;
    - Direct observed therapy.

1.2.3 Misconceptions About Injections Among Prescribers

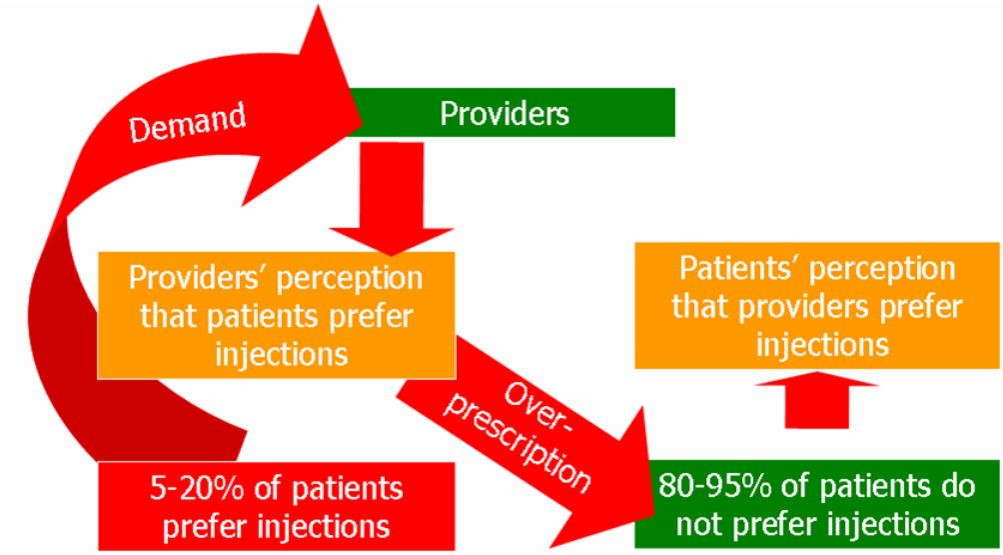
Misguided concepts exist among prescribers about the injections, such as:

- Oral absorption is variable, whereas parenteral administration assures high drug levels;
- Injectable drugs are "stronger" than oral drugs;
- Injectable drugs have more rapid onset of action;
- Chronic conditions (malnutrition) of patients lead to poor oral absorption of drugs.

1.2.4 Misunderstanding Between Patients And Prescribers Leading To Injection Overuse

It has been observed that overuse of therapeutic injections is often attributed to patients' demand. According to studies conducted in a few countries, including Indonesia, the proportion of patients who actually prefer injections does not exceed 5 to 20%. However, this minority that prefers injections pressures providers to give injections. Because of the strong pressure from that minority, providers tend to believe that all patients prefer injections. Figure 1.3 summarizes the misunderstanding between patients and prescribers leading to injection overuse.

Figure 1.3: Misunderstanding Between Patients And Prescribers Leading To Injection Overuse



1.3 Risks Associated with Unsafe Injection Practices

Specific objectives:

At the end of this topic participants will be able to:

- List the infectious diseases caused by unsafe injection practices;
- Identify the risk groups;
- List the conditions causing disease transmission risks.

1.3.1 Infectious Diseases Transmitted Through Unsafe Injections

The risks associated with unsafe injection practices include:

- *Transmission of infections*: Inoculation of an infectious agent into the patient's body, also referred to as bloodborne diseases;
- *Paralysis*: Injection of a drug into a nerve, which can lead to damage to the nerve. This can result in weakness of the limb (lameness) supplied by the nerve;
- *Drug reaction*: Abnormal response of the body to a drug. The most life threatening is anaphylaxis, which is sudden collapse of the circulatory system due to immunological response to the injected drug.

Common diseases transmitted or caused by unsafe injection practices include:

- Hepatitis B;
- Hepatitis C;
- HIV/AIDS;
- Abscesses;
- Hemorrhagic fevers;
- Tetanus.

Hepatitis B is a highly infectious virus with the highest number of infections (21 million annually), and unsafe injections are estimated to cause 32% of all those infections. Meanwhile, hepatitis C causes more than 2 million infections each year, with more than 40% of all HCV infections coming from unsafe injections. Unsafe injections cause approximately 5% of HIV infections.

1.3.2 Groups at Higher Risk from Infections

The groups of people at higher risk of infections from unsafe injection include:

- Patients/clients;
- Health workers;
- Healthcare waste management personnel;
- Communities;
- Drug users.

1.3.3 Conditions Causing Disease Transmission Risks

Different conditions exist, leading to unsafe injection practices and finally towards disease transmission. This concept covers a wide range of scenarios during prescription, during injection administration and disposal. Table 1.4 summarizes the conditions causing risks to injection providers, patients or clients and the community.

Table 1.4: Conditions Causing Risks Of Infections Transmission

Providers	Patients/Clients	Community
• 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 on sharps from one health worker to another; • Sharps are found in unexpected places like linen; • Patient/client suddenly moves during administration of injection.	• Receive injections when there are other treatment alternatives; • Re-use of injection equipment; • Self-medication; • Sharps are found in unexpected places like linen; • Patient/client suddenly moves during administration of injection; • When a contaminated drug is administered; • When aseptic technique is not observed by health worker; • Administration of the drug at incorrect anatomical site; • Accidental switching of drugs; • Expired drugs; • Package is damaged or compromised; • Patient/client suddenly moves during administration;	Unsafe waste disposal practices such as: • Non-secure waste site (should be fenced); • Improperly placed disposal site (too close to people, crops, water sheds); • Improperly disposed waste (pit too shallow, incinerator overflowing, open dumping); • Re-using syringes and needles; • Sharing syringes and needles;

1.4 Challenging Issues on Injection Safety

Specific objectives

At the end of this topic participants will be able to:

- Understand the responsibilities for attaining safe injection practices;

- Describe how health workers become injured.

1.4.1 Who is Responsible?

Because of the time lag between infection and symptoms and invisibility of pathogens within the medical environment, administrators and health workers must be responsible for the safety of injections, other parenteral procedures, and sharps waste management.

These responsibilities extend far beyond the person who gives the injection or takes the blood sample. Others include:

- Supervisors and tutors imparting knowledge and skills;
- Those responsible for re-supply through procurement, like WHO, UNICEF, JHPIEGO, JSI-MMIS, JSI-DELIVER, etc.;
- Stock management and distribution;
- Those responsible for financial allocations;
- Those involved in disposal and destruction of contaminated waste, including cleaners, incinerator operators and public health and environmental safety officers.[10];

1.4.2 How do Health Workers Become Injured?

Many injuries can occur when:

- Waste handlers are disposing of sharps;
- Manipulating used sharps (recapping, bending, breaking, or cutting hypodermic needles), which can cause the blood inside to splatter or cause accidental injury to themselves;
- When one staff member accidentally sticks herself/himself or another staff member when carrying unprotected sharps;
- When sharp items are found in areas where they are unexpected, such as on surgical drapes or bed linen, in plastic bags, or soft boxes;
- When handling or disposing of waste that contains used hypodermic needles or other sharps, the healthcare service providers are at risk of sustaining a needlestick injury.

However, it is often difficult to obtain evidence that dangerous injections are being given. The reasons for this are threefold:

- Invisibility of infection on the equipment'
- A high proportion of infected persons shows no signs of their transmissible diseases;

[10] Battersby, A., R. Feilden and B. Stilwell, "Vital to Health?", a Briefing Document for Senior Decision Makers, USAID, December, 1998.

- A time lag, sometimes of many years, before the full consequences of prior infection become apparent.

1.5 Strategies for Achieving Safe Injection

Specific Objectives

At the end of this topic, participants will be able to:

- List the elements of injection safety strategies.

Achieving Appropriate Use of Injections

Unsafe injection practices are often viewed as a chronic problem with no easy solution. However, safe and appropriate use of injections can be achieved by adopting a three part strategy[11]:

(a) Changing behaviour of health workers and patients

Twenty years into the HIV pandemic, the knowledge of HIV among patients and health workers in some countries has driven consumer demand for safe injection equipment and irreversibly improved injection practices. With growing knowledge of HCV and HBV, similar patterns of consumer demand for safe injections should emerge. HIV prevention programmes can be expanded to include injection safety components.

(b) Ensuring availability of equipment and supplies

Simply increasing the availability of safe injection equipment and IPC commodities can stimulate demand and improve practices, as discussed in Chapter 5.

(c) Managing waste safely and appropriately

As waste disposal is frequently not an integral part of health planning, unsafe waste management is common. However, when it is appropriately planned, significant results emerge. National healthcare waste management strategies require a national policy to manage healthcare waste, a comprehensive system for implementation, improved awareness and training of health workers at all levels, as well as the selection of appropriate options for the local solutions.

[11] WHO Fact sheet No.231, April 2002.

CHAPTER 2

BEHAVIOURAL CHANGE COMMUNICATION FOR INJECTION SAFETY

This chapter provides an overview of the important role of behavioural change communication (BCC) in injection safety (IS) and infection prevention and control (IPC). The topics in this chapter aim to increase health workers' competence in knowledge, attitudes, technical and managerial skills.

General Objectives

At the end of this chapter participants will be able to:

- Understand the need for behavioural change communication in IS and IPC;
- Identify strategies for effective behaviour change communication in the IS and IPC context;
- Practice effective communication skills and supportive feedback in injection safety and infection prevention and control.

Specific Objectives

At the end of this topic participants will be able to:

- Define behaviour and behaviour change;
- Identify the reasons for behavioural change;
- Explain factors influencing behavioural change.

2.1 The Need for Behavioural Change Communication in IS and IPC

Why Behaviour Change?

Behaviour, and how to change it, is one of the key strategies for improving injection safety. In order for each injection to be safe, health workers, administrators and healthcare waste handlers all need to do something differently.

Looking at chapter one, we have seen that there are some positive (acceptable) and negative (unacceptable) practices that affect injection safety and infection prevention and control.

Behaviour change is a process of how people modify bad behaviour (unsafe practice) or acquire a positive behaviour (safe practice). Helping these workers learn and practice the skills, attitudes, and intentions is important for a successful integration of behaviour change programme.

Stages of Change

Change implies the process occurring over time; it is therefore involving a series of steps:

1) *Pre-contemplation stage*: People are not intending to take action in the foreseeable feature. This could be because they are uninformed or under informed about their behaviour. Or they may have tried to change a number of times and become demoralized abut the ability to change
2) *Contemplation stage*: People are intending to change after being given some specific information and they are aware of positive and negative effects of change. This balance between the costs and benefits of changing can produce profound ambivalence that can keep people stuck in this stage for long period f time.
3) *Preparation stage*: People are intending to take action in the immediate future.
4) *Action stage*: People have made specific overt modifications in their practices: observable behaviour change often has been equated with action.
5) *Maintenance stage*: People are working to prevent regression and maintain desired behaviour.

Reasons for Behavioural Change in IS and IPC

The **unsafe injection practices** that harm health workers, patients/clients and communities that need to be changed include:

- Recapping of needles;
- Re-use of syringes and needles;
- Overuse of therapeutic injections/unnecessary prescription of injections;
- Mixing of medical waste;
- Not segregating waste;
- Overfilling of safety boxes;
- Poor handling of safety boxes.

Ways of overcoming unsafe injection practices include:

- Reduction of unnecessary injections;
- Rational prescription of injections;
- Availability of oral medications;
- Training in injection safety practices;
- Supportive supervision;
- Availability of appropriate injection devices;
- Proper disposal of sharps and other waste;

- Essential information for patient/client and community on injection safety, including: the benefits of oral medication, a description of safe injection devices and commodities, and safe and appropriate waste disposal of syringes and needles.

Factors Influencing Behavioural Chanage

Factors that influence behaviour are internal and external. Internal factors are within an individual (i.e. Attitude, knowledge, skills and competences). External factors include environmental (i.e. supportive supervision, resources both human (manpower) and non-human (finances, supplies, equipment, etc)).

Table 2.1, shows motivation factors that influence health workers to practice safe injection practices.

Table 2.1: Motivation Factors for Health Workers to Practice Safe Injections

- Belief that they are protecting both patients/clients and themselves from harm (Internal factor);
- Knowledge and skills to perform the procedure (Internal factor);
- Assurance that patients/clients are open to prescription of oral medication (External factor);
- Availability of oral medication to implement standard guidelines (External factor);
- Availability of supplies, preventing the need to re-use equipment (External factor);
- Supportive work environment (External factor);
- Availability of easy to follow/user friendly guidelines (External factor);
- Incentives for good professional practices (External factor);
- Capacity building and on-the-job trainings (External factor);

The barriers hindering the health workers from practicing safe injection include the fact that they:

- Do not know all the steps for safe injection;
- Do not believe that the steps are all important;
- Are too hurried to carry them out;
- Lack necessary supplies and have not been able to obtain them in the past;
- Are uncomfortable doing new and/or different steps.

Similarly, the enabling factors that make it easier to carry out injection safety practices include:

- Truly desire to do right for their patients/client;
- Appreciation that the re-use prevention syringes and needles are easier and faster to use;
- Availability of injection safety commodities.

2.2 Identify Strategies for Effective Behaviour Change Communication in the IS and IPC Context

To reduce overuse of injections and to assure safe injection practices, multidisciplinary BCC strategies comprising three elements should be implemented:

- First, there needs to be a change in behaviour, such that patients and health workers should be encouraged to adopt safe practices and to avoid unnecessary injections.
- Second, sufficient quantities of clean injection equipment should be available in each health facility.
- Third, mechanisms should be in place so that "sharps" (i.e. needles and syringes) are so disposed of as to ensure that contaminated injection equipment is not reused and the risk of accidental needlestick injuries is minimized.
-

Important Activities Include:

- Review of policies, norms, and standards on injection safety and infection prevention and control issued by the government, clearly stating needed steps;
- Discussion to stress health workers' professional responsibility to adhere to official policies, guidelines, and standards
- Training activities to build competence (knowledge, skills, and attitudes);
- Problem-solving to help workers improve time management and provision and management of injection supplies.

Experience With Unsafe Injection Shows That:

- Of all medical procedures, injections are probably the most common.
- Many of the therapeutic injections could be avoided with alternative oral medication;
- In many countries, both patients and health workers prefer medicines to be administered by injection;
- It has been frequently reported that patients ask for injections because they believe that medication is more efficacious when injected and that the pain of the injection is a marker of that efficacy;
- Reasons for health workers to use injections excessively include the desire to respond to a perceived patient preference, the wish to monitor compliance directly and, in some instances, the possibility of charging a higher fee for service;

- Overall, unnecessary injections lead to high out-of-pocket healthcare expenses for patients and their families.

Dangers of Health Workers' Negative Behaviour

Many injections administered in the world are unsafe. Of particular concern is the reuse of injection equipment without sterilization – a frequent practice in developing countries and those in transition, where it is common simply to rinse syringes and needles in receptacles of tepid water between injections. In these countries, injections account for a high proportion of new infections of hepatitis B and hepatitis C viruses. A behavioural change campaign is required for both providers of injections and the recipients.

Each year, globally, reuse of contaminated injection equipment causes an estimated 8 to 16 million infections with hepatitis B virus, 2.3 to 4.7 million infections with hepatitis C virus, and 80,000 to 160,000 infections with HIV. Together, these chronic infections are responsible for an estimated 1.3 million early deaths and 26 million of years of life lost[12]. (This information, although mentioned in chapter 1, is repeated here for emphasis on the need for behavioural change).

2.3 Communication Skills and Supportive Feedback in IS and IPC

Specific Objective:

At the end of this topic, participants will be able to:

- Define the components of effective communication;
- Identify approaches to effective communication in the context of injection safety and infection prevention and control.

Defining Effective Communication

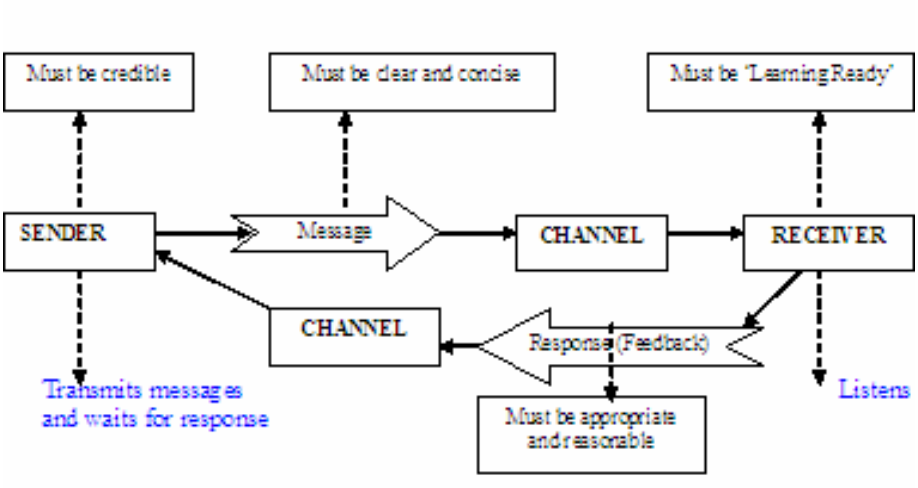
Communication is a vital part of injection safety, especially in the infection prevention and control for the management of hospital acquired infections such the HIV, HBV and HCV.

Therefore, effective communication is the process of sharing and exchanging ideas from one person to another. It involves the sender, message, channel, receiver and feedback.

Effective communication is a social interaction between the sender and the receiver through an appropriate channel. Effective communication is a two-way interaction as illustrated in Figure 2.2.

Figure 2.2: Major Elements of Effective Communication

[12] http://www.who.int/injection_safety/newsletter/EB107/en/



Behavioural change communication is viewed as the process of using approaches and tools to foster positive change in practice, as well as in knowledge and attitude around safe injection and IPC. Behavioural change approaches recognize that presenting facts alone does not ensure behavioural change and are designed to accommodate the stages of behavioural adoption of an individual or groups and to cultivate skills integrally needed to enable and sustain change.

Types of Communication Skills

i) Verbal: Questions (i.e. open-ended, closed questions, clarifying or paraphrasing)

ii) Non Verbal: (i.e. body language and signs)

To assist health workers in changing their behaviour, different methods are used, (i.e. training, workshops, meetings, and pictorial portraits placed on the walls). For example, to assist the workers to use and dispose safely the injection waste and sharps waste, pictures can be used for demonstration. Figure 2.1 shows the demonstration of proper use of safety boxes.

Figure 2.1: Demonstration of Safe Use of Safety Boxes

1. Open new, undamaged pack of syringe

2. Dispose of used needle and syringe immediately (DO NOT RECAP!)

3. Close safety box when it is ¾ full

4. Destroy it in the incinerator

Issues for discussion:

- What does the illustration communicate?
- To whom is the information targeted?

Identify approaches to effective communication

Case Study: *Improving Communication Amongst Staff*

Objectives:

- Identify approaches for reporting problems at work;
- Identify approaches to solve problems at work.

(i) Waste Handler

You are a waste handler at a busy outpatient clinic. You have been trying to improve waste handling practices in your unit, and as far as you know all health orderlies, medical ward attendants and nurses agree that you need to work toward for that goal. A new nurse has been added to your facility. You notice that after that nurse's shift, there are always loose used syringes and

needles found lying on the floor near the safety box. There are no other changes on the ward in terms of patients or equipment, but this nurse seems to handle the injection equipment differently from others.

You decide to talk to your supervisor to resolve the situation; what are the approaches to report the situation?

(ii) Supervisor (i.e. Ward In-charge)

You are the supervisor of waste handlers at a busy outpatient clinic. One morning a waste handler comes to your office and tells you that the new nurse recently assigned to the outpatient clinic leaves needles scattered on the floor near the safety box. The waste handler is worried that there might be an accidental needle-stick.

What are the approaches to solve the problem?

Table 2.2: Skills and Attitudes Required

Waste Handler	S/A*	Remarks	Supervisor	S/A	Remarks
1. Establish rapport	S/A		1. Establish rapport	S/A	
2. Start on a positive note	S*		2. Active listening	S	
3. Bring out positive aspects on waste management	A*		3. Empathy	A	
4. Effectively communicate the problem	S		4. Effective questioning	S	
5. Explain the causes	S		5. Reassurance	S/A	
6. Express need for assistance to solve the problem.	S		6. Resolution of the problem	S	
			7. Plan for future activities	S	
			8. Patience, being supportive	A	
			9. Responding to questions clearly	S	
			10. Motivation	S	

KEY: S/A* Skills and Attitudes
S* Skills
A* Attitudes

Facilitator should discuss the following skills:

Waste Handler
Effective interpersonal communication (i.e., establish rapport, start on a positive note)

Effectively Communicate
C Clearly assess and express the problem with confidence;
L Link to your experiences;
E Explain the causes and consequences of the problem;
A Ask for support to solve the problem;
N Now act.

Supervisor
Effective interpersonal communication (e.g., establish rapport, start on a positive note)

Effectively Communicate
C Communicate with empathy;
L Listen actively;
E Explore concerns and give encouragement;
A Address concerns and advise;
N Now plan together.

2.4 Behavioural Change for IS: Areas of Intervention

Specific objective:

At the end of this topic, participants will be able to:

- Understand BCC interventions required to achieve safe injection.

Interventions based on the elements BCC and IS/IPC have proven to be successful and demonstrated that poor injection practices can be eliminated. For example, in Tanzania, behavioural change interventions have resulted in a substantial and sustained decrease in the overuse of injections in different ways.

For example:
- Increasing the availability of clean, disposable injection equipment has almost eliminated unsafe injection practices.
- The introduction of small-scale incinerators, while at the same time training health workers, has successfully eliminated dangerous needles and other sharps waste from the environment.

To ensure change in behaviour, the following should be done:

- Efforts to ensure safe and appropriate use of injections require collaboration between all partners;
- Because multidisciplinary interventions are needed, the basis of preventive activities should include careful coordination of already existing initiatives rather than the creation of new programmes;
- National health authorities responsible for health promotion, HIV prevention, integrated management of childhood illnesses and blood transfusion services should promote safer behaviour among patients and health workers;
- Similarly, national authorities responsible for access to essential drugs, immunization services and family planning should increase the availability of clean injection equipment;
- It is recommended that responsibility for safe management of healthcare waste should be assigned to healthcare services.

Injections are given in most health facilities. Poor practices can potentially lead to a high burden of disease. Markers of injection practice may therefore be considered as critical indicators of quality for health-system assessment, particularly in countries that are reforming such systems.

With different types of injection equipment available for use in health facilities, we need to make proper choices. A number of issues need to be addressed, such as:

- Although reusable syringes and needles can be effectively sterilized with steam, evidence indicates that it is difficult to ensure complete sterilization;
- Frequent breakdown in such systems leads to lack of sterilization.
- Use of disposable injection equipment may create a consumer demand for safety as patients can be encouraged to witness the breaking of the sterility seal of new injection equipment;
- The quality of injection equipment should be regulated by national authorities, so that international standards can be met and unsafe reuse of disposable equipment be actively prevented;
- Finally, "auto-disable syringes", which are disabled automatically after one use, provide an additional opportunity to prevent dangerous reuse of injection equipment.

Unsafe injections cause many infections of bloodborne pathogens. Other sources of such infections include:

- Transfusion of unsafe blood or blood products;
- Unsafe percutaneous or permucosal procedures.

Thus, injection safety strategies should be integrated within a national strategy to prevent exposure to bloodborne pathogens from all sources.

CHAPTER 3

INFECTION PREVENTION AND CONTROL PRACTICES

The infection prevention and control (IPC) practices described in this chapter are intended for use in all types of health facilities in Tanzania.

IPC in health facilities has four primary objectives:

- To prevent nosocomial infections in patients/clients;
- To protect health workers from occupational infections;
- To protect communities from infectious diseases;
- To prevent the environment from pollution.

Teaching health workers (HWs) how to protect themselves, their patients/clients and the community is very important. If HWs know how to protect themselves and consistently use these measures, they will help protect their patients/clients and the community as well.

General Objectives

At the end of this chapter, participants will be able to:

- Describe the fundamentals of IPC;
- Understand processes in IPC;
- Describe how to prevent nosocomial infections.

3.1 Fundamentals of Infection Prevention and Control

3.1.1 Disease Transmission Cycle and Standard Precautions

Specific Objectives

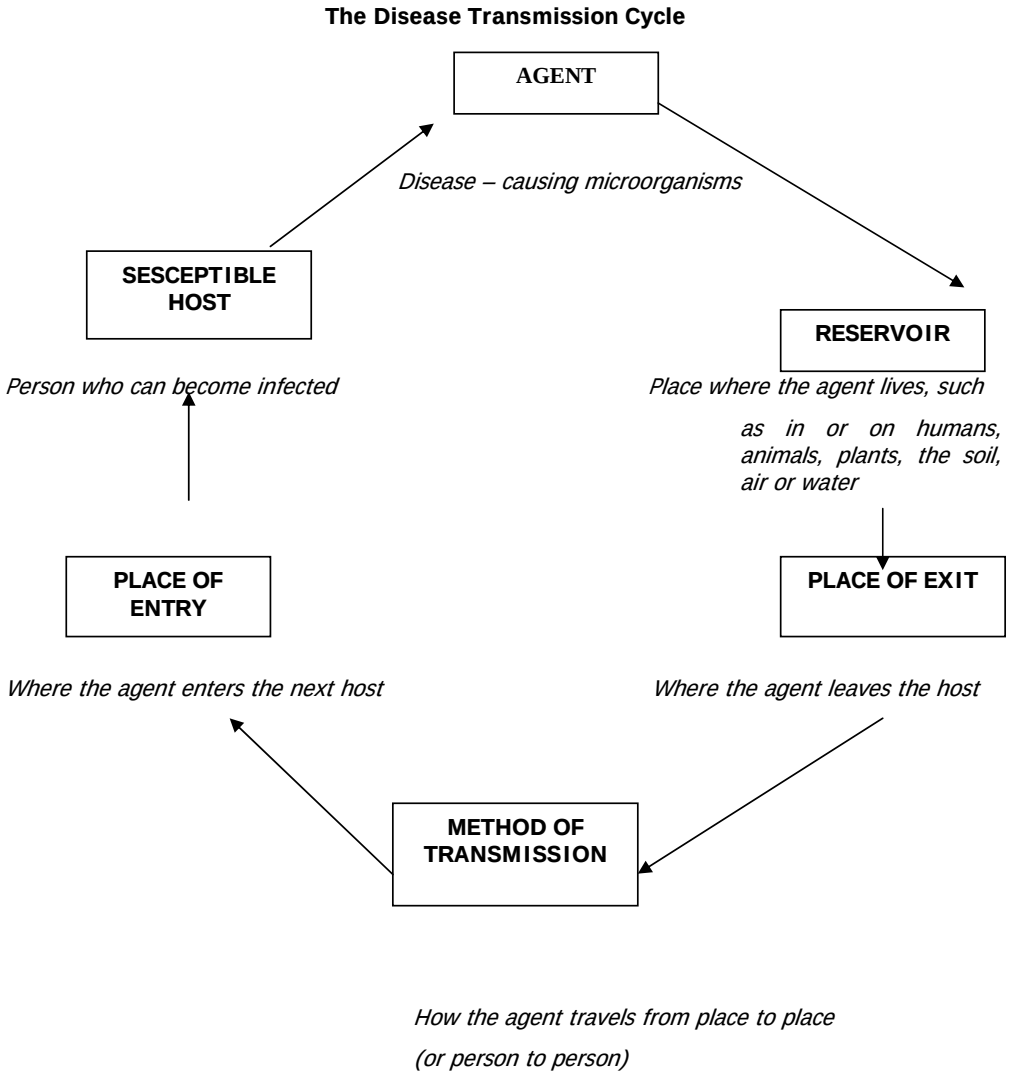
At the end of this topic, participants will be able to:

- Describe disease transmission cycle;
- Explain modes of transmission of diseases;
- Explain standard precautions;
- Outline the rationale of standard precautions;
- Describe key components of standard precautions.

Disease Transmission Cycle

For bacteria, viruses and other infectious agents to successfully survive and spread, certain factors and conditions must exist. The essential factors for the transmission of disease(s) are illustrated in Figure 3.1.

Figure 3.1: Disease Transmission Cycle



Elements of disease transmission include:

- **Agent** - Disease producing microorganisms;
- **Reservoir** - Place where the agent lives such as in or on humans, animals, plants , the soil, air or water;
- **A place of exit** - where the agent leaves the host;

- **Method of transmission** - how the agent travels from place to place or person to person;
- **Place of entry** - where the agent enters the next host;
- **Susceptible host** - a person who can become infected.

Modes of Disease Transmission

(a) Contact

This is the most important and most frequent mode of transmission of nosocomial infection and is divided into two subgroups:

- *Direct Contact:* physical transfer of microorganisms between an infected or colonized person and a susceptible host, for example, touching an open wound or draining pustule;
- *Indirect Contact:* involves contact of a susceptible host with a contaminated intermediate object, usually inanimate, such as contaminated instruments, needles or dressings, or contaminated hands and gloves.

(b) Droplet

This occurs when droplets containing microorganisms generated from the infected person are propelled a short distance through the air and deposited on the host's conjunctivae, nasal mucosa, or mouth. For transmission to occur, the source and the susceptible host need to be within approximately one meter (3 feet) of one another. Droplets are generated from the source person primarily when coughing, sneezing and talking. (i.e., influenza, rubella viruses, and corynebacterium diphtheriae).

(c) Airborne

This occurs by dissemination of either airborne droplet nuclei (small-particle residue) of evaporated droplets containing micro-organisms that remain suspended in the air for long periods of time, or dust particles containing the infectious agent, (i.e., TB, chicken pox and measles).

(d) Common Vehicle

Applies to microorganisms transmitted by contaminated items such as foods, water, injections/intravenous solutions, blood (i.e., HBV, HCV, HIV, salmonella and shigella species).

(e) Vector-borne

This refers to transmission by pathogen carrying organisms, (i.e., mosquitoes, flies, rats and other vermin transmitting microorganisms).

Standard Precautions

Definition

Standard precautions are a simple set of effective practice guidelines (creating a physical, mechanical or chemical barrier) to protect health workers and patients/clients from a range of infections, including from bloodborne pathogens. The practices are used when caring for all patients/clients, regardless of diagnosis.

They apply to blood, all body fluids, secretions and excretions (except sweat), non-intact skin and mucous membranes. Because no one really knows what organisms clients or patients may have at any time, it is essential that standard precautions be used at all times.

The following actions create protective barriers for preventing infections in clients, patients and health worker and provide the means for implementing standard precautions:

- **Consider every person** (patient or staff) as potentially infectious and susceptible to infections;
- **Hand hygiene** including hand washing, hand antisepsis, antiseptic hand rub and surgical hand scrub
- **Personal protective equipment** (PPE) including gloves, masks, goggles, caps, gowns, boots and aprons;
- **Appropriate handling** of sharps, patient care and resuscitation equipment, linen, patient placement and patient environmental cleaning;
- **Safe disposal of infectious waste materials** to protect those who handle them and prevent injury or spread to the community;
- **Processing instruments** by decontamination, cleaning and then either sterilization or high-level disinfection (HLD) using recommended procedure.

Proper infection prevention practices are fundamental to quality of care. A safe work environment is essential to protect health workers, patients and communities. Standard precautions break the disease transmission cycle in one of four ways by:

- Reducing the number of infection-causing microorganisms present (i.e., through hand hygiene, cleaning instruments and prepping skin prior to IV insertion);
- Killing or inactivating infection-causing microorganisms (i.e., through hand hygiene with an antiseptic or a waterless alcohol preparation or reprocessing instruments);

- Creating barriers to prevent infectious agents from spreading (i.e., through wearing personal protective equipment or covering mouth when sneezing);
- Reducing or eliminating risky practices (e.g., by passing sharps using hands-free technique, using disposable gloves instead of none and disposing of syringes at point of use).

3.1.2 Hand Hygiene

Specific Objectives

At the end of this topic, participants will be able to:

- Define hand hygiene and hand washing
- Describe the classification of hand hygiene
- Describe hand hygiene practices
- Explain how to improve hand hygiene practices.

Hand Hygiene

This is a set of practices intended to prevent hand-borne infections by removing dirt and debris and inhibiting or killing microorganisms on skin. Failure to perform appropriate hand hygiene is considered to be the leading cause of nosocomial (hospital or health facility acquired) infections and the spread of multi-resistant microorganisms and has been recognized as a significant contributor of outbreaks.

Types of Hand Hygiene

There are four types of hand hygiene:

- Routine hand washing;
- Hand antisepsis;
- Antiseptic hand rub;
- Surgical hand scrub.

Routine Hand Washing

This is the process of mechanically removing soil and debris from the skin of hands using liquid soap and running water. The purpose is to remove dirt, organic material and transient micro-organisms from the skin. Four elements are essential for effective hand washing:

- Soap;
- Running water;
- Friction;
- Drying.

Technique of Hand Washing

1) Turn on the tap
2) Wet hands thoroughly under running water to at least 4 inches above the wrist.
3) Soap hands adequately
4) Rub hands vigorously back and front, in between fingers up to and including the wrist. This should take about 10 - 15 seconds
5) Rinse under clean running water until all traces of soap are removed
6) Dry hands from tip of fingers to wrist with paper towel. If towels are not available, shake off excess water and allow hands to air-dry.
7) Use same paper towel to turn off tap if tap is not elbow or pedal controlled

Figures 3.2 and 3.3 show demonstration of skills in hand hygiene.[13]

[13] WHO. 2005. *Guidelines on Hand Hygiene in Health Care (Advanced Draft): A Summary.* WHO: Geneva

Figure 3.2: Handwashing Techniques With Soap and Water

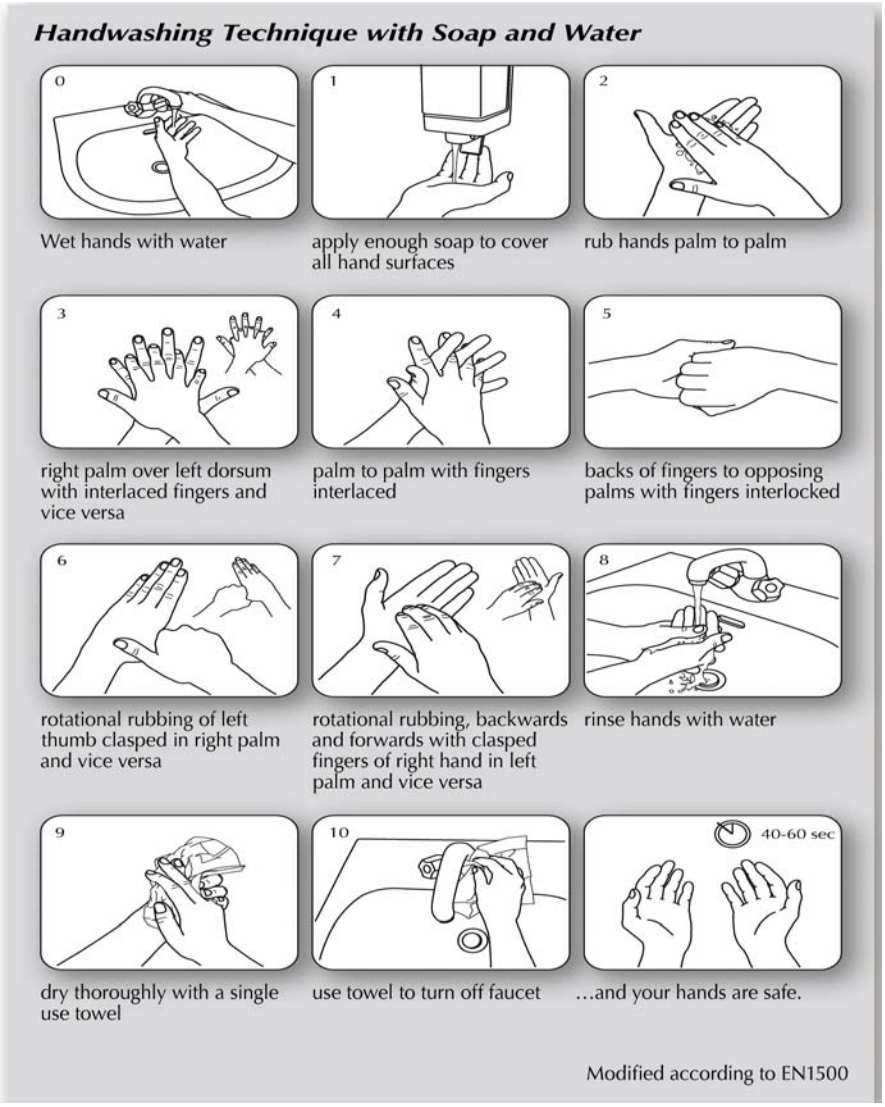
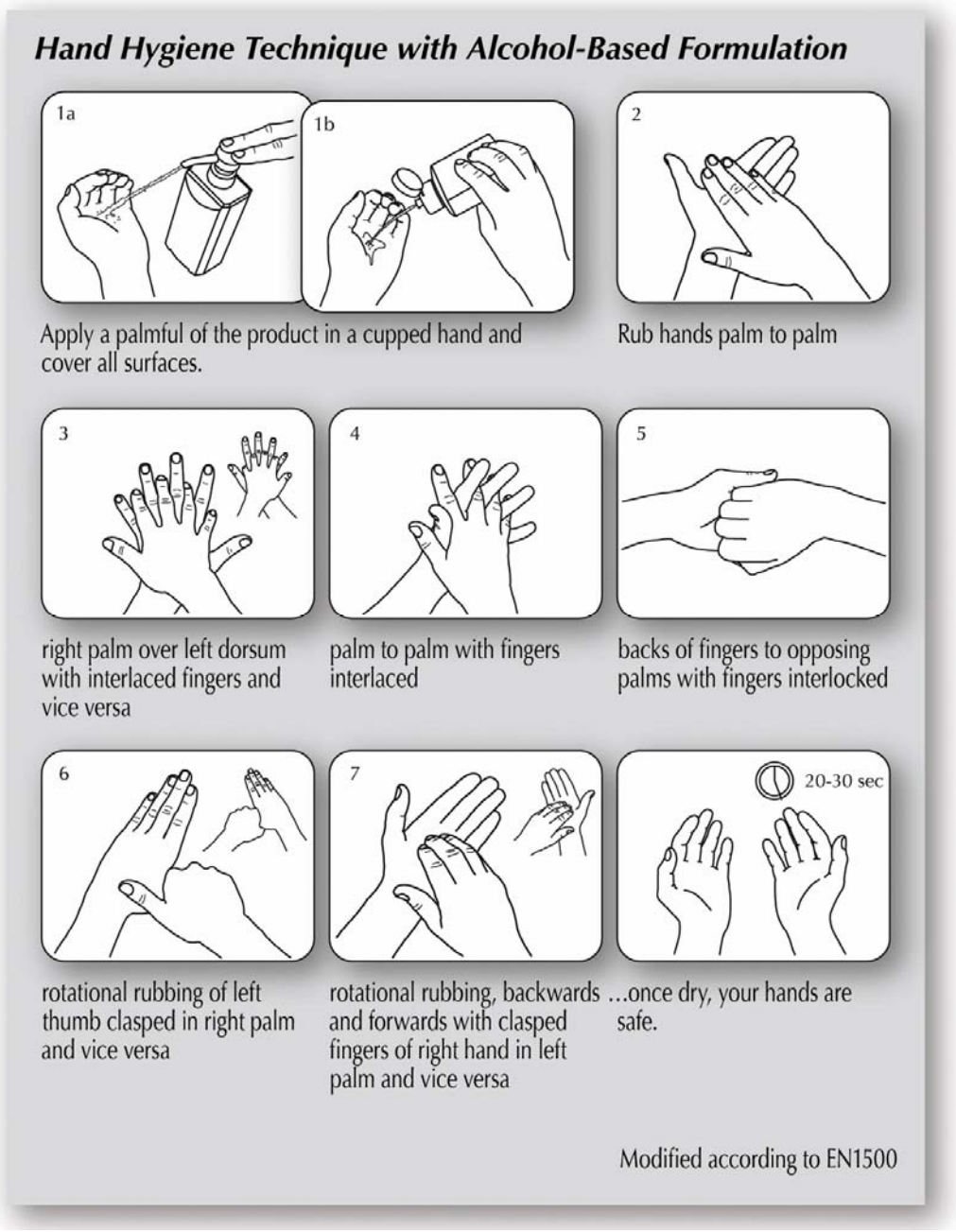


Figure 3.3: Demonstration of the Skills In Hand Hygiene with Alcohol-Based Formulation



When should hand washing be done?

- Before and after eating, before contact with each patient and before work;
- Whenever there is a chance of contamination;
- Before putting on gloves for performing clinical procedures (i.e., insertion of intrauterine device (IUD));

- Between certain procedures on the same patient where soiling of hands is likely, to avoid cross-contamination of body sites;
- After touching blood, body fluids, secretions, excretions, exudates from wounds
- After contact with items known or considered likely to be contaminated with blood, body fluids, secretions, or excretions (e.g., bedpans, urinals, wound dressings) whether or not gloves are worn
- After gloves are removed
- Before medication preparation.

Hand Antisepsis

The goal of hand antisepsis is to remove transient microorganisms, dirt and kills or inhibits the growth of resident microorganisms, such as:

- When there is heavy microbial contamination;
- Before performing invasive procedures, (e.g., the placement and care of intravascular devices, indwelling urinary catheters);
- Before contact with patients who have immune defects, damage to the skin (e.g., burns, wounds) and percutaneous implanted devices, (e.g., central venous canula);
- Before and after direct contact with patients who have antimicrobial resistant organisms.

Commonly Used Antiseptics

- Alcohol-based solutions (tincture of iodine or chlorhexidine);
- Alcohol (60 – 90% ethyl, isopropyl or 'methylated spirit);
- Chlorhexidine gluconate (2-4%) (e.g., Hibitane, Hibiscrub);
- Chlorhexidine gluconate and cetrimide, various concentrations at least 2% (e.g., Savlon);
- Iodine (3%);
- Aqueous iodine and alcohol-containing (tincture of iodine) products.

The technique for hand antisepsis is similar to that for routine hand washing but instead of plain soap, antiseptic agent is used.

Antiseptic Hand Rub

Antiseptic hand rub kills or inhibits the growth of most transient and resident micro-organisms but does not remove dirt. Can be used when:

- Hand washing with soap and running water is not possible, as long as hands are not visibly soiled with dirt, blood, or other organic material.

- If hands are visibly soiled or contaminated with blood and body fluids, hand washing with liquid soap and running water should be done first.

Steps in Performing Hand Rub

Step 1: Apply enough antiseptic hand rub to cover the entire surface of hands and fingers.

Step 2: Rub the solution vigorously into hands (15 – 30 seconds), especially between fingers and nails, until dry.

How To Prepare Antiseptic Hand Rubs Solution (Alcohol-based)

A non-irritating antiseptic hand rub can be made by adding 2 mls of glycerin, propylene glycol or sorbitol in 100 mls of 60 - 90% ethyl alcohol or isopropyl alcohol.

Surgical Hand Scrub

Scrubbing with antiseptic before beginning surgical procedures will help prevent the growth of micro-organisms for a long period of time.

Technique

1) Remove hand-worn jewelry; (e.g., rings, watches, bracelets)
2) Turn on tap;
3) Wet hands and arms up to the elbow under clean running water, always holding hands with fingers-up in a vertical position. Apply antiseptic/ soap generously;
4) Using a circular motion to avoid abrasions, begin at the fingertips of one hand and lather and wash between the fingers, continuing from fingertips to elbow. Continue washing for 3-5 minutes;
5) Wash surfaces between fingers, sides of hands, tips of fingers, palms and dorsum of hands up to the elbow of one arm;
6) Repeat procedure for the second hand and arm;
7) Rinse each arm separately, fingertips first, holding hands above the level of the elbow;
8) Dry hands in fingers-up vertical position with a sterile towel. Wipe from the fingertips to the elbow.

Apply 5 ml. of a waterless, alcohol-based hand rub to hands, fingers and forearms and rub until dry. Repeat application, rubbing 2 more times for a total of at least 2 minutes and using a total of 15ml of hand rub.

How to Improve Hand Washing Practices

- Provision of adequate water supply and liquid soap and antiseptics;
- Provision of health facilities with running water;
- Creating awareness of health workers of all health professions on the importance of improving hand washing practices through:
  - Wide dissemination of current guidelines for hand hygiene practices;
  - Involvement of everyone at the health facility ;
  - Use successful educational techniques including monitoring and positive feedback;
  - Use participatory performance improvement approaches targeting all healthcare staff to promote compliance.

3.1.3 Personal Protective Equipment (PPE)

Specific objectives

At the end of this topic, participants will be able to:

- Define personal protective equipment
- Describe the various types of PPE
- Explain how PPE helps prevent the spread of microorganisms.

Definition

Personal protective equipment is a mechanical barrier that helps to prevent the spread of microorganisms from:

- Person-to-person (patients, healthcare clients or health worker);
- Equipment, instruments and environmental surfaces to people.

Various Types of Personal Protective Equipment

Personal protective equipment includes:

(a) Gloves

Gloves protect hands from infectious materials and protect patients from microorganisms on staff members' hands. They are the most important mechanical barrier for preventing the spread of infection as well as needlestick and sharp injuries.

Types of gloves

There are three types of gloves:

- *Sterile surgical single use gloves*: used for invasive procedures. This includes elbow length gloves;
- *Non-sterile disposable gloves*: examination gloves for single use (e.g., insertion of suppositories, etc.);

- *Heavy duty/utility gloves*: used for decontamination of large equipment, cleaning of floors, walls, health facility furniture, in the laundry etc. These gloves can be re-used after cleaning. They specifically protect health workers from needlestick and sharps injuries.

Standard operating procedures for gloves

1. Gloves should be worn as additional measures, not as substitute for hand washing.
2. Gloves are not required for routine care activities in which contact is limited to a patient's intact skin.
3. Clean, non-sterile gloves should be worn:
   - For examination and non-surgical procedures.
   - For contact with blood, body fluids, secretions and excretions, mucous membranes, draining wounds or non-intact skin (open skin lesions or exudative rash)
   - For handling items visibly soiled with blood, body fluids, secretions or excretions
   - When the health worker has non-intact skin on his/her hands
   - When inserting an intravenous line.
4. Sterile surgical gloves should be worn for surgical and invasive procedures.
5. Gloves should be changed between care activities and procedures with the same patient after contact with materials that may contain high concentrations of microorganisms.
6. Gloves should be removed before moving to another patient or after completion of specific task.
7. Hands should be washed and dried immediately after removing gloves.
8. With exception of utility gloves other gloves should not be washed, decontaminated and reused.
9. Gloves should not be worn while walking in corridors and traveling in elevators.
10. Never use gloves while opening doors, writing, handling phones and books/files or any other object not related to the task being performed.

(b) Gowns

Gowns are materials that keep blood and other body fluids off the skin of personnel, particularly in operating, delivery and emergency rooms. Health workers can wear a plastic or rubber apron underneath gown to prevent contact between skin and blood and body fluids.

Standard operating procedures for gowns

- Gowns should be used for protective isolation.
- Gowns should not be worn outside the area for which they are intended.
- Gowns should be worn to protect uncovered skin and to prevent soiling of clothing during procedures and patient care activities likely to generate splashes or sprays of blood, body fluids, secretions, or excretions. Plastic aprons are recommended where splashes are likely to occur.
- Clinical coats and scrub suits (These clean clothes should remain in the working place as their transfer increases the risk of infection to environments outside the health care facility.)
- If large spills occur, the best things to do is shower or bathe as soon after completing the procedure as possible.

Note: The unnecessary use of gowns is not recommended.

(c) Masks and Respirators

Masks are worn in an attempt to contain moisture droplets expelled as health workers or surgical staff speak, cough or sneeze (droplet precautions), as well as to prevent accidental splashes of blood or other contaminated body fluids from entering the health worker's nose or mouth. They should be large enough to cover the nose, lower face, jaw and all facial hair (to contain it). If not made of fluid-resistant materials, masks are not effective in preventing the latter very well.

Respirators are specialized types of masks, called particulate respirators (such as N-95) that are recommended for situations in which filtering inhaled air is considered important (e.g., for the care of a person on airborne precautions). They contain multiple layers of filter material and fit the face tightly so that no air leaks around the mask when breathing

Types of Masks

There are three types of masks:

- *The tie-back mask*, which has four ties to fasten the mask around the mouth and nose;

- *The ear-loop mask* is similar to the tieback mask except that it has two elastic bands use for fastening;
- *Surgical masks* with attached faced shields to help provide a protective barrier against splashes and spatters of blood or other potentially infectious material are also available.

These masks are fluid resistant, lightweight, and are adequate for most procedures and isolation precautions in which the use of mask is indicated.

Standard Operating Procedures for Masks and Respirators

Masks should be worn where appropriate to protect the mucous membranes of the nose and mouth of service providers during procedures and patient care.

A surgical mask becomes ineffective as a barrier if its integrity is damaged or if it becomes wet (i.e., from perspiration, or if splashed with blood or other potentially infectious material). If this occurs, remove mask and replace with a new one.

(d) Caps

Caps are used to keep the hair and scalp covered so that flakes of skin and hair are not shed into the wound during surgery. Caps should be large enough to cover all hair. While caps provide some protections to the patient, their primary purpose is to protect the health workers from blood and body fluid splashes and sprays.

(e) Protective Eyewear

Eyewear protects staff in the event of an accidental splash of blood or other body fluid by covering the eyes. Eyewear includes clear plastic goggles, safety glasses, face shields and visors.

Types of eyewear

- Plastic glasses with solid side shields
- Goggles
- Masks with clear visors
- Chin-length face shields.

Standard operating procedures for eyewear

1. Protective eyewear should be worn where appropriate to protect the mucous membranes of the eyes during procedures and patient care

activities likely to generate splashes or sprays of blood, body fluids, secretions, and excretions;

- Use protective eyewear that is appropriate for the particular procedure.
- If plastic eyewear or goggles are visibly soiled with blood or other potentially infectious materials, then decontamination, cleaning and disinfection is required;
- Single use protective barriers should be discarded into the appropriate receptacle(s);
- Re-usable protective barriers should be decontaminated, cleaned, and disinfected, according to the appropriate guidelines;
- Wash hands and dry them after removal of protective barriers.

(f) Boots (Footwear)

Boots are worn to protect feet from injury by sharp or heavy items or fluids that may accidentally fall or drip on them.

Standard operating procedures for boots

1. Rubber boots or leather are recommended because they protect more and they may be kept clean and free of contamination from blood or other fluid spills.
2. Shoe covers are unnecessary if clean, sturdy shoes are available for use in surgical area.

(g) Apron

Aprons made of rubber or plastic provide a waterproof barrier along the front of the health workers body and should also be worn during procedures where the likelihood of splashes or spillage of blood, body fluids, secretions or excretions is likely. When conducting deliveries and surgeries, mackintosh or plastic aprons are usually used to protect clothing or surfaces from contamination.

If used appropriately, the above PPEs will protect both patients and service providers from different disease transmitting microorganisms. Table 3.1 shows how the PPEs block the spread of microorganisms.

Table 3.1: How PPEs Block the Spread of Microorganisms

Where Microorganisms Are Found	How Microorganisms Are Spread	Barriers to Stop the Spread of Microorganisms	Who the Barrier Protects
Healthcare staff			
Hair and scalp	Shedding skin	Cap	Patient
Nose and mouth	Coughing, talking, and sneezing	Mask	
Body and skin		Scrub suit, cover gown	Patient
Hands		Gloves, hand washing, or waterless antiseptic hand rub	Patient
Patients' mucous membranes and non intact skin	Touching	Gloves	Patient and staff
	Splashing/spraying	Gloves, eyewear, mask, drapes, apron	Staff
Patients' blood and body fluids	Touching	Footwear, utility gloves	Staff/ community
Patients' unprepared skin	Accidental exposure with needles and scalpels	decontamination	
Clinic or hospital environment	Touching	Gloves, hand washing and dressing	Staff and their family

3.1.4 Antiseptics and Disinfectants

Specific objectives

At the end of this topic, participants will be able to:

- Describe the types and uses of antiseptics and disinfectants
- Outline the selection criteria, as well as dispensing and storage conditions of antiseptics and disinfectants
- Mention the general guidelines of antiseptics and disinfectants
- Describe the formulae for preparing dilute chlorine solution.

(a) Antiseptics

Definition

Antiseptics or antimicrobial agents (terms used interchangeably) are chemicals applied to the skin or other living tissue to inhibit or kill microorganisms (both transient and resident) thereby reducing the total bacterial count.

Antisepsis

Antisepsis is the process of reducing the number of microorganisms on skin, mucous membranes or other body tissue by applying an antimicrobial antiseptic agent

Types of Antiseptics

- 70-90% alcohol (ethyl, isopropyl or "methylated spirit");
- 2-4% chlorhexidine gluconate (Hibitane®, Hibiscrub®, Hibiclens®);
- chlorhexidine gluconate and cetrimide, various concentrations (Savlon®);
- 3% iodine; aqueous iodine and alcohol containing (tincture of iodine) products, 7.5 – 10% iodophors, various concentrations (Betadine® or Wescodyne®);
- 0.5-4% chloroxylenol (Para-chloro-metaxylenol or "PCMX") various concentrations (Dettol®);
- 0.2-2% triclosan.

Use of Antiseptics

- Hand hygiene;
- Skin preparation prior to surgical procedures;
- In cervical or vaginal preparations;
- Wound dressing.

Criteria for Selecting Antiseptics

- It should be safe
- Microbial activity should be known
- Should have instructions on how to use
- Should not have residual effect
- Cost effectiveness
- Acceptance by the government/Authority
- Disposal should not be hazardous to the community and environment
- Should be user-friendly.

Storing and Dispensing of Antiseptics

Contaminated antiseptics can cause subsequent infection when used for hand washing or preparing a client's skin. The following can prevent contamination of antiseptic solutions:

- Unless supplied commercially in small quantities, pour the antiseptic into a small, reusable receptacle for daily use. This prevents evaporation and contamination;
- Make sure receptacle is labeled with the correct name of the solution each time you refill it;

- Do not store gauze or cotton wool in antiseptics because this promotes contamination;
- Establish a routine schedule for preparing new solutions and cleaning reusable receptacles. The solution is at increased risk of becoming contaminated after 1 week of storage;
- Do not 'top off' antiseptic dispensers;
- Wash reusable receptacles thoroughly with soap and clean water, rinse with boiled water if available and drip dry before refilling.
- Label reusable receptacles with the date each time they are washed, dried and refilled;
- All receptacles should have lids which should be well tightened;
- Concentrated antiseptic solutions should be stored in a cool, dark area. Never store them in direct sunlight or in excessive heat (e.g., upper shelves in a tin-roofed building).

(b) Disinfectants

Definition

Disenfectants are chemicals that kill or inhibit all microorganisms except bacteria endospores on non-living (inanimate) objects.

There are three groups of disinfectants:

High –level disinfectants are substances that kill all bacteria, viruses, fungi, and mycobacterium tuberculosis. Some high–level disinfectants are also chemical sterilants and, given sufficient time, destroy bacterial endospores.

Examples of high-level disinfectants are:

- Glutaraldehydes 2% (cidex)
- Chlorhexidine 4%
- Cetrimide 5%
- Hydrogen peroxide 5%
- Chlorine 0.5%

Intermediate–level disinfectants kill bacteria and most viruses.
Examples are:

- Isopropyl 60-70%
- Ethanol 70- 90 %
- Methaylated spirit 60-90 %
- Iodines
- Povidine-iodine 2.5 %
- Formaldehyde 8 %

Note: Intermediate-level disinfectants are not recommended for use on blood and other potentially infectious materials because small non-lipid viruses

(e.g., enteroviruses) may be resistant. They can be used for some non-critical items or devices or on environmental surfaces.

Low-level disinfectants kill some bacteria, viruses and fungi, but does not kill tuberculosis causing microorganisms and bacterial endospores.

Examples are:

- Hydrogen peroxide 3 %
- Phenolics 1- 2 %
- Dettol
- Lysol 5%

Note: Low-level disinfectants should only be used to decontaminate the environmental surfaces, floor, furniture, walls. They must not be used for processing instruments and other items

Formula for Making Chlorine Solutions[14]

(a) Formula for Making a Dilute Solution from a Concentrated Solution

Check concentration (% concentrate) of the chlorine product you are using.

$$\text{Total Parts (TP) water} = \left[\frac{\%\,Concentrate}{\%\,Dilute}\right] - 1$$

Mix 1 part concentrated bleach with the total parts water required.

Example: Make a dilute solution (0.5%) from 3.5% concentrated solution

STEP 1: Calculate TP water: $\left[\frac{3.5\%}{0.5\%}\right] - 1 = 7 - 1 = 6$

STEP 2: Take 1 part concentrated solution and add to 6 parts water.

In countries where French products are available, the amount of active chlorine is usually expressed in degrees chlorum. One degree chlorum is equivalent to 0.3% active chlorine.

(b) Formula for making chlorine solutions from dry powders

[14] AVC International (1999). Infection Prevention Curriculum in Teachers Manual. New York Pg. 267

Check concentration (% concentrate) of the powder you are using.

$$\textbf{Grams/Litre} = \left[\frac{\%\ Dilute}{\%\ Concentrate}\right] x\ 1000$$

Mix measured amount of bleach powder with 1 liter of water.

Example: Make a dilute chlorine-releasing solution (0.5%) from a concentrated powder (35%).

STEP 1: Calculate grams/litre: $\left[\frac{0.5\%}{35\%}\right] x\ 1000 = 14.2\ g/L$

STEP 2: Add 14.2 grams (≈ 14 g) to 1 litre of water.

When bleach powder is used, the resulting chlorine solution is likely to be cloudy (milky).

Factors affecting the performance of disinfectants

- Nature of the items to be disinfected;
- Number of the microorganisms present (a high number of microorganisms requires more time for disinfection);
- Resistance of microorganisms (some microorganisms are more resistant to disinfections than others, e.g., bacterial spores, mycobacterium, hydrophilic viruses, fungi, vegetative bacteria lipid viruses;
- Types and concentration of disinfectant used;
- Presence of organic materials;
- Duration of the exposure and temperature;
- Rough surface (having crevices, lumen, hinges) need a longer time for disinfection.

Choosing Disinfectant

Disinfectant chosen should be:

- Bactericidal not bacteriostatic;
- Active against a wide range of microorganisms;
- Not readily inactivated by organic mater (i.e. stable when in contact with organic matter);
- Rapid activity;
- Non-toxic;
- Non-corrosive;

- Non-damaging to equipment and substances treated;
- Cost-effective and available.

Instructions/guidelines For the Use of Disinfectants

- Follow the manufactures' instructions and ensure that the correct (optimum) dilution is used;
- Check expiry date of the solution, the date should be clearly marked on the receptacles;
- Disinfectant must be thoroughly cleaned or sterilized before refill between uses, NEVER TOP UP;
- Disinfectants must not be used to sterilize instruments or equipment (unless specified in the disinfectant policy, (e.g., endospores));
- Disinfectant should be supplied preferably ready for use from pharmacy (new stocks to be supplied on receipt of empty receptacles)
- Do not discard empty receptacles or use them to store other solutions. Chemicals can be harmful when used in the wrong situation;
- Open receptacles of disinfectant should not be tolerated in any healthcare environment there is a serious risk of contamination with multiple antibiotics-resistant bacteria such as *pseudomonas species* and spores;
- When disinfectants are designed for use in surfaces WIPE (do not wash bath or floor wash).

3.2 Processes in Infection Prevention and Control

An important objective of infection prevention and control is to minimize the level of microbial contamination in areas where patient care and instrument processing take place. These include processing instruments and linens, housekeeping, traffic flow and activity pattern and safe practices during surgical procedures.

3.2.1 Processing Instruments and Other Items

The basic infection prevention processes recommended to reduce disease transmission from soiled instruments and other reusable items are **decontamination, cleaning** and either **sterilization** or **high-level disinfection (HLD).** Regardless of the type of operative procedure, the steps in processing surgical instruments and other items are the same.

Specific objectives

At the end of this topic, participants will be able to:

- Define the terms decontamination, cleaning, high level disinfection, sterilization and central sterilization supplies department (CSSD);
- Describe different steps in processing instruments.

Definitions

Decontamination is a process that makes inanimate objects **safer** to handle by staff **before** cleaning (i.e., inactivates HBV, HCV and HIV and reduces the number of other microorganisms but does not eliminate them).

Cleaning is a process that physically removes all visible dust, soil, blood or other body fluids from inanimate objects as well as removing sufficient numbers of microorganisms to reduce risks for those who touch the skin or handle the object. It consists of thoroughly washing with soap or detergent and water, rinsing with clean water and drying.

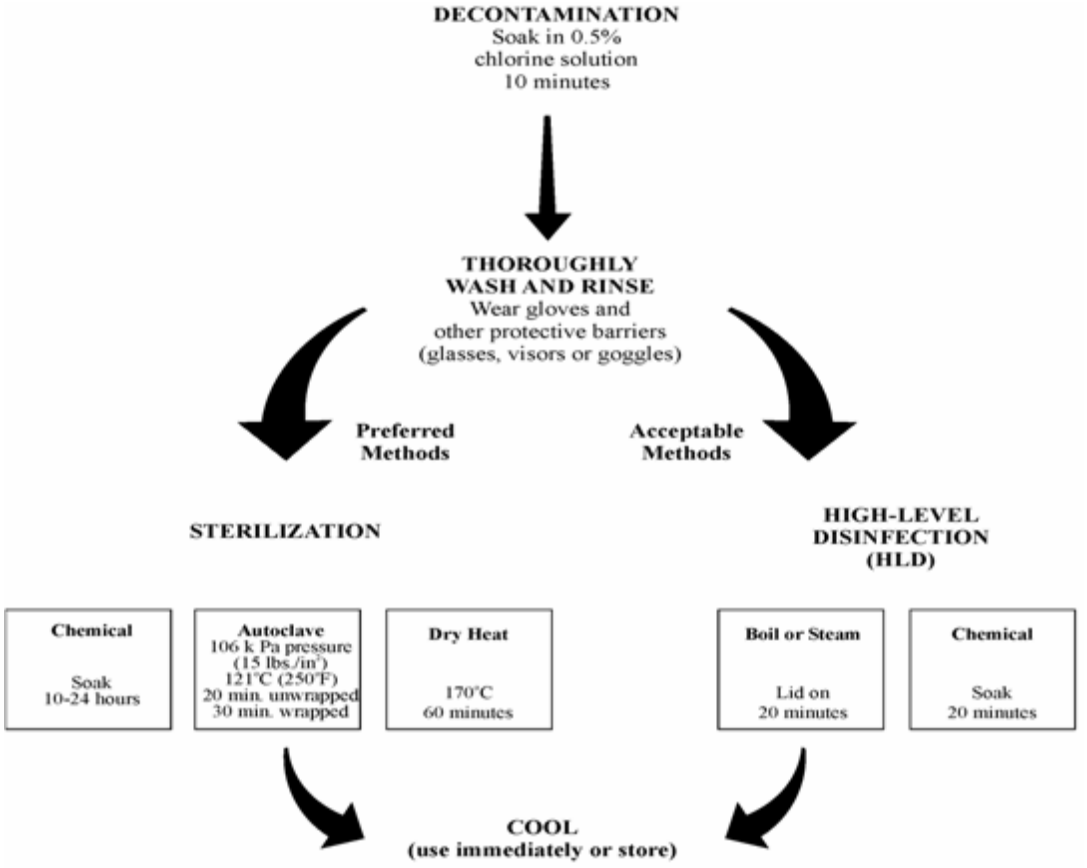
High-level disinfection (HLD) is a process that eliminates **all** microorganisms **except some** bacterial endospores from inanimate objects by boiling, steaming or the use of chemical disinfectants.

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

Central Sterilization Supply Department (CSSD) is an area where instruments and equipment are processed, and where staff should be specifically trained in handling, processing and storing instruments, equipment and other clean, sterile or HLD items.

The steps in processing instruments are summarized in Figure 3.4.

Figure 3.4: Major Steps in Processing Instruments



Decontamination is the first step in handling used instruments and other items. It is important to decontaminate instruments and objects that may have been in contact with blood or body fluids so that they are safer to handle for personnel who can clean them.

Decontamination Tips:

- Use a plastic receptacle for decontamination to help prevent:
  - Dulling of sharps (e.g., scissors) due to contact with metal receptacles;
  - Rusting of instruments due to a chemical reaction (electrolysis) that can occur between two different metals (i.e., the instrument and receptacle) when placed in water.
- Immediately after use, all instruments should be placed in an approved disinfectant such as 0.5% chlorine solution for 10 minutes to inactivate most organisms, including HBV, HCV and HIV;
- Do not soak metal instruments that are electroplated (i.e., not 100% stainless steel) even in plain water for more than an hour because rusting will occur;

- After decontamination, instruments should be rinsed immediately with cool water to remove visible organic material before being thoroughly cleaned;
- Large surfaces, such as operating or pelvic examination tables, that may have come in contact with blood and body fluids should be decontaminated by wiping with a suitable disinfectant such as 0.5% chlorine solution before reuse or when visibly contaminated. This is an easy, inexpensive way to decontaminate these large surfaces;
- Once instruments and other items have been decontaminated, they can safely be further processed. This consists of cleaning and finally either sterilization or high-level disinfection;
- Change the decontamination solution daily, or more often if necessary (change whenever it becomes dirty);
- The receptacle should be covered.

Cleaning is an effective way to reduce the number of microorganisms, especially endospores that cause tetanus, on soiled instruments and equipment. Neither sterilization nor HLD is effective without prior cleaning.

Use of soap is important for effective cleaning because water alone will not remove protein, oils and grease. Liquid soap is preferred to be used because it mixes more easily with water than bar or powdered soaps. In addition, liquid soap breaks up and dissolves or suspends grease, oil and other foreign matter in solution so that they can be removed more easily by the cleaning process.

Cleaning that follows decontamination can remove up to 90% of micro-organisms (bacteria, viruses, fungi and parasites) and is the best way to reduce the number of endospores, which cause tetanus and gangrene.

Cleaning should be done under the surface of the water, using liquid soap and friction to remove all organic material from instruments. After cleaning, rinse items in clean water until no detergent remains. This is followed by air-drying the items if possible. Remember to use heavy-duty gloves when cleaning instruments, and washing hands after removing gloves.

Care of All Instruments

- Those with moving parts should be lubricated after drying;
- Avoid oils that may protect bacteria during autoclaving (a water soluble lubricant is recommended (i.e, K-Y gel));
- Never use steel wool or abrasive powders on stainless steel instruments. Their use may seriously damage the corrosion resistant film of the instrument;
- Never label surgical instruments by impact marking. Striking any hardened instruments can cause stress and severe damage may result at a later date;

- Staining and spotting can be caused by condensation of water droplets on the surface, leaving slight mineral deposits;
- When instruments do stain in spite of all good care taken they can be cleaned by using a commercially available rust and stain remover.

New Instruments

- All new instruments are supplied without lubrication. It is recommended that all be carefully washed and dried and any moving part lubricated;
- Whenever cleaning, regardless of method, keep ratchets unlocked and box joints open;
- When instruments are no longer new, avoid as much as possible contact between stainless steel instruments and any of the following substances: barium chloride, aluminium chloride, bromide and iodine containing compounds(halogenated compounds).

Manual Cleaning of Soiled Instruments and Equipment

- When an operation is in progress do not drop instruments into a holding solution of disinfectant. If the instruments are not cleaned first, disinfectants, such as glutaraldehyde or alcohol, act as fixatives of any organic material present, making it difficult to remove;
- Instruments should not be soaked in saline, as they will become pitted;
- Dilute detergent properly according to suppliers' directions;
- Completely dismantle all items and leave instruments open;
- Use warm water, detergent and hard brush to completely remove the blood, tissue, food and other residue, paying special attention to small teeth of instruments and joints;
- Rinse with clean water to remove traces of detergent;
- Dry properly. Failure to remove water from trapped areas will cause corrosion;
- Consider the item contaminated when packaging is torn, damaged, wet, dropped on the floor or when the expiry date has passed.

Sterilization kills all micro-organisms, including bacterial endospores, it is therefore a preferable method than HLD for instruments and other items that will come in contact with the bloodstream or tissues under the skin.

High-level Disinfection (HLD) is the process that eliminates all micro-organisms (including bacteria, viruses, fungi and parasites) but does not reliably kill all bacterial endospores, which cause diseases such as tetanus and gas gangrene. HLD is suitable for instruments and items that come in contact with broken skin or intact mucous membranes.

HLD can be performed by boiling, soaking in chemicals or steaming.

HLD by Boiling

Step 1:

- Decontaminate and clean all items to be boiled;
- Open all hinged items and disassemble those with sliding or multiple parts;
- Completely submerge all items in the water in the pot or boiler;
- Place any bowls and receptacles upright, not upside-down, and fill with water.

Step 2

Cover the pot or close the lid on the boiler and bring the water to a gentle, rolling boil.

Step 3

When the water comes to a rolling boil, start timing for 20 minutes. Use a timer to make sure to record the time that boiling begins. From this point on, do not add or remove any water and do not add any items to the pot or boiler.

Step 4:

Lower the heat to keep the water at a gentle, rolling boil. If the water boils too vigorously it will evaporate and the items may become damaged if they bounce around the receptacle and hit the sidewalls and other items being boiled. Lower heat also saves fuel or electricity.

Step 5:

After 20 minutes, remove the items using dry, HLD pickups (lifters, cheatle forceps). Place the items on a HLD tray or in a HLD receptacle away from insects and dust.

An HLD tray or receptacle can be prepared by boiling it for 20 minutes or by filling it with a 0.5% chlorite solution and letting it soak for 20 minutes, then draining the chlorite solution and rinsing thoroughly with sterile water.

Step 6:

Allow to air-dry before use or storage

Step 7:

Use items immediately or keep them in a covered, sterile or a HLD receptacle for up to one week.

Never leave boiled items in water that has stopped boiling; they can become contaminated as the water cools down.

Tips for HLD by Boiling

- Items must be completely covered with water. Open all hinged instruments and disassemble items with sliding or multiple parts;
- Always boil for 20 minutes. Start timing when the water reaches a rolling boil. If you forget to start timing the procedure, start timing at the point at which you realize this;
- Do not add anything to or remove anything from the boiler once boiling begins.

HLD by Steaming

After instruments and other items have been decontaminated and thoroughly cleaned, they are ready for HLD by steaming.

Step 1:

Place instruments, plastic manual vacuum aspiration (MVA) cannulae and other items in one of the steamer pans with holes in its bottom. To make removal from the pan easier, do not overfill the pan.

Step 2:

Repeat this process until up to three steamer pans have been filled. Stack the filled steamer pans on top of a bottom pan containing water for boiling. A second empty pan without holes should be placed on the counter next to the heat source.

Step 3:

Place a lid on the top pan and bring the water to a full rolling boil. (When water only simmers, very little steam is formed and the temperature may not get high enough to kill microorganisms).

Step 4:

When steam begins to come out between the pans and the lid, start the timer or note the time on a clock and record the time in the HLD log.

Step 5:

Steam items for 20 minutes.

Step 6:

Remove the top steamer pan and put the lid on the pan that was below it (the pan now on top). Gently shake excess water from the pan just removed.

Step 7:

Put the pan just removed onto the empty pan. Repeat until all pans are restacked on this empty pan and the top pan is covered with the lid. (This step allows the items to cool and dry without becoming contaminated).

Step 8:

Allow items to air dry in the steamer pans (1 to 2 hours) before using.

Step 9:
Using a high-level disinfected forceps, transfer the dry items to a dry, high-level disinfected receptacle with a tight-fitting cover. Instruments and other items can also be stored in the stacked and covered steamer pans as long as a bottom pan (without holes) is used.

HLD by Chemicals

Step 1
Decontaminate, clean, and thoroughly dry all instruments and other items to be processed. Water from wet items will dilute the chemical solution, thereby reducing its effectiveness.

Step 2
When using glutaraldehyde solution: prepare the solution according to the manufacturer's instructions. Ideally, an indicator strip should be used each time the solution is used to determine if the solution is still effective. After preparing the solution, place in a clean receptacle with a lid. Mark the receptacle with the date the solution was prepared and the date it expires.

When using a chlorine solution: prepare the 0.5% chlorine solution as described. Fresh solution should be made each day or more often if the solution becomes cloudy. Put the solution in a clean receptacle with a lid.

Step 3
Open all hinged items and disassemble those with sliding or multiple parts. The solution must contact all surfaces in order for HLD to be achieved. Completely submerge all items in the solution. All parts of the items should be under the surface of the solution. Place any bowls and receptacles upright, not upside-down, and fill with the solution.

Step 4
Cover the receptacle, and allow the items to soak for 20 minutes. Do not add or remove any instruments or other items once timing has begun.

Step 5
Remove the items from the solution using dry, HLD pickups (lifters, cheatle forceps).

Step 6
Rinse thoroughly with sterile water to remove the residue that chemical sterilants leave on items. This residue is toxic to skin and tissue.

Step 7
Place the items on an HLD tray or in an HLD receptacle and allow air-drying before use or storage. Use items immediately or keep in a covered, dry HLD receptacle and use within one week. HLD tray or receptacle can be prepared by boiling it for 20 minutes or by filling it with a 0.5% chlorine solution and letting it soak for 20 minutes, then draining the chlorine solution and rinsing thoroughly with boiled water.

Tips for HLD by Chemicals

- Items must be completely covered with solution;
- Open all hinged instruments and disassemble items with sliding or multiple parts;
- Soak for 20 minutes. If you forget to start timing, start at the point at which you remember;
- Do not add or remove anything once timing begins;
- Rinse items thoroughly with boiled water;
- Antiseptics should never be used for HLD.

Sterilization protects patients by eliminating all micro-organisms (bacteria, viruses, fungi, and parasites), including bacterial endospores, from instruments and other items. Sterilization is recommended for instruments and other items that will come in contact with the bloodstream or tissues under the skin, as well as on draped and some surgical attire.

Sterilization can be performed using:

- High pressure steam (autoclaving);
- Dry heat (oven);
- Soaking in chemicals (cold sterilization).

Chemical sterilization is the alternative where heat cannot be used, (e.g., ethylene oxide and glutaraldehyde).

Sterilization by Heat

Sterilization by autoclaving and dry heat is the most effective method of sterilization and reliable if monitored carefully. It is also cheaper than chemical methods or irradiation. It should be considered first for all medical equipment that can withstand heat.

A. Dry Heat

Time/Temperature

- 1 hour at 170°C
- 2 hours at 160°C
- 2½ hours at 150°C
- 3 hours at 140°C

B. Steam heat

Time: 20 minutes (or 30 minutes if wrapped)
Temperature: 121°C
Pressure: 106 kPa (15 lb/sq inch)

C. Sterilization by chemicals

Chemical sterilization method is used for instruments and other items that are heat-sensitive or when heat sterilization is not available.

Step 1
Decontaminate, clean, and thoroughly dry all instruments and other items to be sterilized. Water from wet instruments and other items dilutes the chemical solution, thereby reducing its effectiveness.

Step 2
Prepare the glutaraldehyde or other chemical solution by following the manufacturer's instructions or use a solution that was prepared previously, as long as it is clear (not cloudy) and has not expired. After preparing the solution, put it in a clean receptacle with a lid. Always mark the receptacle with the date the solution was prepared and the date it expires.

Step 3
Open all hinged instruments and other items and disassemble those with sliding or multiple parts, the solution must be in contact with all surfaces in order for sterilization to be achieved. Completely submerge all instruments and other items in the solution. Place any bowls and receptacles upright, not upside-down, and fill with the solution

Step 4
Follow the manufacturer's instructions regarding the time necessary for sterilization to be achieved. In general, if the solution contains glutaraldehyde (e.g., cidex), cover the receptacle, and allow the instruments and other items to soak for 8 to 10 hours. Do not add or remove any instruments or other items once time has begun.

Step 5
Remove the instruments and other items from the solution using large, sterile pickups (lifters, cheatle forceps).

Step 6

Rinse thoroughly with sterile water to remove the residue that chemical sterilants leave on instruments and other items; this residue is toxic to skin and tissues.

Step 7

To store, place the instruments and other items on a sterile tray or in a sterile receptacle and allow air-drying before use or storage. Use the instruments and other items immediately or keep in a covered, dry, sterile receptacle and use within one week.

Step 8

After processing, items should be used immediately or stored in such a way that they do not become contaminated. Proper storage is as important as proper processing.

Central Sterilization Supply Department (CSSD) is a semi-restricted area and consists of the following four areas:

- "Dirty" receiving/clean up area
- "Clean" work area
- Clean equipment storage area
- Sterile storage area

"Dirty" Receiving/clean-up Area is the place where soiled items are received, disassembled and washed, rinsed and dried. This area should have:

- A receiving counter
- Two sinks (if possible) with clean water supply
- A clean equipment counter for drying

"Clean" Work Area is the place where clean items are inspected for flaws or damage, packed (if indicated) and either sterilized or HLD and sent for storage as packed or air dried and placed in sterile or HLD receptacle. This area should have:

- A large work table
- Shelves for holding clean and packed items
- A high pressure steam sterilizer , a dry heat oven, a steamer or a boiler

Clean Equipment Storage Area is the place where clean equipment is stored on shelves (enclosed if possible). It should have an office desk for record keeping. CSSD staff should enter through this area.

Sterile Storage Area is the area where sterilized packs and covered sterile items are stored. This should be separate from the central sterile supply area.

3.2.2 Processing Linen

Specific Objectives

At the end of this topic, participants will be able to:

- Define various terminologies used in processing linen;
- Describe different steps in processing linen.

In processing linen, staff should be appropriately trained and regularly supervised to reduce the risk of contamination. Staff at each health facility should determine the best way to handle process and store linens.

Definitions

Linen: Cloth items used by housekeeping staff, other health workers and patients/clients (bedding, towels, cleaning cloths, gowns, caps, masks, scrub suits, surgical gowns, drapes and wrappers).

Soaps or detergents (terms used interchangeably): Cleaning products that lower surface tension, thereby helping remove dirt, debris and transient microorganisms from linen, (e. g. liquid and powder soap).

Sorting: The process of inspecting and removing foreign, and in some cases dangerous, objects (i.e., sharps or broken glass), from soiled linen before washing. This step is extremely important because soiled linen from the operating room or clinic occasionally contains sharps (e.g., scalpels, sharp-tipped scissors, hypodermic and suture needles and towel clips).

Soiled linen: Visibly dirty linen from multiple sources within the hospital or clinic that has been collected and brought to the laundry for processing. All items, regardless of whether or not they are visibly dirty or have been used in a surgical procedure, must be washed and dried in laundry.

Note: Staff responsible for washing soiled items should wear utility gloves, protective eyewear, plastic or rubber aprons and protective foot wear.

Collecting and Transporting Soiled Linen

Soiled linen should be collected after invasive medical or surgical procedures or when changing linen in patient rooms.

- Collect used linen in cloth or plastic bags or receptacles with lids. If linen is heavily contaminated with blood or body fluids, carefully roll the contaminated area into the center of the linen and place in a leak-proof bag or receptacle with a lid;
- Cloth bags are adequate for the majority of patient care linen and require the same processing as their contents;

- Handle soiled linen as little as possible and do not shake it. This helps prevent spreading microorganisms to the environment, personnel and other patients;
- It is not necessary to double-bag or use additional precautions for used linen from patients in isolation;
- Do not sort and wash soiled linens in patient-care areas (CDC, 1988; OSHA, 1991; National IPC Guidelines, 2004);
- Collect and remove soiled linen after each procedure daily, or as needed, from patients' rooms;
- Transport collected soiled linen in closed, leak-proof bags, receptacles with lids or covered carts to the processing area daily or more often as needed;
- Transport soiled linen and clean linen separately. If there are separate carts or receptacles available for soiled and clean linen, they should be labeled accordingly. If not, thoroughly clean the receptacles or carts used to transport soiled linen before using them for clean linen.

Sorting Soiled Linen

The processing area for soiled linen must be separate from other areas, such as those used for folding and storing clean linen, patient care and food preparation. There should be adequate ventilation and physical barriers (walls) between the clean and soiled linen areas.

Sorting must be carefully performed because soiled linen (large drapes and towel drapes) from the operating room or other procedure areas occasionally contain sharps (e.g., scalpels, sharp-tipped scissors, hypodermic and suture needles and sharp-tipped towel clips). In addition, bedding from patients' rooms may contain soiled dressings and be bloodstained or wet with other body fluids.

Laundering Linen

All linen items (i.e., bed sheets, surgical drapes, masks, gowns) used in the direct care of a patient must be thoroughly washed before re-use.

- Soiled linen must be washed immediately to avoid staining;
- Decontamination prior to washing is not necessary, unless linen is heavily soiled and will be hand washed (repeat soaking of linen in chlorine, even dilute solutions, will cause the fabric to deteriorate more quickly);
- In addition, workers should not carry wet, soiled linen close to their bodies even if they are wearing a plastic or rubber apron.

Hand washing linen

Step 1
Wash heavily soiled linen separately from non-soiled linen.

Step 2
Wash the entire item in water with liquid soap to remove all soils, even if not visible. Use warm water if available. Add bleach (e.g., 30–60 mL, about 2–3 tablespoons, of 5% chlorine solution) to aid cleaning and bactericidal action. Add soap (a mild acid agent) to prevent yellowing of linen, if desired.

Step 3: Check the item for cleanliness. Rewash if it is dirty or stained.

Step 4: Rinse the item with clean water.

Machine Washing Linen

Step 1: Wash heavily soiled linen separately from non-soiled linen.

Step 2: Adjust the temperature and time cycle of the machine according to manufacturer's instructions and the type of soap or other washing product being used. Both cold and hot water washing cycles that include bleach reduce bacterial counts in the linen.

Storing, Transporting and Distributing Clean Linen

Storing Clean Linen

- Keep clean linen in clean, closed storage areas;
- Use physical barriers to separate folding and storage rooms from soiled areas;
- Keep shelves clean;
- Handle stored linen as little as possible.

3.2.3 Housekeeping

Specific objectives

At the end of this topic, participants will be able to:

- Define terms used in housekeeping;
- Outline criteria in selecting cleaning solution;
- Explain various cleaning methods;
- Describe housekeeping procedures for specific areas.

Definitions

Housekeeping: Refers to the general cleaning of the health facility environment, which includes floors, walls, tables and other surfaces.

Cleaning solution: Any combination of soap (or detergent) and water, with or without a chemical disinfectant, used to wash or wipe down environment surfaces such as floors, chairs, bench, walls and ceilings.

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

Soaps and detergents (terms used interchangeably): Cleaning products (bar, liquid, or powder) that lower surface tension, thereby helping remove dirt, debris and transient microorganisms from hands. Plain soaps require friction (scrubbing) to mechanically remove microorganisms; antiseptic (antimicrobial) soaps kill or inhibit the growth of most microorganisms.

Importance of Housekeeping

General housekeeping is important in order to:

- Reduce the number of microorganisms that comes in contact with clients or staff;
- Prevent accidents caused by slippery floor following spillage of either body fluids or solutions;
- Provide a pleasant atmosphere.

General Principles for Hospital Cleaning

- Scrubbing (frictional cleaning) is the best way to physically remove dirt, debris and microorganisms;
- Cleaning is required prior to any disinfection process because dirt, debris and other materials can decrease the effectiveness of many chemical disinfectants;
- Cleaning products should be selected on the basis of their use, efficacy, safety and cost;
- Cleaning should always progress from the least soiled areas to the most soiled areas and from high to low areas, so that the dirty areas and debris that fall on the floor will be cleaned up last;
- Dry sweeping, mopping and dusting should be avoided to prevent dust, debris and microorganisms from getting into the air and landing on clean surfaces. Airborne fungal spores are especially important as they can cause fatal infections in immunosupressed patients;

- Mixing (dilution) instruction should be followed when using disinfectants. (Too much or too little water may reduce the effectiveness of disinfectants);
- Cleaning methods and written cleaning schedules should be based on the type of surface, amount and type of soil present and the purpose of the area;
- Routine cleaning is necessary to maintain a standard of cleanliness. Schedules and procedures should be consistent and posted.

How to Select Cleaning Products

Different types of cleaning products are available, liquid soap and detergents, disinfectants, combinations (detergent and disinfectant), and each type has different properties. An ideal cleaning product should accomplish the following criteria:

- Suspension of fats (suspend fats in water);
- Saponification of fats (make fats water-soluble);
- Surfaction (decrease surface tension of water and allow greater penetration of the agent into the dirt or soil);
- Dispersion (break up of soil into small particles);
- Protein destruction (break up protein);
- Softening the water (removal of calcium and magnesium).

Cleaning methods

Common methods of cleaning are briefly described below:

Wet mopping: The most common and preferred method to clean floors. There are three techniques:

- **Single-bucket (basin) Technique**: One bucket of cleaning solution is used. The solution must be changed when dirty. (The killing power of the cleaning product decreases with the increased load of soil an organic material present);
- **Double-bucket Technique:** Two different buckets are used, one containing a cleaning solution and the other containing rinse water. The mop is always rinsed and wrung out before it is dipped into the cleaning solution. The double-bucket technique extends the life of the cleaning solution (fewer changes are required), saving both labour and material costs;
- **Triple-bucket technique:** The third bucket is used for wringing out the mop before rinsing, which extends the life of the rinse water;
- **Flooding**: Flooding followed by wet vacuuming is recommended in the surgical suite, if possible. Flooding is best done at night or at times when foot traffic is minimal;

- **Dusting**: The most commonly used method for cleaning walls, ceiling, doors, windows, furniture and other environmental surfaces.
  - Clean cloth or mop is wet with cleaning solution contained in a basin or bucket. The double-bucket system minimizes the contamination of the cleaning solution;
  - Dry dusting should be avoided and dust cloths and mops should never be shaken to avoid the spread of microorganisms;
  - Dusting should be performed in a systematic way, using a starting point as a reference to ensure that all surfaces have been reached;
  - When doing high dusting (ceiling tiles and walls), check for stains that may indicate possible leaks. (Leaks should be repaired as soon as possible because moist ceiling tiles provide a reservoir for fungal growth).

Remember: Cleaning should start with the least soiled area and move to the most soiled area and from high to low surfaces.

The schedule and procedures for specific areas is given in Table 3.2.

Table 3.2: Schedule and procedures for cleaning specific areas

Area/Surface	Frequency	Process
Floors	Twice daily or more as needed	Use a clean, wet mop and fresh detergent solution. A disinfectant cleaning solution should be used when contamination is present
Sinks	Daily or more often as needed	Scrub with a separated mop, cloth or brush and a disinfectant cleaning solution
Lamps, chairs, table and counters	Daily or when visibly dirty	Damp dusting – wipe with a cloth dampened in a fresh detergent solution
Walls, windows, ceilings and doors	Weekly or when visibly dirty	Clean using a damp cloth – wipe with a cloth dampened in a fresh detergent solution
Procedure and Examination Rooms	After every procedure, and whenever visibly soiled	Wipe horizontal (flat) surfaces, equipment, and furniture used for the procedures with a disinfectant cleaning solution. Linen or paper on the examination table should be changed after each patient. Clean blood or other body fluid spills as described below.
Toilets and latrines	Wash at least three times daily and as needed	Scrub frequently with separate mop, cloth or brush and a disinfectant cleaning solution (e.g., Harpic)
Operating room	At the beginning of every day	All flat (horizontal) surfaces (table, chairs, etc.) should be wiped with a clean, lint-free moist cloth to remove dust and lint that may have collected overnight

Area/Surface	Frequency	Process
	Between every case	Wipe all surfaces and mattress pads with a disinfectant cleaning solution; Wipe all flat surfaces that have come in immediate contact with a patient or body fluids with a disinfectant cleaning solution.
	At the end of every day	Total cleaning or terminal cleaning (mopping floors and scrubbing all surfaces from top to bottom) of the operating room should be done at the end of each day (Remember to clean door handles, light switches etc.)
Cleaning equipment (mops, brushes, etc.)	Between each use	If contaminated, decontaminate in 0.5% chlorine solution; Clean in soap or detergent and water; Sun dry until completely dry before next use

Note:

- Do not dry mop or sweep the operating room. (This causes dust, debris and microorganisms to become airborne and contaminate clean surfaces.)
- The double- or triple-bucket method is recommended for cleaning the operating room and other areas of the surgical suite.

Housekeeping Tips

- Frictional cleaning (scrubbing) is the best way to remove dirt and microorganisms. Always use frictional cleaning for each procedure;
- Always wear utility gloves to clean heavily contaminated areas such as toilets and spills of blood and body fluids; if gloves are not available, use a plastic bag over the hand;
- Use a damp or wet cloth or mop for walls, floors and halls; avoid dry sweeping and dusting as these practices spread dust, debris and microorganisms into the air and onto clean surfaces;
- Use separate equipment (brushes, clothes) for high-risk cleaning areas that are likely to be contaminated (e.g., toilets);
- Change cleaning solutions when they are obviously dirty, (the heavier the load of soil and organic materials the less the cleaning power of the disinfectant);
- Decontamination and maintenance of cleaning equipment (mops, buckets, etc.):
    - Use of cleaning equipment that is not properly maintained can contribute to the spread of infectious agents;
    - All cleaning equipment should be decontaminated with 0.5% chlorine solution at least once daily, and whenever contaminated or visibly dirty;
    - Decontaminate cleaning equipment that has come in contact with any body fluids (blood, body fluids, secretions or excretions)

by soaking for 10 minutes in 0.5% chlorine solution or other locally available and approved disinfectant.

- Wash from top to bottom, so that debris that falls on the floor will be cleaned-up last;
- Start cleaning from clean to dirty area;
- When using disinfectants follow dilution instructions; too much or too little water may reduce the killing activity of disinfectants.

3.2.4 Traffic Flow and Activity Pattern

Specific Objectives

At the end of this topic, participants will be able to:

- Define traffic flow and activity pattern;
- Describe space and equipment requirements for minimizing microbial contamination in procedure areas and surgical unit;
- Explain guidelines for working in the operating room.

Definition

traffic flow and activity pattern refers to processes applied to regulate the flow of visitors, patients and staff in health facilities.

Note:

- Contamination can be minimized by reducing the number of people permitted into areas and by defining the activities that take place there;
- The number of microorganisms in designated areas tends to be related to the number of people present and their activities.

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

- Procedure areas where patients are examined and procedures are carried out;
- Labour and delivery wards;
- Surgical units where major and minor operations are performed, including pre-operative and recovery rooms;
- Work areas where instruments are processed; these include dirty and clean areas where soiled instruments, equipment and other items are first cleaned and are either high-level disinfected or sterilized and then stored.

Space and Equipment Requirements

Health facilities vary in the types of services they provide. As a guide, the space and equipment requirements for the types of surgery typically performed are roughly the same. These include the following:

- Changing room and scrub area for clinic staff;
- Preoperative area where clients are examined and evaluated prior to surgery;
- Operating room;
- Recovery area for patient observation after surgery (may be combined with the preoperative area);
- Processing area for cleaning, sterilizing or high-level disinfecting instruments and other items;
- Space for storing sterile packs and/or high-level disinfected receptacles of instruments and other items.

The recommended infection prevention practices for minimizing microbial contamination of specific areas in health facilities are briefly described below.

Procedure Areas

- Limit traffic to authorized staff and patients at all times;
- Permit only the patient and staff performing and assisting with procedures in the procedure room (family members should be limited with obstetrical procedures);
- Patients can wear their own clean clothing;
- Staff should wear attire and PPE according to procedures performed;
- Have covered receptacles filled with a 0.5% chlorine solution for immediate decontamination of instruments and other items once they are no longer needed;
- Have a leak-proof, covered waste receptacle for disposal of contaminated waste items (cotton, gauze, and dressing) at point of use;
- Have a puncture-resistant receptacle for safe disposal of sharps;
- Have storage space in procedure rooms for clean, high-level disinfected and sterile supplies (Storage shelves should be enclosed to minimize dust and debris collecting on stored items).

Floor plans for the process of instrument cleaning, high-level disinfecting and sterilizing areas in a clinic and larger health facility is described below.

Surgical Unit

The surgical unit is often divided into four designated areas, which are labeled and defined by the activities performed in each as follows:

Unrestricted Area: The entrance from the main corridor and is isolated from other areas of the surgical unit. This is the point through which staff, patients and materials enter the surgical unit.

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

Semi-restricted Area: The peripheral support area of the surgical unit and includes preoperative and recovery rooms, storage space for sterile and high-level disinfected items, and corridors leading to the restricted area. In this area the following should be observed:

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

Restricted Area: The area consisting of the operating room(s) and scrub sink areas. The following should be observed in this area:

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

Guidelines for Working in Operating Room(s)

- Enclose the operating room to minimize dust and eliminate flies; central air conditioning is preferred. (If windows are the only ventilation, provide tight-fitting screens.)
- The operating room should be located away from areas of the hospital or health facility that are heavily traveled by staff and patients.

Before Surgical Procedures

- Place a clean, covered receptacle filled with 0.5% chlorine solution or another locally available and approved disinfectant for immediate decontamination of instruments and other items once they are no longer needed;
- Place a plastic bag or leak-proof, covered waste receptacle for contaminated waste items (cotton gauze, old dressings);
- Place a puncture-resistant receptacle for the safe disposal of sharps (e.g., suture needles, hypodermic needles and syringes, and disposable scalpel blades) at the point of use but without contaminating the sterile field;
- Place a leak-proof, covered waste receptacle for soiled linen away from sterile items;
- Organize tables, mayo and ring stands side by side in an area away from the traffic patterns and at least 45 cm (18 inches) from walls, cabinets and other non-sterile surfaces;
- Place a clean sheet, a lift sheet and arm-board covers on the operating room bed;
- Check and set up suction, oxygen and anesthesia equipment
- Place supplies and packages that are ready to open on the tables, not on the floor;
- The mayo stand and other non-sterile surfaces that are to be used during the procedure should be covered with a sterile towel or cloth.

During Surgical Procedures

- Limit the number of staff entering the operating room to only those necessary to perform the procedure and to patients. Make the surgical team self-sufficient so that outside help is not required;
- Keep the doors closed at all times, except during movement of staff, patients, supplies and equipment;
- Keep the number of people and their movements to a minimum; the number of microorganisms increase with activity;
- Keep talking to a minimum in the sterile field;
- Scrubbed staff should wear full surgical attire, including:
    - sterile surgical gowns on top of scrub suit-a clean surgical cap that covers the head;
    - clean, closed shoes (or boots that can be wiped clean) that protect the feet from fluids or dropped items;
    - surgical gloves, protective eyewear and a mask covering the mouth, nose and any facial hair;
    - scrubbed staff should keep their arms and hands within the operative field at all times and touch only sterile items or areas.
- Non-scrubbed staff should wear surgical attire, including:
    - Clean, scrub suit;
    - Clean surgical cap that covers the head;

    - Clean, closed shoes that protect the feet from fluids or dropped items, and a mask covering the mouth, nose and any facial hair;
    - Non-scrubbed staff should stay at the periphery of the operating room keeping their distance from sterile areas; they should not lean or reach over the operative field;
- Clean accidental spills or contaminated debris in areas outside the surgical field with 0.5% chlorine solution as promptly as possible.

After Surgical Procedures

Non-scrubbed staff wearing utility gloves should do the following:

- Collect all waste and remove it from the room in closed leak-proof receptacles
- Close and remove puncture-resistant receptacles when they are three quarters full.
- Remove covered receptacles with 0.5% chlorine solution with instruments and surgical gloves from the room.
- Remove soiled linen in closed leak-proof receptacles.
- Remove waste, soiled linen, dirty instruments and equipment, and supplies that have been opened but not used, in a leak-proof, covered waste receptacle. (Make sure that these items do not re-enter the restricted area.)

3.2.5 Safe Practices in Operating Room

Specific objectives

At the end of this topic, will be able to:

- Define terms used operating room;
- Explain risks associated with surgical procedures for injuries in the operating room;
- Describe recommended safe operative procedures.

Definitions

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

Surgical Asepsis: Preparation and maintenance of a reduced (safe) level of microorganisms during an operation by controlling four main sources of infectious organisms:

- The patient;

- Personnel;
- Equipment;
- The environment.

The Surgical Environment

The operating room has special characteristics that increase the chance of accidents, especially when sharp instruments are being passed from one individual to the other, without due attention. Sharp instruments include anything capable of puncturing the skin (scissors, needles, scalpels or blades, etc).

Instruments That Cause Injuries

The vast majority of sharps injuries in hospitals occur in the operating room. Many items can cause sharps injuries and glove tears resulting in exposure to blood. Some of the most important are:

- Scalpel and suture needles;
- Hypodermic needles;
- Wire sutures;
- Laparoscopy and surgical drain trocars;
- Orthopaedic drill bits, screws, pins wires and saws;
- Needle point cautery tips;
- Skin hooks and towel clips;
- Sharp-pointed scissors and sharp-tipped mosquito forceps;
- Dissecting forceps;
- Sharp-toothed tenaculli.

Scalpel injuries most often occur when:

- Putting in and taking off the disposable blade;
- Passing the scalpel hand to hand between team members;
- Cutting (i.e., where hands are employed to hold or spread tissue or cutting towards the fingers of the surgeon or that of an assistant);
- Leaving the scalpel on the operating field before or after using it; Dropping it on one's or the assistant's feet;
- Placing a scalpel in an over-filled sharps receptacle or a poorly located receptacle.

Suture needle injuries most often occur when:

- Loading or repositioning it on the needle holder;
- Passing the needle hand to hand between team members;
- Suturing: where hands are employed to hold or spread tissue or cutting toward the fingers of the surgeon or assistant;
- Leaving the needle on the operating field before or after using it;
- Dropping it to ones or the assistant's foot;

- Placing a suture needle in an over-filled sharps receptacle or a poorly located receptacle.

Almost all of these injuries can be easily avoided and with little expense. For example:

- Use a small Mayo forceps (not fingers) when holding the scalpel blade, when putting it on or taking it off or loading the suture needle (Alternatively, use disposable scalpels with a permanent blade that cannot be removed);
- Always use tissue forceps, not fingers, to hold tissue when using a scalpel or suturing;
- Use a "hands-free" technique to pass or transfer sharps (scalpel, needles and sharp-tipped scissors) by establishing a "safe" or "neutral zone" in the operative field (see description below);
- Always remove sharps from the field immediately after use;
- Make sure that sharps receptacles are replaced when they are only three-quarters (3/4) full and place receptacles as close to where sharps are being used as conveniently as possible (i.e., within arm's reach).

Hands-Free Technique

Hands-free-technique is a safer method of passing sharp instruments during surgical procedures

Instructions for Hand-Free-Technique include:

- Always use "hands-free" technique for passing sharp surgical instruments;
- Use a sterile kidney basin or other suitable receptacle (safe or neutral zone);
- The receptacle is placed on the sterile field between the surgeon or clinician and assistant;
- The assistant puts individual instruments in the receptacle as they are needed;
- Surgeon or clinician takes them from the receptacle, and returns it to the receptacle after using it;

3.3 Preventing Nosocomial Infections

Most of these infections can be prevented with readily available, relatively inexpensive strategies by adhering to recommended infection prevention practices.

Specific objectives

At the end of this topic, participants will be able to:

- Define nosocomial infection;
- Explain key contributing factors to nosocomial infections;
- Explain the impact of nosocomial infections;
- Describe various prevention methods for nosocomial infections.

Nosocomial infections are infection that a patient is not incubating at a time when he or she comes to the hospital, also called healthcare-related infections.

Key Contributing Factors to Nosocomial Infections

- Inadequate standards and practices for blood transfusion;
- Increased use of invasive medical devices;
- Contaminated IV fluids;
- Overuse of broad spectrum antibiotics leading to antibiotics resistance; Unsafe and frequently unnecessary injections;
- Increased number of people in health facilities, overcrowding in wards and sharing beds;
- Impaired immunity (age, illness and treatments);
- New organisms, (i.e., SARS, HBV, HIV, Ebola).

The Impact of Nosocomial Infections

- Emotional stress;
- Functional disability;
- Reduced quality of life;
- Increased cost of health-care through:
    - Increased length of hospitalization;
    - Use of expensive medications (e.g., ARV and braod spectrum antibiotics);
    - Expensive services (e.g., laboratory tests, X-rays, blood transfusions).

Various Prevention Methods for Nosocomial Infections

Prevention methods for nosocomial infections involve application of:

- Standard precautions, which apply to all clients and patients attending health facility (for more details refer to section 3.1.1);

- Transmission-based precautions are a second level of precautions intended for use in patients **known** or **highly suspected** of being infected or colonized with pathogens transmitted by:
    - Air (tuberculosis, chicken pox, measles, etc.);
    - Droplet (flu, mumps and rubella);
    - Contact (hepatitis A or E and other enteric pathogens (includes faecal/oral transmission), herpes simplex, and skin or eye infections).

Airborne Precautions are used in addition to standard precautions for a patient known or suspected to be infected with microorganisms transmitted by the airborne route.

(a) Patient Placement

Private Room

- Door closed
- Room air is exhausted to the outside (negative air pressure) using fan, air conditioner or other filtration system
- If private room not available, place patient in room (negative air pressure as above) with patient having active infection with the same disease, but with no other infection (cohorting)
- Check all visitors for susceptibility before allowing them to visit.

(b) Respiratory Protection

- Wear a mask.
- If SARS, bird flu is known or suspected, wear a particulate respirator (N95 Mask) if available or a mask.
- If chicken pox or measles:
    - Immune persons—no mask required.
    - Susceptible persons—do not enter room
- Remove mask after leaving the room and place in a plastic bag or waste receptacle with tight-fitting lid.

(c) Patient Transport

- Limit transport of patient to essential purposes only.
- During transport, patient must wear mask.
- Notify area receiving patient, in advance.

Droplet precautions

Reduce the risks for nosocomial transmission of pathogens spread by droplet. The risks can be prevented through the following measures:

(a) Patient Placement

- Private room; door may be left open.

- If private room not available, place patient in room with patient having active infection with the same disease, but with no other infection (that is, cohorting).
- If neither option is available, maintain separation of at least 1 meter (3 feet) between patients.

(b) Respiratory and Eye/mucous Membrane Protection

- Wear a mask and goggles or face shield if within 1 meter of patient.

(c) Patient Transport

- Limit transport of patient to essential purposes only
- During transport, patient must wear a mask.
- Notify area receiving patient.

Contact precautions (see content under droplet precautions)

CHAPTER 4

INJECTION SAFETY PRACTICES

This chapter is designed to help participants improve their knowledge, skills and attitudes in the practice of administering safe injections. The chapter will include the following topics: ensuring safety when giving injections, unsafe injections practices and adverse effects, prevention and management of exposure to bloodborne pathogens, and demonstration of proficiency in safe injection practices.

General Objectives

At the end of the chapter, participants will be able to:

- Ensure safety in giving injections;
- Describe unsafe injection practices and adverse effects;
- Explain the prevention and management of exposures;
- Demonstrate proficiency in safe injection practices.

4.1 Ensuring Safety When Giving Injections

Specific Objectives

At the end of this topic, participants will be able to:

- Define injection safety;
- Describe types and characteristics of injection devices;
- Identify the nine 'rights' in giving a safe injection ;
- Describe the best practices in injection safety.

4.1.1 What is a Safe Injection?

A safe injection 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 that is dangerous for other people.

A safe injection has the following qualities:

- Given when it is necessary and there is no other suitable alternative;
- When the right drug is given to the right patient in the right dose, using the right needle and syringe, at the right site, by the right route and at the right time;
- Given by a skilled health worker with proper disposal of waste that does not harm the provider, the recipient or the community.

Relationship between IPC and IS

- Injection safety is an integral component of infection prevention and control;
- It is an element of standard precautions;
- It is a key element of patient and health worker safety;
- It is supported by infection prevention and control guidelines and procedures such as hand hygiene and waste management.

Injection safety is also a critical component of the continuous quality improvement (CQI) programme, managed by the healthcare team and specifically the infection prevention and control team in health facilities.

4.1.2 Types and Characteristics of Injection Devices

There are different types of injection devices, all of which have the same purpose: administering an injection. However, there are desirable characteristics of injection safety devices such as:

- Device is needle-less;
- Safety feature within the device is an integral part of the device
- Device preferably works passively (i.e., it requires no activation by the user). If user activation is necessary, the safety feature can be engaged with a single-handed technique and allows one of the worker's hands to be free;
- User can easily tell whether the safety feature is activated;
- Safety feature cannot be de-activated and remains protected through disposal;
- Device performs reliably (i.e., is easy to use and is also practical).

Table 4.1 includes different types of injection devices currently in the world market with their advantages and disadvantages.

Table 4.1: Advantages and disadvantages of different types of injection devices

Type of Device	Advantages	Disadvantages
Auto-disable	• Cannot be reused; • Eliminate the patient-to-patient disease transmission caused by the use of contaminated syringes and needles.	• More expensive than standard disposable (but are still affordable). • Have no needlestick prevention features • Need collection and disposal system.
Manually retractable	• Cannot be re-used; • Needlestick prevention feature: Needle retracts inside barrel; • Eliminate the patient-to-patient disease transmission caused by the use of contaminated syringes and needles.	• Not automatic; relies on good will of health worker; • Expensive.
Automatically retractable	• Cannot be re-used; • Automatic safety feature: needle retracts inside barrel; • Eliminate the patient-to-patient disease transmission caused by the use of contaminated syringes and needles.	• High cost; • Relies on good will of health workers; • Cannot be used if the patient is on IV drip.
Standard disposable	• Less expensive; • Available on local market.	• Have no safety features; • Can be reused, so patient-to-patient disease; transmission caused by the use of contaminated syringes and needles is possible.

In giving injections, necessary commodities may be needed to ensure safety. Table 4.2 gives a description of these commodities.

Table 4.2: IPC and IS commodities; their use, advantages and limitations

Type	Description	Use	Advantages	Limitations
Needle Remover	• Manually operated units remove the needle from the syringe by cutting the hub of the syringe and/or the needle; • Electrically operated units destroy needles instantly by burning the needle; • Needle removers can be made of metal or plastic; • Needle receptacles are disposed or emptied into a needle pit.	• Utilize for cutting or destroying needles from used syringes immediately after use; • Reduce community exposure to sharps waste; • Available at point of use; • Segregate waste; • Low initial and operating costs (US $2 -50); some can be made locally; • Easy to use; • Can facilitate recycling of plastic syringes; • Blade life: 200,000 cuts.	• Reduces occupational risks to waste handlers and scavengers; Prevent reuse of syringes; • Reduce the volume of sharps waste.	• Correct use relies on user compliance; • Needles must be disposed of properly; • Syringes disposal method still required; • May not destroy needles completely; • Must be maintained over time • Constant electricity supply is required for electric models; • Required at each injection location.
Safety Box	• Made of puncture-resistant and liquid-proof cardboard; • 5-L safety boxes hold up to 100 used syringes and needles; • Are usually 'bundled' with syringes and needles to ensure availability at the point of use.	• Utilize for collecting used syringes and needles; immediately after use.	• Easy to use; • Reduces occupational risks to waste handlers and scavengers; • Prevent re-use of syringes; • Available at point of use. • Reduce community; exposure to sharps. • Low cost;	• Requires on-going supply; • Filled boxes require final treatment--often involves transport to treatment site; • Needlestick injuries remain a hazard during waste handling transport; • In situations where many injections are given, safety box accumulate very quickly; • Most boxes manufactured for t international market are liqui proof, but they disintegrate if become wet.
	• Covered collection receptacles with appropriate bin liner;	• Use for segregating different categories of healthcare waste;	• Contain the waste; • Used for interim storage	• A separate bin needed in each treatment area for each type o

Type	Description	Use	Advantages	Limitations
Waste bins	• Usually made of durable plastic or metal material with the following characteristics: o Well-fitted lid o Leak-proof o Non-corrosive o Washable.		of healthcare waste; • Can be reused; • Can be colour-coded.	waste (infectious, non-infectiou • Attractive for other uses.
Bin liners	• Color-coded plastic bags for lining waste bins.	• Separate waste categories according to risk.	• Help health workers and waste handlers identify degree of risk of waste; • Contain waste and fluid and keep it away from people and the environment.	• Non-biodegradable; • May be expensive; • May be extra-budgetary item; • Not puncture-resistant; • Require re-supply.

4.1.3 Right Ways and Standards in Giving a Safe Injection

To ensure that injections are safe, it is necessary to check and verify that all rights are implemented and that the methods of verification are standardized. Moreover, the service providers are the ones responsible for verification. Table 4.3 indicates the right ways to give a safe injection and methods of verification.

Table 4.3: 'Right' Ways to Give a Safe Injection

Rights	Standards *Always check and verify all 'rights'*	Method of Verification	Verified By
1. Right Patient	What is the name on the prescription? Is this the right patient?	Ask patient/guardian, etc., to tell you his/her name.	Injection Provider
2. Right Drug	Is the name of the drug on the prescription the same as the injection you are about to administer?	Verify name of drug on prescription with injection to be administered. If you are unsure, verify with physician or pharmacist.	Injection Provider
3. Right Formulation	Could the medication be given orally instead of as an injection?	Discuss with patient available choices.	Injection Prescriber
4. Right Injection Equipment	Use only sterile, non-reusable syringes,needles, dental cartridge.	Check to ensure that syringe/needle package is unbroken.	Injection Provider
5. Right Dosage	Check dosage against patient's age, weight and the pharmacokinetics of the drug.	Read the pharmaceutical recommendations of the drug. If unsure, verify with the physician/prescriber.	Injection Prescriber and Injection Provider
6. Right Time	Follow the specific dose interval.	Check whether the time of giving the injection has been recorded and signed by the injection provider	Injection Prescriber and Injection Provider
7. Right Route	Be sure to use the correct route of administration (intra-muscular, intravenous, intra-dermal or subcutaneous).	Observe the directions of the prescriber. Check prescription or other related records. Check whether the provider has recorded the route used e.g., IM/IV)	Injection Provider
8. Right Storage	Right temperature, Vaccine Vial Monitor (VVM) check test.	Check cold chain issues including Vaccine Vial Monitor.	Pharmacy Health Worker Injection Provider
9. Right Method of Disposal	Do not recap needle. Dispose of used syringe and needle immediately after use in appropriate safety box. **or** Use the needle remover and safety box.	Check the safety box for correct method of disposal Check whether safety boxes are available and are in use	Injection Provider

Summary of key messages in safe injections:

- Do no harm to the recipient;
- Do not expose the health worker to any avoidable risk;
- Do not result in waste that is dangerous for the community.

For a safe injection:

- Use a syringe and needle from a new, sealed, and undamaged packet for every injection;
- Consider the advantages of a device when given the choice and ability to use
- Without re-capping, place syringe and needle in a safety box immediately after use;
- Manage injection waste safely and appropriately.

4.1.4 The Elements of Best Practices in Injection Safety

Selecting safe medicines:

- Proper handling of medicines, including keeping it in a clean environment;
- Label clearly according to established standards or norms;
- Observe proper storage conditions, including temperature and humidity (as recommended by manufacturer);
- Check expiry dates;
- Check the medicines three times--before removing from storage, when reconstituting and before giving it to the patient.

Avoid contamination of equipment and medication and observe aseptic technique by doing the following:

- Wash hands or use alcohol-based handrub before preparing the drug and after giving the injection;
- Prepare on clean surface;
- Do not touch part of needle that will come in contact with patient's tissue;
- Proper preparation of the injection site ;
- Do not leave the needle in the rubber cap of the vial.

Preparation of injection site:

- Wash the skin with water if dirty and dry it well;
- Swab the injection site with alcohol based solution (methylated spirit).

Giving of the injection:

- Select the appropriate site;
- Follow the correct procedure specific to the injection (e.g., IM, subcutaneous, IV, etc.);

Reconstituting drugs or vaccines safely

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

Dispose injection wastes and sharps appropriately

- Immediate disposal of syringe and needle in puncture and leak-proof safety box
- Prevent needlestick injuries.

WHO recommendation :

> WHO recommends that injection device security is ensured in all health facilities, including therapeutic service, so that injectable medicines, diluents, single use injection devices and safety boxes are supplied in a timely manner in adequate quantities.

4.2 Unsafe Injection Practices

Specific Objectives

At the end of this session the participant will be able to:

- Define unsafe injection;
- Identify injection practices that harm the patient, provider and the community;
- Identify reasons for giving unnecessary injections.

What is an Unsafe Injection?

Unsafe injections:

- Harm the recipient, and/or the provider, and/or the community;
- Result in waste that is dangerous to other people;
- Occur when a contaminated drug is administered, such as when partially opened vials are mixed, multi-dose vials are used and needles are left in rubber cap of vial;
- Happen expired drugs are given;
- Are a result of applying pressure to bleeding sites with dirty material or finger and when drugs are administered at incorrect anatomical site;
- Use non-sterile needles and syringes;
- Occur when health worker do not observe aseptic technique;

- Are likely when open multi-dose vials stored and used beyond recommended period.

Unsafe injection practices:

- Syringes and needles are often rinsed in a pot of tepid water between injections. While this most often occurs in dispensaries, it is also practiced in large healthcare setting and by all ranks of healthcare workers;
- In some countries the proportion of injections given with syringes or needles reused without sterilization is as high as 70%[15] ;
- Poor collection and disposal of dirty injection equipment;
- In some countries unsafe disposal can lead to re-sale on the black market of used equipment.[16] [17];
- Reuse of syringes and needles in the absence of sterilization exposes millions of people to infection.

4.3 Adverse Reactions Following Injection

Introduction

The aim of this topic is to understand the adverse effects of unsafe injections and how to identify, prevent and manage the adverse effects.

Specific Objectives

At the end of this unit, participants will be able to:

- Define the term adverse events following injection (AEFI);
- List types of adverse events;
- Discuss the causes of adverse events;
- Discuss the management of adverse events;
- Discuss the monitoring of adverse events.

4.3.1 What is an Adverse Effect?

An adverse effect caused by an unsafe injection is an incident that harms a person receiving healthcare caused by poor injection practices rather than the underlying condition of the patient.

Common adverse effects include:

[15] http://www.who.int/mediacentre/factsheets/fs231/en/

[16] www.childrensvaccine.org/files/Immunization_Injection%20Safety_in_Nepal.pdf

[17] Ahmed, R., "Hospital Waste Management in Pakistan: *Case Study Report* Special Waste Fractions: Hospital Waste", WASTE, August 1997

- Transmission of bloodborne infections such as Hepatitis B and C, and HIV;
- Injection abscesses, paralysis, trauma, shock and allergic reactions.

Tables 4.4 and 4.5 provide information on causes and types of adverse effects associated with unsafe injection.

Table 4.4: Causes of Adverse Effects

Source of Error	Types of Errors
Provider	• An error in preparing the injection, handling or administration, such as: o Contaminating the drug, diluent or injection equipment, injection site; o Giving too much of the drug in one dose; o Injecting the medication into a nerve; o Using non-sterile syringes and needles for each injection; o Using the wrong diluents or the wrong amount of diluents; o Giving the wrong drug; o Administering an injection on an agitated patient without assistance; o Inadequate screening of patient.
Programme	• Poor quality control of drug at manufacturer level.
Recipient	• Not observing contra-indications.

Table 4.5: Types of adverse effects

Cause of Adverse Event	Types of Adverse Event
Drug (i.e., vaccine) reaction. Reaction of the patient to the drug.	A reaction can be: • **Local**: Pain, swelling, redness and/or abscess formation at the site of injection (Allergic reaction i.e., skin rash.); • **Systemic**: Fever, malaise, muscle pain, headache, or loss of appetite; sepsis. (Allergic reaction: anaphylactic shock, Stevens Johnson's syndrome).
Coincidental The adverse event occurs after the administration of the injection but is un-related to the medication or its administration.	Any of the above (and other problems).

Unknown The adverse event cannot be directly connected to the drug or its administration.	Any of above except sepsis and infection.

4.3.2 Monitoring of Adverse Events

Every health facility should have a system of monitoring adverse events.

- Identify, record and report events;
- Investigate events;
- Manage the events;
- Refer where necessary;
- Follow-up with injection provider to provide required training and supervision.

Table 4.6: Management of Adverse Effects

Categories	Management
Shock/anaphylaxis	Adrenaline, hydrocortisone. Consider intravenous re-hydration
Convulsions	Diazepam
Paralysis	Physiotherapy
Fever	Paracetamol
Abscess	Drainage and antibiotics
Local swelling	Observation, cold compression, aspirin
Skin rash	Observation, chlopheniramine
Sepsis	Antibiotics

4.4 Prevention and Management of Exposures

The purpose of this section is to improve the knowledge and skills of the participants so as to prevent and manage needlestick/sharp injuries.

Specific Objectives

At the end of this topic, participants will be able to:

- Define needlestick injuries and sharps injuries;
- List who is at risk for needlestick injuries;
- Describe the management of needlestick and sharps injuries and splashes;
- Explain the importance of pre- and post-exposure counseling;
- Describe the PEP procedure in Tanzania.

Definitions

- **Needlestick injury**: Puncture of the skin caused by an injection needle.
- **Sharps injury:** An injury caused by puncture of the skin by a sharp object/instrument including an injection needle.

Categories of personnel at risk for needlestick injuries

- Nurses;
- Physicians;
- Medical Laboratory Technologists;
- Housekeeping Staff;
- Laundry Workers;
- Waste Collection Personnel;
- Patients/Clients and the Community.

4.4.1 Why should People Report Exposure?

Health workers should adopt the attitude that "all human blood and certain body fluids should be treated as if they are known to be infectious to HIV, HBV, and other bloodborne pathogens." This approach should motivate healthcare workers to see that any accidental needle prick or other exposures should call for attention and therefore should be reported to the appropriate authority as soon as possible. Healthcare workers should be encouraged to take appropriate measures, including, testing, PEP, counseling etc., when exposed to bloodborne pathogens. Reporting will facilitate surveillance to develop an effective prevention, control and management plan.

4.4.2 What to Report

All accidental exposures must be reported to the employee's immediate supervisor as soon as possible. The report should include date and time of exposure; details of the procedure being performed; where and how the exposure occurred; details of exposure including type and amount of fluid or material and severity of exposure; details about exposure source; and details about counseling, post-exposure management; and follow-up.

In many cases, incidences like needle pricks are not reported. The reasons for not reporting include among others:

- Ignorance, which include unawareness of the existence of a reporting system, absence of the reporting mechanism, and knowledge of how HIV is transmitted;
- Mistrust of the systems' confidentiality, (i.e., anticipated stigma);
- Inadequate functioning of the system, such as, unavailability of the support system, PEP, counseling, education, stigma, etc.

Management of Needlestick Injuries[18]

Management of needlestick and sharp injuries lies under the following:

- Providing post-exposure prophylaxis;
- Monitoring and reporting of injuries through injury register;
- Evaluating injuries;
- Conducting follow-up.

If a needlestick injury occurs:

- Bleed the wound;
- Wash with soap and running water;
- Alert your supervisor;
- Identify source patient;
- Immediately report to designated person/facility;
- Document the incident;
- Get pre- and post-test counseling;
- Get post-exposure prophylaxis (PEP) within 2 hours if possible;
- Evaluate injuries:
  - Immediately;
  - After six weeks;
  - Three months;
  - Six months.
- Conduct follow-up on a six-monthly basis.

PEP Procedures in Tanzania

According to the PEP procedures there are factors to consider before selecting drugs and other services.

Type of exposure

- Percutaneous injury;
- Mucous membrane exposure;
- Non-intact skin exposure;
- Bites resulting in blood exposure to either person involved.

Low Risk Exposure

[18] American Nurses Association (ANA). *Safe Needles Save Lives*, 2000, p. 17.

- Small volume of blood;
- Asymptomatic patient;
- Injury with solid needle;
- Superficial injury or mucocutaneous exposure.

High Risk Exposure

- Large volume of blood or potentially infectious fluids;
- Blood or fluid containing blood from symptomatic patient;
- Injury with hollow needle;
- Deep or extensive injuries;
- Confirmed drug resistance in source patient.

Evaluation of the Exposure Source

- The source person is known to be HIV-infected;
- The source person is known, but their HIV status is unknown;
- The source person is unknown.

Selection of Drugs for HIV PEP

- "Basic" two-drug regimen using two nucleoside analogs
    - Zidovudine 300 mg bd
    - Lamivudine 150 mg bd
    - Combivir or Duovir 1bd
- Three-drug regime using two nucleoside analogs and a protease inhibitor or a non-nucleoside
    - Zidovudine 300 mg bd
    - Lamivudine 150 mg bd
    - Combivir or Duovir 1 bd plus
    - Indinavir 800 mg tds

PEP should be discontinued if the source person is determined to be HIV-negative or the person exposed is HIV-positive

HIV PEP Administration

- Administer prophylactic ARV treatment as soon as possible, within 36 hours of exposure, using AZT 300 mg bd + 3 TC 150 mg bd for 4 weeks. Also, consider additional 3rd drug (EFZ) if source individual is symptomatic, or large volumes of blood are transferred;
- Prophylaxis should be continued for 4 weeks if tolerated;
- Exposed person should be reevaluated within 72 hours as additional information about the source is obtained, including serologic status, VL, current treatment, any resistance test results or information about factors that would modify recommendations;

- If available, an HIV antibody test should be used to monitor for seroconversion, and this test should be performed at baseline and at 6 weeks, 3 months, and 6 months post exposure. VL tests for screening are not recommended exposed person unless there is an illness compatible with acute retroviral syndrome;
- If PEP is given, the HCW should be monitored for drug toxicity at baseline and at 2 weeks with full blood picture and hepatic function tests;
- Exposed persons should be asked to commit to behavioral measures, (i.e., sexual abstinence or condom use for several weeks to two months. The greatest risk is during the first 6 to 12 weeks post exposure);
- Female HCWs should be advised for family planning;
- Female HCWs with known or possible pregnancy should be treated as anyone else, except for selection of drugs, which should involve a discussion of benefits and risks between the HCWs and her care provider. EFV and the combination d4T and ddl should be avoided.

Post-Exposure Follow-up Management

- An HIV test of the exposed HCW should be done at baseline, six weeks, twelve weeks, and six months
- Follow up should be performed on any exposed HCP who develops an illness compatible with acute retroviral syndrome
- If PEP is used, monitor for drug toxicity

Post-Exposure Education

- Exposed HCW who choose to take PEP should be advised of the importance of completing the prescribed regimen
- Behavioral changes (e.g., abstinence or condom use) should be discussed
- Information about potential drug interactions and side effects (including how to report and manage side effects) should be explained

Post-Exposure Counseling

- Emotional effects to be observed and client should receive counseling service
- Modify behavior, including taking medicines and using precautions to prevent secondary transmission

4.4.3 Main Areas for Post-Exposure Counseling

The main areas for post exposure council include:

- Risk of infection post-exposure;
- Reporting illness in the follow-up period as follows:
    - Following possible exposure counsel to report any fever, aches, rashes, swollen glands, fatigue and general malaise;

    - Following a possible hepatitis exposure (B and C) counsel to report any abdominal discomfort, sore joints, jaundice and any change in colour of urine or stool.
- Secondary spread:
    - Sex behavioral change;
    - Not to donate blood for a period of at least 6 months.
- Medication:
    - Clients should be advised not to adjust the dose or stop the medications without consulting a physician;
    - Clients should be advised to consult a doctor before taking any other medication;
    - Reporting any side effects that may develop;
    - Clients should be advised not to adjust the dose or stop the medications without consulting a physician.

Summary

For a successful sharps injury prevention programme requirements are outlined below:

- Commitment by management to reduce bloodborne exposures, including purchasing and implementing safety devices;
- A designated multidisciplinary prevention committee with decision-making authority and representation from frontline health workers, infection prevention and control, management, occupational health, and purchasing;
- The assessment of hazards and use of data to identify highest risk products and procedures;
- Identification and elimination of injuries;
- Reporting of injuries;
- Needlestick injury log containing the situation, and type of device causing injury;
- Frontline health worker involvement in the evaluation, selection, and implementation of safer needle devices.

An exposure control plan containing policies for:

- Annual revision;
- Post-exposure evaluation and follow-up;
- Placement, checking, and replacement of sharps receptacles;
- Interactive training for committee and workers;
- Evaluation of work and efficacy of engineering controls;
- Recordkeeping[19]

[19] American Nurses Association (ANA). ***Safe Needles Save Lives***, 2000, p. 17

4.4.4 Preventive Strategies

Post-exposure programs are keys to the timely and effective response to an occupational exposure. They should include:

- Standards and protocols for responding to exposures, including provisions for immediate post-exposure activities (first aid, disinfection, reporting and referral), assessing the exposure, counseling the exposed worker, referral for medical care, post-exposure prophylaxis, testing and follow-up for the exposed worker, and obtaining information from the source person.
- Selection of designated personnel and training in their roles (first point of referral for exposed worker, assessment of exposure, administration of post-exposure prophylaxis, liaison with source person).
- Establish systems for timely and knowledgeable delivery of medical care, counseling, and follow-up.
- Education and training of staff in the protocols, personnel, and systems involved in responding to exposures.

4.4.5 Management of Occupational Blood Exposure

The management of occupational exposure includes:

- *Immediate care*: wash wounds with soap and running water; flush mucous membranes with water
- *Risk assessment*: Type of fluid and type of exposure
- *Evaluate source*: Counsel and test source for HIV serology (preferably use rapid test if available)
- *Exposed person*: Test and counsel person and initiate PEP as quickly as possible (see below)
- *Follow-up*: HIV exposure (source positive HIV serology or acute HIV with positive HIV RNA)
- *HIV serology* to the exposed individual at baseline, 6, 12 weeks and 6 months
- *Reevaluate and adjust regimen* within 72 hours(depending on the availability of results), if taking PEP
- *Pregnancy test* should be done for all exposed females in reproductive age if their pregnancy status is unknown
- *Monitor* for drug toxicity

4.4.6 PEP and Risk of Transmission

Exposure increases risk of transmission when large quantity of blood is involved (for example, when the device is visibly contaminated with source patient's blood, when the procedure involves needle placed directly into source patient's vein or artery, there is a deep injury, or when the injury involves hollow-bore needle). Moreover, the risk increases depending on the stage of HIV infection in source patient, for example, acute infection or when the patient is in the late stages.

Appropriate Steps Should Include:

- Exposed staff report incident to supervisor and fill appropriate forms
- Counselling (briefly);
- HIV testing or confirmation of positive test of the patient with counselling (if this is possible);
- HIV testing of the exposed staff;
- Determination of risk of exposure;
- High risk: exposure staff should get 3 drugs;
- Drugs should be administered as soon as possible.

Table 4.7 shows the recommended HIV exposure prophylaxis for injuries.

Table 4.7: Recommended HIV Post-Exposure Prophylaxis for Injuries

Exposure type	HIV-positive Class 1+	HIV-positive Class 2+	Source of unknown HIV status	Unknown Source
Less severe**	Recommend basic 2-drug PEP++	Recommend expanded 3-drug PEP	Generally, no PEP warranted however, consider basis 2- drug PEP++ for source with HIV risk factors	Generally, no PEP warranted; however, consider basic 2-drug PEP++ in setting where exposure to HIV infected persons is likely
Large volume	Recommend expanded 3-drug PEP	Recommend expanded 3-drug PEP	Generally, no PEP warranted; however, consider basic 2-drug PEP**for source with HIV risk factors++	Generally, no PEP warranted; however, consider basic 2- drug PEP** in setting where exposure to HIV-infected persons is likely

4.4.7 Standard Precautions

Standard Precautions

Because a health worker cannot always know when a patient's body fluids are infectious, standard precautions should be used with all patients in the healthcare setting, regardless of their infection status.

Minimum Standard Precautions

- A source of clean water;
- Routine hand washing before and after any contact with a patient who has fever;
- Use of barrier precautions such as bandages and gloves;
- Safe handling and disposal of sharp instruments and equipment, including needles and syringes anduse of "sharps boxes" at every ward.

Routine Hand Washing

- The most important precaution for the prevention of infections
- Washing hands with soap and water eliminates microorganisms from the skin and hands

Health Facilities

Should provide at least:

- Soap;
- Soap dishes (with openings to allow water to drain away);
- Running water or a bucket kept full with clean water;
- A bucket for collecting rinse water and a ladle for dipping, if running water is not available;
- One-use towels (paper towels or cloth towels that can be used once and laundered. If not available, hands should be air-dried).

Steps in Hand Washing

- Place soap in palm of one hand;
- Wash the opposite hand and forearm. Rub surfaces vigorously for at least 10 seconds. Move the soap to the opposite hand and repeat;
- Use clean water to rinse both hands and forearms. If running water is not available, pour clean water from a bucket over the soapy hands and forearms. The rinse water should drain into another bucket;
- Dry the hands and forearms with a clean, one-use towel, or let rinsed hands and forearms air dry.

Barrier Protection

- Wear disposable gloves to empty bedpans or urinals, clean up spills of blood, vomit, urine or fecal materials, and while doing any invasive procedure such as drawing blood or starting an IV line;

- Cover cuts, scrapes, hangnails, and rashes with band-aids or bandages.

Handle and Dispose of Sharp Instruments Safely

- Disposable needles and syringes should be used only once. Do not recap needles after use
- Discard the used disposable needle and syringe in a puncture-resistant receptacle "sharps box"
- Burn the receptacle in an incinerator or pit

Disinfect Reusable Equipment and Instruments

- Obtain a jar or pan; clean and disinfect it;
- Place equipment and instruments in pan of soapy water after use. Fill with soapy water; leave them to soak until they are cleaned;
- Take the soaking equipment and instruments to the cleaning area;
- Clean them in soap and water. Remove any blood or biological waste, especially from the area around the equipment and instruments fittings.

Disinfect Reusable Equipment and Instruments

- Draw full-strength bleach into a tub or container, soak equipment and instruments for 30 minutes, and then expel bleach into a receptacle for contaminated waste;
- Soak again with bleach;
- Let the disinfected equipment and instruments air-dry;
- Store epuipment in a clean jar that has been disinfected.

4.5 Community Training Program on IS/IPC

The aim of this section is for participants to understand how to conduct a knowledge and attitude survey for selected communities on infection prevention and control and injection safety. Participants should be able to do the following:

- Work with others in the preparation of educational materials on infection prevention and control and injection safety for community training;
- Develop training programmes on infection prevention and control and injection safety for the community;
- Conduct sensitization programmes within the community to emphasize the importance of compliance with infection prevention and control and injection safety;
- Mobilize community action for compliance with infection prevention and control and injection safety;
- Monitor community behaviour on infection prevention and control and injection safety;

- Evaluate changes in community behaviour on infection prevention and control, and injection safety.

Assessment of Community Awareness on Injection safety and Infection Prevention and Control

To achieve successful assessment of community on IPC/IS, the following processes are essential:

- A community survey process which includes:
    - Instrument;
    - Sample population;
    - Survey Implementation;
    - Analysis, recording and reporting of survey results.
- Preparation of community training programmes on infection prevention and control and injection safety;
- Selection and preparation of educational materials on infection prevention and control and injection safety;

Monitoring and evaluation of community behaviour change impact.

- Structure (programme and resources);
- Process (programme delivery and community active involvement);
- Outcome (evidence of behaviour change).

4.6 Case Studies for Injection Safety

4.6.1 Listening to Patients

A story line on Busy Amos in the Out-Patients Department

Amos is the newly trained nurse at the Tandahimba District Hospital Out-Patients Department who has just resumed duty at the treatment room on a busy Monday morning. Outside the room is a long queue of patients waiting for treatment.

He gets the card of the **next** patient. While reading the prescription on the card he is called to answer the telephone.

On returning, the patient whose card he was reading before the phone call had gone to the toilet. He called 'next!' and the next patient in the queue walks in. Amos washes his hands, checks the dose on the card and draws the exact amount of 80mg. Gentamycin into a newly opened 2mls. Vanish Point Retractable syringe from his clean injection trolley.

The patient tried to draw his attention that he had not come for an injection but for a dressing, but because Amos is in a hurry to clear the patients, without paying attention, he asked the old man to get behind the screen for the injection the doctor had prescribed for him.

Amos went ahead and gave the injection at the outer upper quadrant of the left buttock and immediately dropped the used syringe and needle in a safety box. The patient began to sweat and shiver immediately.

4.6.2 Adverse Effects that Follows Injections

A Story Line

A young girl who grew up in a poor village in a polygamous household struggles to get school fees to complete her secondary education. She has always wanted to be a doctor and worked so hard that she passed her 'A' levels with good points and is admitted into medical school. The boyfriend from the same village has just graduated as a lawyer and they plan to marry after her internship.

The young medical student accidentally pricks herself with a needle she had used on an HIV positive patient while she was trying to recap it. She tells no one about it.

She got married as a virgin to her childhood sweetheart, fell pregnant and during ante-natal screening, tested HIV positive. She was devastated and could not figure out how she could possibly have got the virus as she trusted her husband and she herself was faithful to her husband. She is worried and keeps it to herself for some weeks wondering if her husband had been unfaithful. Eventually she confronted her husband who in turn was angry and turned on her accusing her of being unfaithful with other doctors at the hospital.

In the same year she was asked to facilitate a workshop and it was during a presentation that she remembered the needlestick seven years back and realized that must have been the time she got infected with the virus.

4.7.3 HIV Clinic

Group Work

You work in a remote area, and you're the doctor responsible of the HIV clinic. Normally, the clinic is closed on Saturday. However, your colleague had to see a very sick child (8 months). The child was born from an HIV+ mother, and had been treated previously for PCP. The child was not taking ART. Your colleague had given an IM injection to the child. The child made a sudden movement after the injection and the needle arrived in the physician's finger. The MD did not wear gloves. She washed the wound immediately with soap and water. The wound was a bit painful and bleeding. Half an hour after the accident happened; she comes to your house, in panic and asks you what to do.

Work in group, looking at the national guidelines and write the steps to take on a transparent sheet

4.7.4 Needlestick Injury

You work in an African regional hospital. Your colleague comes to you in a panic. She was doing an evacuation of a pleural effusion and the needle went deep in her finger, despite gloves. The wound was bleeding and she washed it immediately with water and soap. The doctor also says she is extra worried, because she is 10 weeks pregnant.
The patient was known HIV+, treated for TB.

Questions

It has been reported in several settings that health workers, especially cleaners, do not report accidents, because they know that they need to do an

HIV test before receiving PEP, and they fear lack of confidentiality. What do you think about this? How do you handle this in your setting?

Messages: Be Practical

- Assign one person per health facility responsible for PEP;
- Hold a meeting for all staff, including cleaners, to ensure they know about PEP;
- When the person responsible for PEP is off duty, inform all staff of who will replace him/her;
- Make sure PEP drugs are always accessible by PEP responsible;
- Guarantee confidentiality.

4.6.5 Laundry Workers

Gloria is a young woman who has worked in the laundry in one of the regional hospital for the past year. She is married with 2 children, both still in primary school. The husband works as a watchman at a nearby hotel.

She is a very diligent worker, always punctual and willing to do extra work whenever the need arises. On this fateful day at 2 minutes after 5.00 pm when she is about to change to go home, a laundry bag from the medical ward was brought in for laundry. The supervisor asked her to please help her 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. Whilst sorting the linen, Gloria was pricked by this needle.

She 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 go and see a doctor immediately.

Gloria went to the Out-Patients Department and saw that the queue for the doctor was very long. She was in a hurry to return home to cook for her family so she left the hospital without seeing the doctor and ignored the injury.

Ten years later during a programme for Voluntary Counseling and Testing (VCT), Gloria decided to go for testing and tested positive.

CHAPTER 5

SUPPLY MANAGEMENT

Among other things necessary for smooth services delivery, continued availability of essential commodities at the health facility is very important. Supply management ensures the availability of these commodities at service delivery points by adhering to the seven "rights" of the logistics system. This chapter helps participants understand how to increase the availability of IPC and IS commodities, like personal protective equipment, linen, disinfectants, cleaning solutions, etc., through proper supplies chain management.

General Objectives:

At the end of this chapter, participants will be able to:

- Describe the components of a logistics system;
- Describe inventory management;
- Describe logistics management information system (LMIS);
- Describe the monitoring, supervision and evaluation processes;
- Complete and use supplies management tools.

5.1 Injection Safety Component of the Logistics System

Specific Objectives

At the end of this topic, participants will be able to:

- Define common terms used in logistics;
- Explain the importance of logistics;
- Describe the elements of the logistics cycle.

5.1.1 Definitions

Logistic is the movement of commodities from one place to another according to schedule

Pipeline is the entire chain of storage facilities and transportation links through which supplies move from manufacturer to end user, from order to final delivery to the end user.

Lead-time is the amount of time between placing the order and receiving the commodities in the store ready for use.

Push system is a distribution system where the higher-level facilities determine the quantities to order for the lower-lever facilities. Also called allocation system, because the higher-level facilities allocate products to client facilities.

Pull system is a system in which lower level facilities decide the type of commodities, how much they require and when to 'pull' the products down from higher level facilites. Also called *requisition system* or *indent system.*

Minimum stock level is the amount of stock by specific name below which a store/warehouse should not fall under normal circumstances.

Minimum months of supply is the amount of commodity by name, expressed in months, below which a store/warehouse should not go below under normal circumstances.

Maximum stock level is the amount of a commodity by specific name above which the store/warehouse stock level should not exceed under normal circumstances.

Maximum months of supply is the amount of commodity by name, expressed in months, above which the store/warehouse stock level should not exceed under normal circumstances.

Ending balance is the quantity of stock on hand at a given period, which is determined by a physical count.

Safety stock is the amount of commodity kept as reserve (buffer) stock to avoid stockouts due to delayed deliveries or increased demand.

Working stock is the amount of commodity by name between maximum and minimum stock levels.

Bin card is an individual stock keeping card that includes information about a single lot of a given product.

Stock registers are tools that monitor stock movements and status.

Physical inventory is a means counting by hand the total number of units of each type of commodity in the store by expiry dates.

Requisition and Issue Voucher are documents used to list the quantity of items requested, issued and received by a facility.

5.1.2 Importance of the Logistics System

Ensures the continued availability of supplies and equipment by meeting customers' needs according to the following logistics "rights":

Right Goods
- Based on product selection and specification;
- Based on meeting appropriate quality/ standards;
- Based on suitability to customers.

Right Quantity
- Based on consumption rate;
- Based on amount of time between placing the order and receiving the commodities in the store ready for use;
- Enough to serve the customer.

Right Condition
- Not damaged or expired;
- Stored according to the manufacturer's product instructions.

Right Place
- Accessible to the client;
- Accessible to the provider in the store and in the facilities.

Right Time
- Available when needed.

Right Cost
- Affordable to the client;
- Cost effective for the programme;
- Distributable by affordable modes of transport.

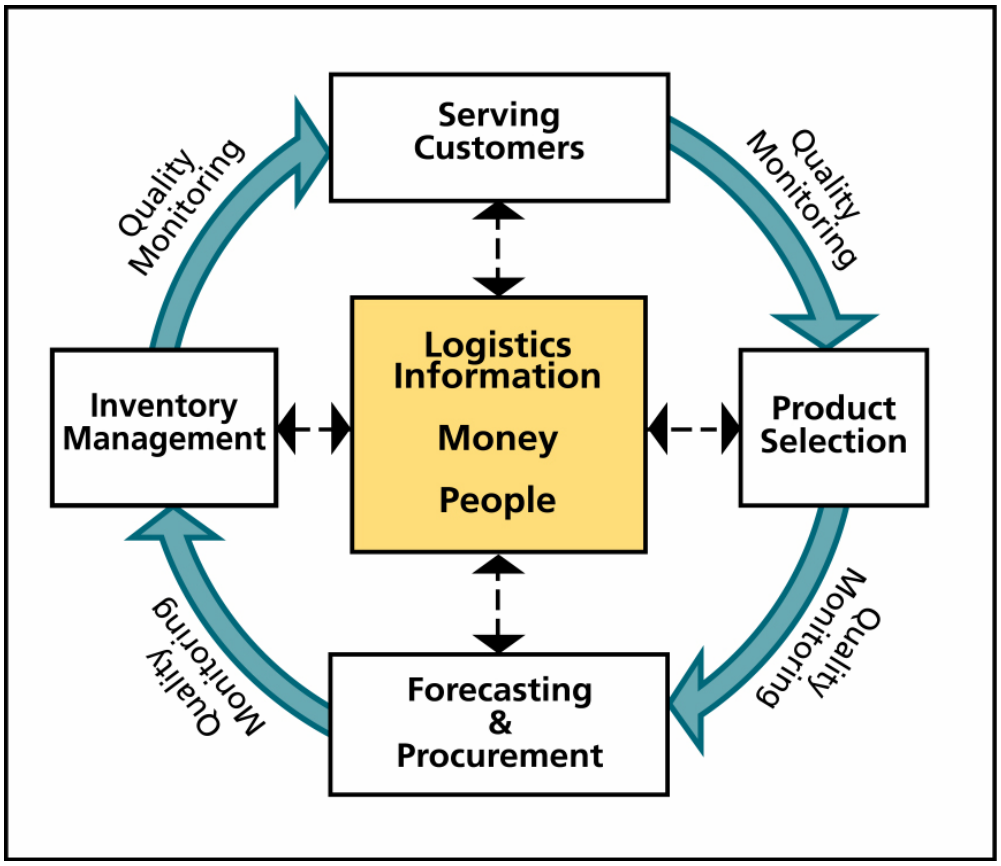
Right Customer
- Correct client for the product;
- The person responsible for commodity security.

5.1.3 The Logistics Cycle

This is a systematic approach of describing different activities in the logistics system. As shown in Figure 5.1, the logistics cycle comprise of four main

elements: product selection; forecasting and procurement; inventory management and servicing customers through which logistics information, money and people are involved. From each step to another within the cycle, quality monitoring is essential.

Figure 5.1: The logistics cycle



The Major Elements of the Logistics Cycle

Serving Customers is the priority of the cycle.

Product selection is dependent on what customers are using or what service providers are prescribing. Some of the products include:

- Personal Protective Equipment;
- Liquid soap, anticeptics, etc.;
- Linen;
- Disinfectants;
- Single use syringes and needles (disposable);
- Re-use prevention syringes (auto-disable syringes);

- Re-use prevention and needlestick prevention syringes (retractable);
- Safety boxes;
- Needle removers;
- Bins;
- Bin liners.

Forecasting and Procurement

Forecasting is the projection of actual needs based on historical data (consumption data), future programme plans and the underlying assumptions. Good forecasting allows the right goods to be acquired in the right quantities and at the right cost.
Procurement involves the process of planning, forecasting, specification development, bids, orders, and facilitating delivery and regulatory needs. It entails financial resources, technical skills, and management systems.

Inventory management is the process of receiving, storing, issuing, ordering and distribution of IS and IPC commodities to various sites

Logistics Management Information System (LMIS)

The logistics management information system is the engine that drives the function of the logistics cycle by providing information used for making logistics decisions, such as when to order and how much to order. There are people to act on the information on all the injection safety commodities and money to run the process.

Quality Monitoring

Surrounding the cycle is quality monitoring, which is concerned with the quality of the products as well as quality of the information and day-to-day logistics decisions. All this needs to operate within a supportive policy environment. In the logistics cycle, goods do not only flow to the customer, but information also flows to and from each element in the logistics cycle.

5.2 Inventory Management

Specific Objectives

At the end of this topic, participants will be able to:
- Define the term inventory management;
- State the purpose for a physical inventory;

- Discuss the stock levels status;
- Describe the components of inventory management;
- Understand how to fill the inventory forms/tools.

5.2.1 Definition of Inventory Management

Inventory management is the process of procuring, receiving, storing, issuing, ordering and distribution of IS and IPC commodities to various sites.

Maximum-minimum (max-min) Inventory Control System

The maximum-minimum inventory control system ensures a continuous supply of health products at service delivery points. Logistics managers monitor stock levels and establish ordering and distribution procedures to maintain stocks between recommended maximum and minimum levels. Ideally an order is placed when the stocks hit the minimum to avoid stock-out or expiring stock in store.

Components of Inventory Management

- *Determining order quantities*: Before determining amount to be ordered there is need to establish what is in stock. This is done through physical inventory.
- *Importance of conducting physical inventory*: To identify the actual amount in the store and that shown on the stores records and to identify discrepancies (e.g., through theft, pilgrage, expiry and damages).

5.2.2 Types of Physical Inventory

- *Complete physical inventory*: All products/commodities are counted by hand at the same time. Normally done yearly.

- *Partial or sample physical inventory*: Some of the products are counted by hand at different times for example partial inventory of a specific product is done at each reorder point to verify quantities.

Steps in Conducting Physical Inventory

1) Count every item in stock by commodity type;
2) Record findings of the physical inventory on bin cards and stock registers;
3) Record date of the physical inventory on bin cards and stock registers;
4) Mark expiry dates on carton/box (if not already marked);
5) Reorganize commodities according to 'first-to-expire, first-out' (FEFO) if not already done;

6) Reorganize supplies and equipment according to 'first-in, first- out', (FIFO) for products with no expiry dates if not already done;
7) Separate expired/damaged or unusable items from usable ones and make appropriate entry in the registers.

Key Measurements in Inventory Control and Their Calculation

(a) Average Monthly Consumption Rate (AMCR): The average number of each commodity issued or dispensed to clients/ patients in a given month. AMCR helps to determine the amount of each commodity that must be kept on hand in order not to stockout. This must be reviewed quarterly and adjusted according to the current consumption trends.

How to calculate AMCR

$$\text{AMCR} = \frac{\text{Total consumption}}{\text{Total months (in a specified review period)}}$$

Example
If you had 500 syringes of 5 ml. at the beginning of January, you received 1,000 of the same at the end of February, and you have 300 at the end of March, what will be your AMCR, assuming there were no stockouts?

Total syringes found in stock (A)	=	500
Total number of syringes received (B)	=	1,000
Total syringes in stock at the end of stock taking period (C)	=	300

Total consumption = A + B – C = (500 + 1000) – 300 = 1,200

Stock taking period = January to March = 3 months

Average monthly consumption = Total consumption/stock taking period
= 1,200/3 = 400

(b) Months of Supply on Hand (MOS): The actual amount of each commodity on hand expressed in months.

Why determine MOS?
- To avoid over and under stocking;
- To always having the right amount of commodity on hand;
- To help determine the amount of supplies to order.

How to calculate:
1) Take the number of each commodity on hand (physical inventory);
2) Take the AMCR for each commodity;

3) Divide (balance on hand, step 1) by (AMCR, step 2);
4) This gives the month of supply on hand.

$$\text{MOS} = \frac{\text{Balance on hand}}{\text{AMCR}}$$

Example
In Store D, there was a balance of 180,000 pieces of syringes and needles at the end of the first quarter; the AMCR for the store is 60,000 pieces. How many months of supply on hand does this store have?

$$\text{MOS} = \frac{\text{Balance on hand}}{\text{AMCR}} = \frac{18{,}0000}{60000} = 3 \text{ months.}$$

(c) Calculation of Minimum/Maximum Stock Levels

Maximum months of stock: The amount of commodity by name expressed in months above which the store/warehouse stock level should not exceed under normal circumstances.

Minimum months of stock: The amount of commodity by name expressed in months below which a store/warehouse should not go below under normal circumstances.

Minimum/Maximum stock level is based on AMCR and the minimum/maximum months assigned to each level, which differs by level of facility in the health system.

Maximum and minimum stock levels are measured in months of stock, and are established depending on the review period and the lead time.

How to Calculate:

Maximum Stock Level
- Take AMCR of each commodity
- Multiply by maximum number of months of stock to be kept

Minimum Stock Level
- Take AMCR of each commodity
- Multiply by minimum number of months of stock to be kept

Example: Determination of the minimum and maximum stock levels

In facility F, the AMCR of 2 ml. syringes is 125. The maximum months of supply for this facility is two months while the minimum months of supply is one month. What is their maximum/minimum stock level?

Answer

Maximum stock level = AMCR x Maximum MOS = 125 x 2
= 250 syringes

Minimum stock level = AMCR x Minimum MOS = 125 x 1
= 125 syringes

(d) Determining the Amount of Commodity to Order

The following steps should be taken to determine the amount of commodity to order:

1) Calculate maximum stock level based on AMCR and maximum months of supply;
2) Subtract stock on hand from the maximum stock level;
3) Record the difference as the quantity of injection safety commodities to order.

Amount of each commodity to order:

= Maximum Stock Level *minus* Stock on Hand

Example

In Kilombero District store, the AMCR for needles and syringes is 12,000 pieces of 5 ml, the store is supposed to keep maximum stock of 3 months. The ending balance at the end of 2nd quarter 2004 was 5,000 pieces. What quantity does this store need to order?

Amount to Order = (Maximum Stock) minus (Ending Stock on Hand)
Maximum stock level = AMCR x Maximum Months of supply
=12,000 x 3
= 36,000

Ending balance = 5,000

Amount to order = 36,000 – 5,000 = 31,000.

(e) Procedures For Receiving Commodities

The following must be done as commodities are received:

- Ensure supplies received tally with ordering form;
- Dispatched commodities are self-verified;
- Receiving Officer checks on expiry date and batch numbers;
- Arrange commodities in different places on shelves in the store;
- Update record, (i.e. bin card/stock registers);
- Sign the issue voucher and file them.

Action to be Taken in Case of Excess/Shortages or Quality Problems:

- Liaise with the source of supply for further advice
- If excess commodity; return to supplier for re-distribution
- Update records, including damaged goods.

Storage:

Store: A structure or room where commodities are kept for safety and are available to users when required.

Purpose of storage:

- To keep supplies safe and secure from theft and damage until they are issued to health services delivery points and the consumer;
- To ensure the quality of supplies by protecting the integrity of the packages and making them easily accessible when needed.

Storage layout: Involves making a plan of having the maximum and best use of the available storage space.

Principles of Storage Practice:

- Store fast moving commodities in an easily accessible place;
- Store each type of commodity in the same area and label them;
- Store the unusable and expired commodities in a segregated marked place;
- Keep all commodities on shelves, cupboards or on the pallets;
- Clean and disinfect storeroom regularly, to discourage harmful insects and rodents from entering the storage area;
- Store all commodities including injection safety supplies in a dry, well-lit, well-ventilated store room;
- Protect storeroom from dampness;
- Keep functional fire safety equipment in an easily accessible place;
- Store latex products away from heat generating sources;
- Maintain cold chain storage as required;
- Limit storage area access to authorized personnel;
- Stack cartons at least 10 cm (4 in.) off the floor, 30 cm (1 ft.) away from the walls and other stacks, and no more than 2.5 m (8 ft.) high;

- Arrange cartons with arrows pointing up and with identification labels, expiry dates and manufacturing dates clearly visible;
- Store health commodities to facilitate 'first-to-expire, first-out' (FEFO) procedures and stock management;
- Store health commodities away from chemicals, flammable products and hazardous materials;
- Separate damaged and expired health commodities from usable commodities;
- Keep narcotics and other controlled substances in a locked place
- Store labeled flammable products separately with appropriate safety precautions;
- Store topical preparations separately.

Issuing and Record Keeping:

Before issuing, the storekeeper should review the issue voucher by verifying:

- Correctness of referenced information;
- Correctness of determining issue quantity;
- Correctness in filing the issue voucher;
- Completeness of the issue voucher.

Units of issue: Commodities can be issued as pieces, boxes, cartons, packs, vials, ampoules, and doses.

The advantages of issuing commodities in different units include:

- Easy to count in boxes or packs;
- There is less possibility of mistakes in counting;
- It takes less time to supply;
- Easy to carry;
- Minimizes pilferage.

Records Keeping

A **record** is a collection of related data items. Table 5.1 includes various types of records, their uses and examples.

Table 5.1 Types of Records and Uses

Type of Record	Examples	Use
Stock Keeping	Bin Card;	An individual stock-keeping card that keeps information about a single lot of a given product; Bin cards are usually displayed at the bins or shelves where the

Type of Record	Examples	Use
		commodity is found; An individual stock keeping card that keeps information about all lots of a product.
	Inventory Control; Card	One inventory card for each product.
	Stores Ledger.	A bound book used instead of the individual card format.
Transaction Records	Packing List; Issue Vouchers; Requisition and Issue Vouchers;	Used to record information on the movement of stocks from one storage facility to another.
Consumption Records	Daily Activity Register(e.g., dispensing register, injection register); Tally Sheet.	Used to record the quantity of each item dispensed to customers.

Reporting

Information needed by the managers of the logistics system in planning and making decision includes:

- The current stock level on hand;
- The amount of stock on order in the pipeline (for requisition systems)
- The quantity of injection, equipment and related supplies required to be ordered at health facilities;
- Historical data on times and shipment quantities, both into and out of the facility;
- Losses and adjustments.

When reporting, the following records are necessary:

- *Stock-keeping records*: These must include inventory control cards, and may include additional records for accountability and prevention of theft
- *Transaction records*: These include records of the amount of commodities shipped from one facility to the next, and records of amounts ordered (for requisition systems)

- *Consumption records*: Used to record the quantity of each item dispensed to clients.

When to Report:

- A reporting schedule should always be established, (e.g., service delivery points, report to the districts by the fifth day of every month).
- District stores: Report to the central level by the tenth day of the month every three months or quarterly.

(Appendix 3 and 4 show sample forms for participants' exercises).

5.3 Logistics Management Information System (LMIS)

Specific Objectives:

At the end of this topic, participants will be able to:

- Define logistics management information system;
- State the importance of LMIS;
- Describe activities that happen to supplies in a logistics system;
- Describe the design of LMIS;
- Identify the characteristics of a functional LMIS.

LMIS is defined as the information required to manage various activities in the supply system.

The Importance of LMIS:

- The place of the LMIS in the logistics cycle is at the centre of the cycle, interacting with each element. Therefore, it is the engine that runs the logistics system;
- Indicates when to order supplies;
- Highlights the position of supplies in the pipeline and whether commodities need to be pushed from higher to lower levels;
- It captures information on where consumption is highest and whether more resources are required;
- Highlights losses in the system, which requires action;
- Points out bottlenecks in the system, thus enabling adjustments;
- Picks out information on 'nearly expired' commodities, thus re-distribution. Expired ones are also picked out, thus enabling destruction.

Activities that happen to supplies in a logistics system

- Supplies can be stored as inventory;
- Supplies can be distributed from one facility to another;
- Supplies can be dispensed to customers at a facility.

These activities in a logistics system are needed to support managers in decision-making.

Design of LMIS

Data items needed for designing LMIS include:

- *Stock on hand*: Quantities of usable stock available at all levels of the system. Do not count any items that are unusable. These should be considered losses to the system;
- *Rate of consumption*: The average quantity of a particular item dispensed to users during a particular time period;
- *Losses and adjustment*: Losses are the quantities of stock removed from the pipeline for any reason other than consumption by client (e.g., expiration, theft, damage, etc.). Adjustments include quantity issued to or received from other facilities. Adjustments may also be administrative changes, such as physical count that discovers a different amount from the quantity listed in the bin cards. Remember, adjustments may either be positive or negative changes in stock.

Characteristics of a functional LMIS

A functional LMIS should:

- Keep the data items that need to be collected to a minimum. Do not collect unnecessary data;
- Ensure that the forms are not complicated. Include precise and concise instructions for completion;
- Ensure that the forms do not take a long time to complete. Completing forms should not take staff time away from other activities.

5.4 Monitoring, Evaluation and Supervision

Specific Objectives

At the end of this topic, participants will be able to:

- Define the terms monitoring and evaluation;
- Discuss rationale of logistics evaluation;
- Describe the purpose of monitoring and evaluation;
- Carry out logistics supervision;
- Evaluate the logistics system using indicators.

Definitions

Monitoring: The routine tracking and reporting of priority information about a programme and its intended output and outcomes

Evaluation: A rigorous, scientifically-based collection of activities, characteristics, and outcomes that determines the merit or worth of injection safety practices.

Rationale of Logistics Evaluation:

- To make informed logistics decisions regarding operations and service delivery;
- To ensure the most effective and efficient use of resources;
- To find out the extent to which a programme or project is having or has had an on desired impact;
- To determine the extent to which the programme or project is on track, and to make any needed correction accordingly.

Purpose of Monitoring and Evaluation:

- Provides important data on the progress of injection safety;
- Permits better injection safety management and decision-making;
- Allows accountability of health workers, clients, and the community;
- Provides appropriate selection of safety devices;
- Ensures that clients get the health commodities needed when they need them;
- Ensures that planned logistics activities are carried out according to schedule;
- Ensures that records are correctly maintained and reports submitted in a timely manner.

Supervision: The process of ensuring that personnel have the knowledge and skills required to carry out their responsibilities effectively and providing immediate on-the-job training as needed.

Purpose of Logistics Supervision:

- To ensure health workers have the knowledge and skills needed to effectively manage the logistics system;
- To identify performance level and take appropriate actions;
- To ensure that established logistics guidelines and procedures are being followed;
- To provide on-the-job training;
- To ensure that personnel at all levels carry out their responsibilities.

Programme Evaluation Using Indicators

Input Indicators:

- Quantity of syringes and needles, safety boxes and needle pullers supplied (Issue Voucher);
- Number of devices received (see stock card/bin card receipts);
- Number of devices used (stock card supplies);
- Availability of injury reporting forms and log books;
- Availability of re-use prevention injection devices (stockouts).

Process Indicators

- Infection prevention and control and injection safety committee exists with a logistician in place;
- Number of meetings on injection safety in which injection device security is discussed;
- Availability of injection safety information, education and communication materials (posters, leaflets, etc. giving information on injection devices) on display.
-

Outcome Indicators

- Number of clients served (receiving devices from the programme);
- Number of health workers trained in injection safety logistics;
- Reported incidences of injuries while using new devices supplied by the programme;
- Observable practice on injection and sharps disposal using commodities supplied by the programme.

Logistics Core Indicators

The following indicators are quantitative, cover most aspects of a logistics cycle and are used to monitor, evaluate and supervise many types of interventions:

- Logistics management information system (LMIS)
- Storage conditions
- Order fill rate
- Stockout frequency
- Adequate stock status
- Forecast accuracy
- Stakeholder commitment to procurement plan
- Existence of an adequate multi-year procurement plan.

CHAPTER 6

HEALTHCARE WASTE MANAGEMENT (HCWM)

Proper disposal of contaminated waste minimizes the spread of infection to clinical personnel and to the local community. Contaminated clinical waste should be incinerated (burned), preferably, and/or buried. The focus of this chapter is to impart the knowledge and skills of proper healthcare waste management.

The following topics comprise the chapter: Introduction to Healthcare Waste; Key Steps in HCWM, Home-based HCWM, Job Responsibilities, Improving Communication Amongst Staff on HCWM-related problems and Healthcare Waste Management Planning for Health Facilities.

General Objectives

At the end of the chapter, participants will be able to:

- Understand the issues related to healthcare waste and explain the effects of healthcare waste on people and the environment;
- Identify laws, guidelines and policies related to HCWM
- Demonstrate knowledge of key steps in healthcare waste management, such as waste minimization, segregation, handling and storage, transport, treatment and destruction, and final disposal, including home-based infectious waste;
- Understand their roles and responsibilities in healthcare waste management;
- Develop a HCWM plan.

6.1 Introduction to Healthcare Waste

Specific objectives

At the end of this topic, the participants will be able to:

- Define healthcare waste;
- Discuss risks and hazards of healthcare waste;
- Classify healthcare waste (infectious and non infectious);
- Discuss the importance of proper waste disposal;
- Identify personnel to be trained.

Definition of Healthcare Waste

WHO defines healthcare waste as the total waste stream from a healthcare or research facility that includes both potential risk waste and non-risk waste materials.

Risks and Hazards of Healthcare Waste

- Needlestick injuries;
- Transmission of infections or disease (e.g., cholera, dysentery, HIV/AIDS, hepatitis A, B, and C);
- Re-use 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;
- Fires;
- Public nuisance (offensive smells, unsightly debris);

The examples of infections caused by exposure to healthcare waste, causative organisms, and modes of transmission, are summarized in Table 6.1.

Table 6.1 Examples of Risks of Exposure to Healthcare Waste

Type of infection	Examples of causative organisms	Transmission vehicles
Gastroenteric infections	Enterobacteria, e.g. *Salmonella*, *Shigella* spp.; *Vibrio cholerae*; helminths	Faeces and/or vomit
Respiratory infections	*Mycobacterium tuberculosis*; measles virus; *Streptococcus pneumoniae*	Inhaled secretions; saliva
Ocular infection	Herpesvirus	Eye secretions
Genital infections	*Neisseria gonorrhoeae*; herpesvirus	Genital secretions
Skin infections	*Streptococcus* spp.	Pus
Anthrax	*Bacillus anthracis*	Skin secretions
Meningitis	*Neisseria meningitidis*	Cerebrospinal fluid
Acquired immunodeficiency syndrome (AIDS)	Human immunodeficiency virus (HIV)	Blood, sexual secretions
Haemorrhagic fevers	Junin, Lassa, Ebola, and Marburg viruses	All bloody products and secretions
Septicaemia	*Staphylococcus* spp.	Blood
Bacteraemia	Coagulase-negative *Staphylococcus* spp.; *Staphylococcus aureus*; *Enterobacter*, *Enterococcus*, *Klebsiella*, and *Streptococcus* spp.	
Candidaemia	*Candida albicans*	Blood
Viral hepatitis A	Hepatitis A virus	Faeces
Viral hepatitis B and C	Hepatitis B and C viruses	Blood and body fluids

Classification of Healthcare Waste

Eighty percent (80%) of waste from health facilities is 'general' waste, and not harmful. It is referred to in Table 6.2 as 'non-infectious waste. Twenty percent (20%) of healthcare waste can be dangerous, and thus is referred

to as 'infectious' waste. One percent (1%) of infectious waste is sharps waste.

Table 6.2: Classification of waste and description by type[20]

Classification	Types of Waste
Infectious waste	***Body fluids***: 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, fetuses, 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 are most likely to be found in waste include: • Formaldehyde • Photographic chemicals • Solvents • Organic chemicals • 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, boxes. ***Radioactive Waste***: Any solid, liquid, or pathological waste contaminated with radioactive isotopes of any kind. ***Genotoxic Waste***: Genotoxic waste is highly hazardous and may have mutagenic or carcinogenic properties. Genotoxic waste may include certain cystostatic drugs, vomit, urine, or faeces from patients treated with cytotoxic drugs, chemicals and radioactive material. ***Pressurized Receptacles***: Cylinders containing gases or aerosols, which when accidentally punctured or incinerated, could explode. ***Waste with High Contents of Heavy Metals*** – Batteries, broken thermometers,

[20] WHO/AFRO/CRHCS. 2003. *Manual of Infection Prevention and Control Policies and Guidelines,* p. 163.

Classification	Types of Waste
	blood pressure gauges, etc.
Non-Infectious waste	***Communal/general Waste:*** All solid waste that does not contain high risk waste types (e.g., infectious, chemical, radioactive). Communal wastes from medical treatment or research centres include uncontaminated wastes such as bottles, office paper, boxes and packaging materials.

Importance of Proper HCW 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;
- Reduces problems of insects, rodents, and animals;
- Reduces odors and helps provide clean and attractive appearance environment of the facility.

Personnel to be Trained

All healthcare staffs are responsible for waste handling. However emphasis will be placed on injection providers, supervisors, waste handlers and those responsible for final disposal. They must be trained on safe and proper healthcare waste management. For incinerator operators, more special training on the specific type of incinerator in use at the facility must be given.

6.2 Policies, Laws and Guidelines Related to Healthcare Waste Management

Specific objectives

At the end of this section, participants will be able to understand:

- Tanzanian laws and policy guidelines related to healthcare waste management;
- International healthcare waste management guidelines and policies.

Tanzanian Laws and Policy Guidelines Related to Healthcare Waste Management

Environment Management Act 2004 (Part IX of EMA section 114 – 150 addresses proper waste management by declaring that everyone is responsible for managing the waste. However other related laws also exist (e.g., Environment Health Act 2003, Public Health Act 2003, TFDA Act, no.1 2003, Local Government Act 1982 Amended in 2000, and Water Quality standards Act No.1, 1981)

Guidelines related to HCWM in Tanzania include Infection prevention and Control Guidelines, National Policy Guidelines on HCWM and Standard and Procedure for HCWM (draft).

International Healthcare Waste Management Guidelines

- National regulations and legislation shall be observed when planning and implementing waste treatment and disposal guidelines;
- Every healthcare facility shall develop a healthcare waste management plan and shall designate a staff to coordinate its management;
- All healthcare staff have a responsibility to dispose of waste in a manner that poses minimal hazard to patients, visitors, health workers, and the community;
- Waste should be properly segregated;
- Sharps shall be contained in a puncture-resistant, liquid-proof safety box;
- Infectious waste materials shall be treated properly to eliminate the potential hazard that these wastes pose to human health and environment;
- All infectious waste shall be stored in a designated location with access limited to authorized personnel;
- Written policies and procedures to promote the safety of waste handlers shall be defined with inputs from persons handling the waste, including those from the private sector;
- Private waste management teams will collaborate and work within the health systems for proper healthcare waste management;
- All waste handlers (including those from the private sector) shall wear personal protective equipment appropriate to the risk (e.g., aprons, protective footwear, heavy work gloves);
- Waste handlers shall be offered hepatitis B immunization;
- All health workers shall be familiar and comply with the national public health regulations governing disposal of biohazard wastes;
- All health workers (including those working privately and with NGOs) shall receive orientation and in-service training on healthcare facility waste management[21].

International healthcare waste management policies, (i.e., Basel Convention, Stockholm Convention and the United Nations Packaging Requirements) also exist and govern the HCWM in Tanzania.

[21] Manyele, S.V., H. Anicetus, and M.H. Bilia, "Globalization and its Effects on Medical Waste Management in Tanzania," The Tanzania Engineers Annual Conference, December, 2003, AICC Arusha, pp. 76-92

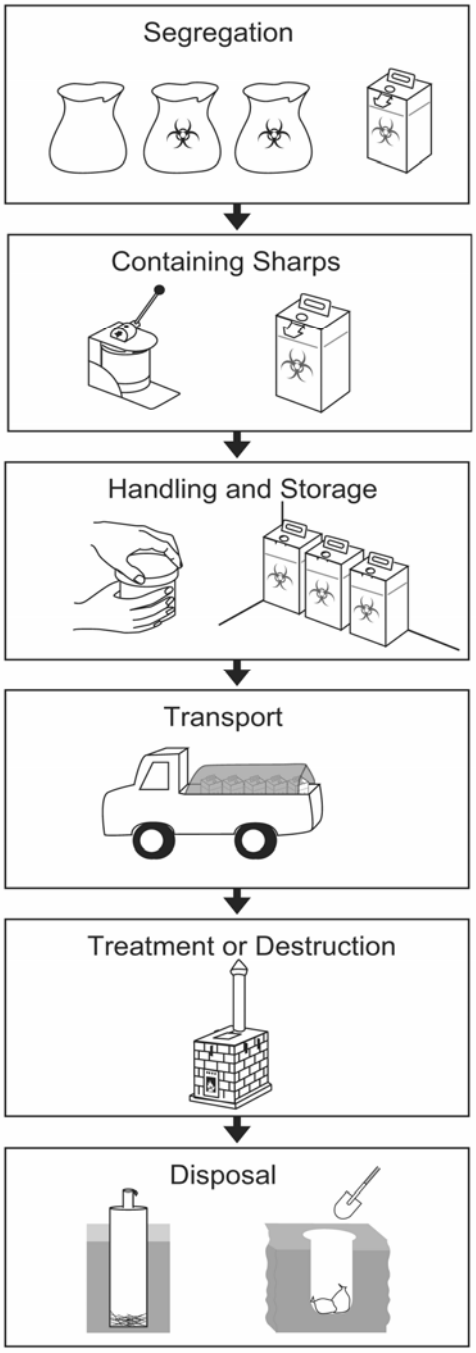
6.3 Key Steps in Healthcare Waste Management

Specific Objectives

At the end of this section, participants will be able to discuss the key steps in HCWM, which include (see Figure 6.2):

1) Waste minimization;
2) Segregation;
3) Handling and storage;
4) Transport;
5) Treatment and destruction;
6) Final disposal.

Figure 6.2: Key Steps In Healthcare Waste Management



6.3.1 Waste Minimization

This is the first and best way to reduce healthcare waste quantities and costs, and to reduce environmental impact on air pollution and landfill capacity.

Effective minimization requires that all purchases of material and supplies be made with waste reduction in mind.

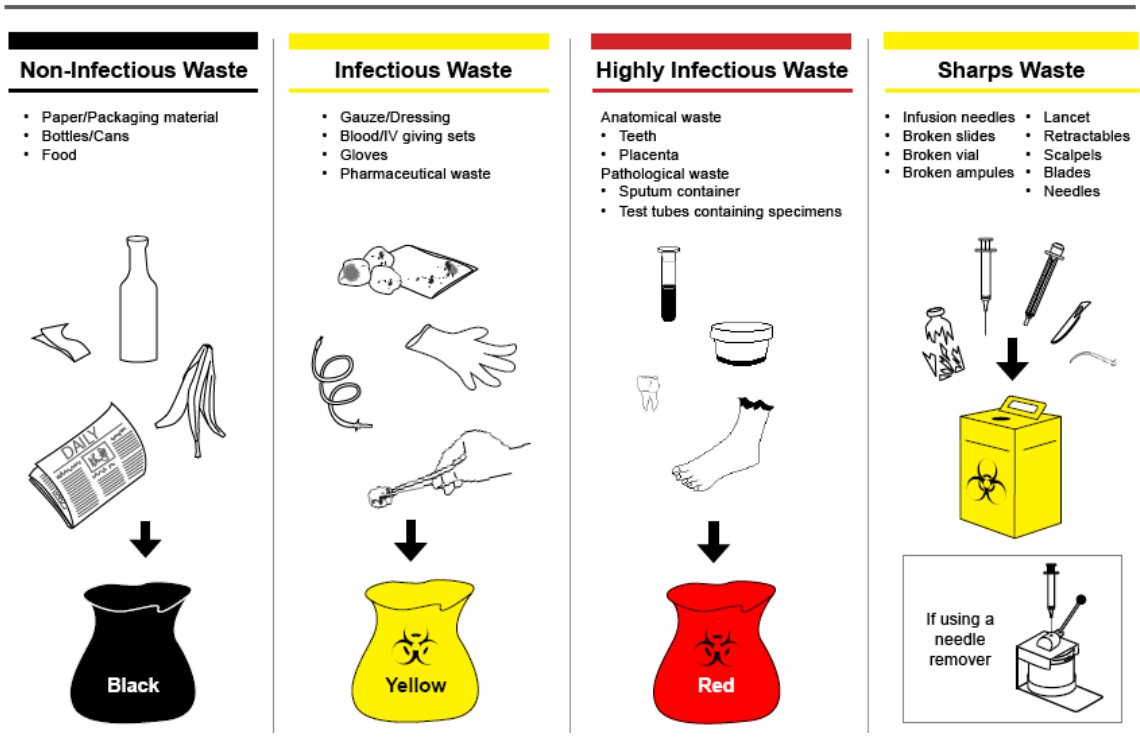
6.3.2 Waste Segregation

Separating waste by type at the place where it is generated is a key step towards good HCWM. Waste should be separated by the person generating the waste immediately according to its type and placed in a bin with an appropriately coloured bin liner or a sharps receptacle. Chemical and radioactive waste should be segregated and sent to MSD and National Radiation Council respectively for their disposal. Waste handlers should never sort through waste after it has been placed in the receptacle. One of the useful aspects of segregation is that some items can be reprocessed and made into other plastic products (i.e., buckets or benches (recycling)).

The following categories of waste should be segregated:

- Non-infectious;
- Infectious;
- Highly Infectious;
- Sharps.

Figure 6.3: Segregation of Healthcare Waste



Colour-coding

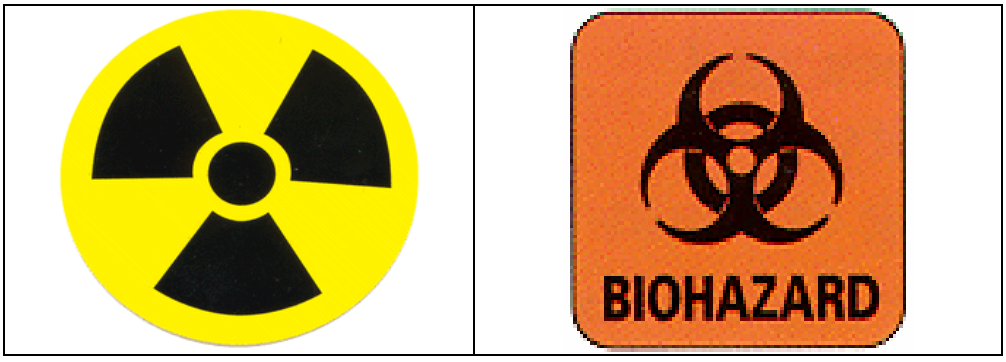
The following is the recommended color-coding as defined by the national guidelines for HCWM. If the facility has decided to use an alternative color-coding system, all waste receptacles should be labeled and all facility staff should be aware of this system.

Table 6.3: Colour-coding for Waste Segregation

Category	Examples	Colour of Bin Liner	
Non-infectious	Paper, packaging materials, plastic bottles, food, cartons	**BLACK/BLUE**	
Infectious	Gloves, dressings, blood, body fluids, used specimen receptacles	**YELLOW**	
Highly Infectious	Anatomical waste, pathological waste	**RED**	
Sharps	Syringes with needles, retractable syringes, syringes with needles removed (if using a needle remover), needles with infusion set removed, scalpels, prickers, blades, broken glass (e.g., pipettes, ampoules, vials)	**YELLOW safety boxes**	

If different colour bags are not available, a biohazard label (see Figure 6.4) may be placed on black bags to indicate their hazardous content.

Figure 6.4: Radioactive and biohazard symbol



Waste bins should be lined with appropriately coloured plastic bin liners. It is very important that both providers and waste handlers understand the colour-coding system and handle waste accordingly (see Table 6.3).

Minimum Specifications for Waste Bins and Receptacles

Waste bins and receptacles must be:

- Leak-proof with well fitting lid;
- Made of non-corrosive material (reusable polypropylene bins);
- Lined with colour-coded non-PVC plastic (disposable polyethylene liner-bags);
- Disinfected and washable after each use;
- Portable (fixed with handle and volume of 25-40 litres);
- Made of material which prevents emission of radiation if intended for radioactive waste;
- Placed at convenient locations for use;
- NOT be used for any other purpose in the health facility.

Segregation of Sharps Waste

All sharps should be disposed of immediately after use. Used syringes and needles can be disposed of into a safety box or a needle remover.

a) Use of a safety boxes

Syringes with needles attached are placed into a safety box or other approved sharps receptacle (an ideal sharps receptacle is puncture-resistant and liquid-proof and has an opening that is small enough that a hand cannot fit into it). ***Note that needles must NEVER be recapped!!!***

How to Use a Safety Box

- Safety boxes are puncture-resistance, liquid-proof boxes produced for the receipt and disposal of sharps, including syringes and needles;
- A safety box must be placed at each injection station and within easy reach of the injection provider;
- 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 workers;
- Do not empty or re-use safety boxes;

Figure 6.5: The 5-L EPI Type Sharps Boxes

What Goes in a Safety Box?

- Syringes with needles
- Retractable syringes
- Syringes with needles removed (if using a needle remover)
- Needles with infusion set removed
- Scalpels
- Prickers
- Blades
- Broken glass (e.g., pipettes, ampoules, vials)

N.B:

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

b) Use of a needle remover

The needle is cut off with a needle remover, and the needle automatically falls into a needle receptacle attached to the needle remover. Full needle receptacles are emptied into a designated sharps pit or sharps barrel. The syringe is disposed of in a safety box.

Advantages:

- Immediately confines hazardous sharps waste;

- Prevents reuse;
- Reduces waste volume;
- Allows for on-site disposal of needles in a sharps pit or barrel;
- Proper use may prevent needlestick injuries to health workers and the community.

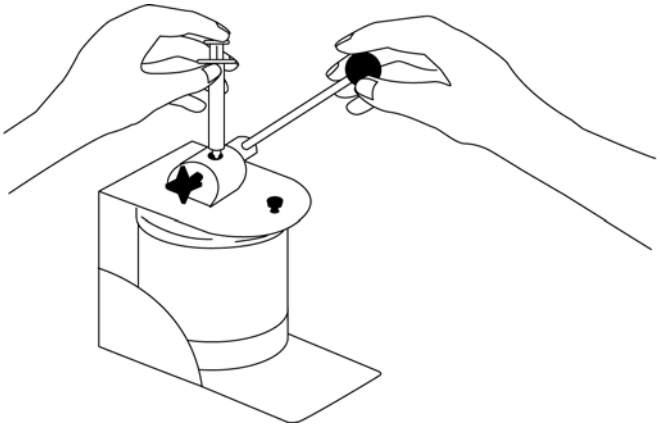
Disadvantages:

- Correct use relies on user compliance;
- Needles must be disposed of properly;
- Syringes disposal method still required;
- May not destroy needles completely;
- Must be maintained over time;
- Constant electricity supply is required for electric models;
- Required at each injection location.

How to Use a Manual Needle Remover

- Place needle remover within easy reach of where the injection is given;
- Use the needle remover immediately after the injection is given;
- Do not save or batch syringes for later removal of needles;
- Do not recap needles before using the needle remover;
- Insert needle as far into the opening as you can, and push the handle down;
- Cut the syringe, not just the needle;
- Fill needle receptacle to fill line--do not overfill;
- Put plastic syringe in a safety box or infectious waste bin for disposal;
- When full, carefully remove needle receptacle and immediately put the lid on the receptacle;
- Special care must be taken when placing the lid on the receptacle to prevent accidental needlesticks;
- Replace needle receptacle when full;
- If transporting the needle remover to outreach sites, make sure the lid is secured;
- It is important to clean and oil the device regularly and tighten screws when necessary; designate an appropriate person.

Figure 6.6: Using a Manual Needle Remover



6.3.3 Handling and Storage of Healthcare Waste

Handling and storage refers to collecting, weighing and storing waste.

Personal Protective Equipment (PPE)

Protective clothing should be worn by waste handlers when working with healthcare waste. This includes aprons, heavy duty long gloves, footwear, goggles/glasses, and masks. This clothing should be taken off when work with waste is completed.
Hands should always be washed with soap and running water after removal of gloves. Table 6.4 shows the specifications for PPEs.

Table 6.4: Specifications for Personal Protective Equipment

PPE	Specifications
Gloves	• Embossed grip for a secure, skid-resistant grip; • Neoprene shell is tough yet flexible; • Cotton liner resists punctures, cuts, snags, and abrasion.
Boots	• Molded polyvinyl or other plastic to ensure that it is waterproof; • Resistant to blood and easy to disinfect for maximum protection and hygiene; • Anti-skid tread prevents slipping; • Resistant to sharps puncture.

Aprons	• Longer length extends to overlap with boots; • Cotton ties and neck loop for easy on/off; • Moisture proof and chemical resistant; • Reusable, non-sterile.
Goggles/Eye Protection	• 100% polycarbonate material resists impact; • Vented side shields allow air to flow through; • Durable and cleanable design; • Properly fit and comfortable.
Mask	Mask with cartridge (for incinerator operator) or ordinary mask.
Head protection	Heavy duty material to protect waste dust and spills.

Figure 6.7 shows some of the personal protective gear for use during handling of the healthcare waste.

Figure 6.7: Recommended PPE's for Healthcare Waste Handling

To be kept in a good condition, protective clothing must be cleaned after each use and be kept at the health facility. Protective clothing must **NEVER** be taken home.

Collection

Healthcare waste collection is the process of moving waste from the point of generation or storage to a treatment or disposal site within the same health facility. Waste should be collected regulary and should follow facility schedule. Waste should never be resorted and segregation must be maintained

Record Keeping

Waste should be quantified by volume or weight and recorded through daily record keeping or quarterly assessment. Full safety boxes should also be recorded. This information can be used to advocate for funds for waste management. Appendix 4 should be used as sample recording form.

Storage Requirements:

- The main storage facility should be located within the hospital premises close to the treatment unit where applicable and away from food storage or food preparation areas;
- The ideal storage area should be designated for waste only, secured (only authorized persons should have access), kept clean, dry and pest free. Ideally the room should be well ventilated, easy to clean and disinfected. The room should have proper drainage and have impervious walls and floor surfaces;
- Healthcare waste should be stored no longer than 2 days, depending on type of healthcare waste and weather condition;
- Organic waste should be disposed of daily;
- Segregation must be maintained throughout until final disposal;
- The size of the storage room should be large enough to accommodate overflow waste in the case of collection breakdown;
- All radio-active waste shall be stored to allow decay to breakdown level. It should be placed in a large receptacle or drum and labeled with the radiation symbol showing a radionuclide's activity on a given date, the period of storage required and marked "Caution--Radioactive Waste";
- Waste handler should weigh and record in the monitoring form;

6.3.4 Waste Transportation

Waste transportation refers to the movement of waste from one place to another, either on-site or off-site.

On-site Transportation

On-site transportation includes all of the procedures and processes for transferring healthcare waste from the point of generation or storage to a treatment or disposal site within the same health facility. Waste should be moved in a designated trolley or wheelbarrow.

The minimum specifications for the wheelbarrow are:

- Easy to push;
- Painted with red color and marked with the letters "HCW";
- Should not be used for any other purposes;
- With smooth surfaces, leak proof, made of plastic or metal;
- Easy to load and unload;
- Easy to disinfect.

Off-site Transportation

Off-site Transportation includes all of the procedures and processes applied to transfer healthcare waste from a health facility to a new place or area for treatment and disposal.

Bins/bags/safety boxes must be kept upright, secured, 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 and the driver must be trained in the management of waste. It is also preferable to have a covered vehicle. The vehicle must be cleaned and sanitized at the end of each day. Sodium hypochlorite, Glutaraldehydes 2% (cidex), Lysol 5% and similar high-level disinfectants should be used.

Designated vehicles should be used for transportation of HCW and have the following features:

- Sealed body with lockable compartment doors;
- Marked with appropriate hazard placards;
- Lifting equipment;
- Be equipped with features to secure bins during transportation;
- Be easy to clean, rigid and leak proof.

If a designated vehicle is not available, another vehicle can be used, provided that the waste can be contained in the secure receptacles (the vehicle should not be used for other purposes).

6.3.5 Waste Treatment and Destruction

Healthcare waste is treated to render it non-hazardous. The treatment covers a broad range of technologies, incineration being one of them. Non-infectious waste does not need to be treated (as shown in Table 6.5).

Table 6.5: Treatment of Healthcare Waste

Types of Waste	Recommended Treatment	Recommended Procedure
Microbiological waste (e.g., cultures, vaccines, specimens)	Autoclave	Follow the machine's instructions.
Pathological waste (e.g., tissue, organs, blood, body fluids)	Liming	Dig pit, place lime, add waste, more lime, add soil.
Infectious fluid	Chemical	0.5% sodium hypochlorite solution; Let sit for 15 minutes.

Incineration

Incineration is high temperature burning. It reduces the volume of the waste and eliminates pathogens. Large scale incinerators that can reach very high temperatures are preferred to small scale, lower temperature incinerators. Incineration produces fewer pollutants than open-air burning, and is preferable if a good quality incinerator is available with a well trained operator.

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

- Clear operation procedures, which should be posted near the incinerator;
- Trained operators;
- Reliable segregation system, so 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.

Things that must NOT be incinerated

- PVC plastics (This includes blood bags and IV lines and bags);
- Mercury thermometers;
- Batteries;
- X-ray or photographic materials;
- Aerosol cans or gas receptacles;

- Glass vials (they can explode or if uncapped they melt and could block the incinerator grate).

Proper Use of Incinerators:

- Keep incinerator clean. Remove ash from ash chamber and grate and do not store waste in incinerator
- Some incinerators need to be preheated by burning general or non-medical waste (paper, packaging material, firewood, coconut shells) and supplemented with kerosene or diesel fuel as may be necessary. This process takes 20-30 minutes before the incinerator reaches the recommended temperature for incinerating healthcare waste (800˚C in the burning chamber).
- Safety boxes and infectious waste should be loaded at a rate that maintains a constant and good, but not fierce fire in the grate.

Maintaining an Incinerator

A qualified official must inspect the incinerator every 6 months using the following criteria:

- Masonry inspection and repair;
  - Check for loose bricks and cracks in mortar, interior and exterior;
  - Repair damage or replace bricks.

- Metal and chimney inspection and repair;
  - Check doors, hinges, grate, chimney cap;
  - Replace if bent or damaged;
  - Clean soot from inside chimney.

- Ash pit;
  - Ashes must be removed regularly from the incinerator and placed in an ash pit;
  - When ash pit is full, cover and dig new pit.

- Site maintenance;
  - Extraneous waste should not be left around the incinerator;
  - Clear brush from area around incinerator.

Encapsulation

Encapsulation involves filling receptacles with waste and adding an immobilizing material (cement, sand or clay) and sealing the receptacles. This is the appropriate method for disposing of expired vaccines.

How to encapsulate expired vaccines:

- Use an empty tin can;
- Pour 2 cm concrete into the bottom;
- Place vials of expired vaccines on the layer of concrete, keeping them separated.

6.3.6 Final Disposal Methods

Final disposal is the last step in HCWM to ensure waste is permanently eliminated so that it is no longer a risk to the health worker or the community. All disposal methods used must be agreed upon by key ministries and stakeholders. Both incinerator and burial site should be fenced with a gate and lock to prevent scavenging by both animals and people.

Waste Disposal Tips:

- Use heavy-duty (utility) gloves and appropriate personal protective equipment when handling waste;
- Decontaminate and clean gloves between uses;
- Always wash hands after handling contaminated wastes;
- Handle wastes carefully to avoid spills or splashes;
- Avoid transferring contaminated waste from one receptacle to another;
- Incineration is the preferred method for waste disposal, as the heat will generally be sufficient to destroy infectious microorganisms and will also prevent scavenging and re-use of discarded items;
- If incineration either high or low temperature is not possible, then careful burial is the next best alternative;
- Dispose of used toxic chemical or medicine receptacles properly;
    - Rinse glass receptacles thoroughly with water; glass receptacles may be washed with detergent, rinsed and can be reused;
    - For plastic receptacles that contained toxic substances such as glutaraldehyde (e.g., Cidex® or Sporicidin®), rinse three times with water and dispose by incineration and/or burial; these receptacles may be used for sharps disposal receptacles, but do not reuse them for any other purposes;
- Equipment that is used to hold and transport wastes must not be used for any other purpose in the clinic or health care facility. Contaminated waste receptacles should be clearly labeled;
- Clean contaminated waste receptacles each time they are emptied and non-contaminated ones when visibly soiled;

- Decontaminate all contaminated waste receptacles between each use with 0.5% chlorine solution and rinse well with clean water.

Burying

Burying is placing waste into a pit and covered with earth.

To build a waste burial pit, choose an appropriate site that is at least 50 metres away from any water source to prevent contamination of the water source. The site should have proper drainage, be located downhill from any wells, be free of standing water, and be in an area that does not flood. The site should not be located on land that will be used for agriculture or development. Consult the appropriate local authority for information about placement of the waste pit.

Pits should be dug 1-2 metres wide and to a depth of 2-5 metres, but at least 1.5 metres above the water table. The water table must be measured during the second half of the rainy season. The pit should be located away from public areas and fenced to restrict unauthorized access.

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. Expired vaccines should be encapsulated and buried, not burned

Burning and Burial

Waste is placed into a pit and burned on a daily basis. Waste must be burned thoroughly. Ashes must be covered with earth.

Pits should be dug 1-2 metres wide and to a depth of 2-5 metres, but also at least 1.5 metres above the water table. The pit should be fenced to restrict unauthorized access. The burn pit must be located away from public areas, and smoke from burning waste must not affect the surrounding area. The pit should not be dug around water shed areas. Open burning (outside of a pit, on the ground) should not be practiced. Use a regular community disposal site for general waste. This will conserve both time and resources.

Medical waste may not burn easily, especially if it is wet. Add kerosene to make the fire hot enough to burn all waste. Be sure to add the kerosene before starting the fire—adding kerosene after the fire might cause an explosion.

Always treat the ash as general waste. Bury or otherwise dispose of it in a designated area.

Placenta Pit
Anatomical waste and placentas should be dropped into a concrete lined pit or buried at a sufficient depth (> 1m) inside the health care facility compound. If transportation and disposal cannot be immediately ensured, anatomical waste should be stored in the mortuary.

6.4 Home-based Healthcare Waste Management

This chapter describes the disposal practices for home healthcare waste. Service providers at home can help prevent injury, illness and pollution by following some simple steps when disposing of the sharp objects and contaminated materials used in administering healthcare services at home.

Disposal of sharps used in the home should follow the recommended features required of a sharps disposal container, which should ensure that they must:

- Be made of puncture resistant material and not glass or thin plastic;
- Be leak-proof;
- Be designed to easily allow sharps to be placed in the container, but difficult to remove the contents, or have a lid that will seal the container when it is ¾ full;
- Be clearly labeled "hazardous materials";
- Be large enough to hold the amount of sharps you use;
- Be disposed of in a suitable manner.

Before discarding a container, be sure to reinforce the lid with heavy-duty tape. It is also recommended that soiled bandages, disposable materials and medical gloves should be placed in securely fastened plastic bags before putting them in the garbage can with other household trash.

Soiled dressings and other medical supplies may contain infectious waste. These items should be handled carefully, using vinyl or latex gloves. When handling such items, try to keep the materials away from your clothing. Always wash your hands thoroughly with soap and water after removing gloves and immediately after exposure to infectious waste.
Soiled dressings and supplies, including gauze and wipes used to cleanse wounds, used sanitary napkins, used bandages and tapes, used diapers, disposable drapes, used incontinence pads and similar items.

What Do I Do With Soiled Items?

- Place used disposable materials in a leak-proof plastic bag;
- Make sure the bags are securely closed (e.g., with a hard twist tie);
- Burry them 7 feet deep and at least 50 feet from any water source.

Caring for a chronically ill patient is a long-term endeavor, and therefore a long term measure for disposing the generated waste is necessary. A waste

pit should be dug and burying and burning procedures described in chapter six (6) followed. Where applicable, put the garbage bag out for regular garbage pickup.

6.5 Job Responsibilities in Healthcare Waste Management

The focus of this section is to assign roles and responsibilities of different cadre of staff involved in overall management of healthcare waste at facility level.

Specific Objectives

At the end of this section, participants will be able to:

- Define the roles and responsibilities assigned to different cadre of staff involved in overall management of healthcare waste at facility level.

6.5.1 Medical Officer in Charge of the Hospital

The medical officer in-charge of the health care facility is responsible for the overall effectiveness of the HCWM plan within the establishment that he/she is responsible for. He/She shall take all the necessary measures to implement a safe HCWM plan and particularly assign duties and responsibilities to all medical and non-medical staff that he/she supervises.
The medical officer in-charge of the hospital is responsible for:

- Constituting a HCWM Team/committee to develop a written waste management plan for the health facility;
- Designating a HCWM Officer;
- Supervising implementation, monitoring and review of the HCWM plan;
- Facilitating the allocation of sufficient financial and human resources for the implementation of the HCWM plan;
- Ensuring adequate training and refresher courses for the concerned hospital staff members.

6.5.2 IPC and Healthcare Waste Management Team

This team shall comprise the following officers:

- The medical officer in-charge or his/her deputy, who shall be the chairman
- The head of the administration
- The heads of all hospital departments
- The patron/matron of the hospital
- The head of the operation and maintenance
- Any other officer that the medical officer in-charge may designate such as the pharmacist in-charge or a radiation officer if required.

The HCWM Team is responsible for the preparation, implementation, monitoring and upgrading of the HCWM plan.

6.5.3 Healthcare Waste Management Officer

The HCWM officer is responsible for the daily implementation and monitoring of the HCWM plan and in particular, he/she will:

- Ensure internal collection of waste bags and waste receptacles and their transportation to the central storage facility of the hospital on a daily basis;
- Liaise with the medical and supply department to ensure that an adequate supply of waste bags, receptacles, personal protective equipment and collection trolleys are available at all times;
- Ensure that sanitary staff and sweepers immediately replace used bags (receptacles with a new bag (receptacle) of the same type and, where a waste bag is removed from one receptacle, that the receptacle is properly cleaned before a new bag is fitted in;
- Ensure correct use of the central storage facility and that it is kept secured from unauthorized access. He or she should also prevent unsupervised dumping of waste bags and waste receptacles on the hospital premises;
- Ensure that staff are properly trained on HCWM;
- Coordinate and monitor all waste disposal operations, and for this purpose meet regularly with the concerned representative of the local council;
- Ensure that the correct procedures and methods of transportation and disposal of waste are adhered to;
- Monitor incinerator functioning and ensure timely repairs;
- Ensure that sanitary staff and sweepers are not involved in waste segregation and that they only handle waste bags and receptacles, in the correct manner.
- Ensure all needlestick injuries are managed and reported according to the facility's guidelines;
- Ensure that emergency procedures exist and can be activated at any time; He/She shall make sure that HCF staff members are aware of the actions to be taken. He/She shall investigate record and review all incidents reported regarding hospital waste management. Appropriate action shall be taken to address all incidents;

6.5.4 Head of Administration

The head of the administration (health secretary and directors) must ensure that all the logistic, financial and human resources needed are made

available to implement the HCWM plan. In particular, he/she also ensures that a proper budget is allocated for the implementation of the HCWM plan.

He/She liaises with the medical officer in-charge and the HCWM officer to estimate the specific costs and request the proper budget to the central, regional or district health services.

6.5.5 Heads of Departments

Head of departments are responsible for the proper management of the HCW generated in their respective departments. Their duties include:

- Ensure that all the medical and ancillary staff working in their department respect the HCWM procedures;
- Ensure that the HCWM procedures are clearly displayed at strategic locations;
- Liaise with the HCWM Officer for effective monitoring and reporting of mistakes and errors in the implementation of the HCWM plan.

6.5.6 Patron/Matron of the Hospital

The patron/matron of the hospital shall liaise with the hospital management team. He/she is responsible for the application of the HCWM procedures by the nursing and the sanitary staff.

He/she shall be responsible for recording and reporting to the medical officer in-charge of all cuts or puncture wounds associated with sharps manipulation such as needle stick injuries of medical and non-medical staff members. He/she shall ensure that staff members know the immediate disinfection measures to be taken in case of sharp injuries

6.5.7 Head of operation and maintenance

The head of operation and maintenance shall be responsible for the installation, maintenance and safe operation of waste storage facilities as well as the waste handling and treatment equipment. He/She shall ensure that the concerned hospital staff members are properly trained in these areas.

6.5.8 Pharmacist In-charge

The chief pharmacist is responsible for the sound management of pharmaceutical stores and in particular:

- Gives advice regarding formulation of appropriate procedures for the management of pharmaceutical waste, and coordinate implementation of these procedures;

- Ensures that the concerned hospital staff members receive adequate training in pharmaceutical waste management procedures;
- Supervises the collection of the hazardous pharmaceutical waste and cytotoxic waste in the hospital and their return to the medical stores department.

6.5.9 Injection Providers

- Practice segregation at source.
- Ensure access to safety boxes at all injection sites.
- Never fill safety box more than ¾ full.
- If using needle removers, have needle remover at each injection site and use it immediately after injection.
- Report all spills or needle stick injuries to appropriate office.

6.5.10 Cleaning Staff

- Practice safe waste handling procedures;
- Collect sealed medical waste receptacles at scheduled times;
- Store medical waste receptacles in a safe intermediate storage area;
- Clean all waste bins when emptied;
- Replace bin liners and safety boxes immediately;
- Never desegregate waste;
- Keep intermediate and central storage areas clean;
- Report all spills or needlestick injuries to appropriate office.

6.5.11 Autoclave Operator

- Practice safe waste handling procedures;
- Load autoclave properly;
- Operate autoclave properly;
- Monitor operating temperatures, and pressures of equipment;
- Monitor treatment efficacy of autoclaves with biological or chemical indicator;
- Perform regular maintenance;
- Notify proper staff immediately when repairs are needed.

6.5.12 Incinerator Operator

- Practice safe waste handling procedures;
- Incinerator should be operated on a regular basis;
- Load incinerator properly;
- Operate incinerator properly;
- Monitor operating temperatures and emissions of equipment;
- Perform regular cleaning;
- Notify proper staff immediately when repairs are needed.

6.5.13 Landfill/waste pit Staff

- Ensure that only treated infectious waste is disposed of in landfill/waste pit;
- Make sure that dogs, children, and waste pickers do not have access to landfill/waste pit;
- Cover treated medical waste quickly;
- Use safe handling procedures and protective equipment when in contact with medical waste;
- Report all needle stick injuries to appropriate office.

6.6 Healthcare Waste Management Planning for Health Facilities

The focus of this sub-chapter is to impart the knowledge and skills of proper plan for healthcare waste management for a health facility.

Specific Objectives

At the end of this section, participants will be able to:

- Develop a healthcare waste management plan for their district if one does not exist;
- Develop a healthcare waste management plan for their facility/hospital.

6.6.1 District Healthcare Waste Management Planning

Drafting a district healthcare waste management plan is a collaborative process and should be done by a multi-sectoral group including the district health management team, environmental officers, municipality officials or town council members, district engineers, and administrative staff, infection prevention and control focal persons, and health educators/promoters from collaborating health facilities in the district. The following must be taken into account when drafting waste management plans for the district:

- The economic situation of the country/region. This will assure that solutions proposed are realistic;
- The national and regional health system. Make a chart of the organization of the health system, including the national institutions that are involved in the management of healthcare waste. Identify those responsible for the district. List also the budget available for waste management;
- The legal framework. Describe the current legislation related to healthcare waste management, including environmental protection, solid waste management and infection prevention and control within health facilities;
- The treatment and final disposal processes of healthcare waste. Estimate the kinds and quantities of waste in the district. Make an

inventory of the existing treatment/disposal facilities and their operational status. Include current management practices within the facilities.

- The roles of actors involved in the healthcare waste management system. Identify the key actors and their roles and responsibilities as well as any limits they may have;
- Synthesize the information. Analyze the information gathered and draft a district waste management plan.

Remember that the district plan should include strategies for sharing waste management infrastructure and related facilities within the area. For example, if industrial plants with furnaces able to help with final destruction of medical waste are in the district, the district plan must include an agreement and outline procedures to make use of these facilities (particularly after mass immunization campaigns). Facility-based plans should fit within the context of the above district plans.

6.6.2 Facility Healthcare Waste Management Plans

The following steps should be taken when drafting plans at the facility level. The worksheet "Making a Healthcare Waste Management Plan for Your Facility" (see Appendix 4) may be used as a guide or template.

Step 1

Define staff roles. Identify key persons instrumental in developing plans and supervising waste management at the facility.

Step 2

Outline current healthcare waste management status at facility. A meeting should be held, the objective of which is to develop strategies and plans for waste management at the facility. Existing legislation and policies as well as the burden of healthcare waste should be discussed. A comprehensive outline of the healthcare waste management plans currently practiced must be articulated.

Step 3

Outline ideal practices: establishing standards. Review/develop clear guidelines for management of waste at the facility, including segregation, prioritizing sharps, recording, handling and transport of safety boxes, final waste disposal for each category of waste and plans for providing hepatitis B and tetanus toxoid immunizations to all cadres of staff.

Step 4

List improvements needed. Prioritize areas that need improvement in the facility. Detail the date for introduction and the person responsible for

accomplishing each task. List supervision and training required for each cadre of staff.

Step 5

Assessment of healthcare waste management cost. Waste management supplies required at the facility for the next six months should be listed. List all needs, including those items needing regular replacement, transportation costs and indicates supplies that are already available.

Waste management costs should cover the following:

- Waste bins, coloured bin liners, and biohazard and radioactive labels;
- Disinfectants and antiseptics;
- Personal protective equipment such as aprons, gloves, boots (their frequency of use and replacement must be included);
- Healthcare waste transportation costs (vehicles, fuel and driver);
- Final disposal capital;
- Maintenance and repair for incinerator (if applicable).

Step 6

Outline monitoring schedule. List each cadre of staff, their supervisor, and the frequency with which they will be monitored. The forms to be used in monitoring activities and the date of introduction of the plan should be indicated.

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APPENDIX 1

GLOSSARY

Abscess: A focal collection of pus resulting from necrosis of tissue, sometimes observed at the site of an injection.

Administrative controls: A method of controlling employee exposures through enforcement of policies and procedures, modification of work assignment, training in specific work practices, and other administrative measures designed to reduce the exposure (OSHA).

Auto-disable (A-D) syringe: A specially modified plastic syringe with a fixed needle, which is automatically disabled after a single use.

Biohazard: A biohazard (biological hazard) implies a risk to the health of humans caused by exposure to harmful bacteria, viruses, or other dangerous biological agents or organisms, or by a material produced by such an organism. Biohazards can present their risk either directly through infection or indirectly through damage.

Bloodborne pathogens: Pathogenic micro-organisms that are transmitted through exposure to blood or blood products, and are present in human blood and cause disease in humans. These pathogens include, but are not limited to, hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV).

Burden of disease: The health and socio-economic cost of a given medical condition on a society.

Colour-coding: Designates the use of different colours for the storage of different categories of healthcare wastes.

Disposal: Intentional burial, deposit, discharge, dumping, placing or release of any waste material into or on any air, land or water.

Encapsulation: Pre-treatment consisting of filling receptacles with waste, adding an immobilizing material (mortar, bituminous sand, clay material) and sealing it before disposing of it in a landfill site or burying it in a small burial pit.

Engineering controls: In the context of sharps injury prevention, means control (e.g. sharps disposal receptacles, safer medical devices, such as sharps with engineered sharps injury protections and needleless systems) that isolate or remove the bloodborne pathogens hazard from the workplace.

Hazard elimination: Rather than using injections, administer medications another way, such as by using tablets, inhalers, etc.

Hepatitis B: Hepatitis caused by a virus and transmitted by exposure to blood or blood products or during sexual intercourse. It causes acute and chronic hepatitis. Chronic hepatitis B can cause liver disease, cirrhosis, and liver cancer.

Hepatitis C: Hepatitis caused by a virus and transmitted by exposure to blood or blood products. Hepatitis C is usually chronic and can cause cirrhosis, and primary liver cancer.

Hierarchy of controls: Concept used by the industrial hygiene profession to prioritize prevention interventions. Hierarchically these include administrative controls, engineering controls, personal protective equipment and work practice controls (CDC).

HIV/AIDS: Human Immunodeficiency Virus, a virus mainly transmitted during sexual intercourse or through exposure to blood or blood products. HIV causes the Acquired Immunodeficiency Syndrome (AIDS).

Incineration: The controlled burning of solid, liquid or gaseous combustible wastes in a specific facility (incinerator) at a minimum of 800°C to produce gases and residues containing little or no combustible material and minimize the creation of toxic air pollutants such as dioxin. Open fire burning cannot ensure complete disinfection of waste.

Infection prevention and control: The activities aiming at the prevention of the spread of pathogens between patients, from health workers to patients and from patients to health workers in the healthcare setting.

Injection: The administration of a substance into the skin, subcutaneous tissue, muscle tissue or veins.

Intra-dermal injection: An injection given within the substance of the skin.

Intra-muscular injection: An injection given into the body of a muscle.

Intravenous injection: An injection given into a vein.

Jet injector: A needle-free device that allows the injection of a substance through the skin under high pressure.

Needlestick: Penetrating stab wounds caused by needles.

Pathogen: A micro-organism capable of causing disease.

Personal protective equipment (PPE): Specialized equipment worn by an employee to protect against a hazard.

Recapping: The act of replacing a protective sheath on a needle. The OSHA bloodborne pathogens standard prohibits recapping needles unless the

employer can demonstrate that no alternative is feasible, or that such action is required by a specific medical or dental procedure.

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

Safety (Sharps) box: A puncture-resistant, liquid-proof receptacle designed to hold used sharps safely during collection, disposal and destruction.

Safety device/Sharps engineered sharps injury protections (ESIPS): A non-needle sharp or needle device used for withdrawing body fluids, accessing a vein or artery, or administering medications or other fluids, with a built in safety feature or mechanism that effectively reduces the risk of an exposure incident (OSHA).

Safety syringe: Modified, disposable plastic syringe designed so that the health worker can disable it in such a way that the needle is protected and cannot be re-used.

Sanitary landfill: Characterized by the controlled and organized deposit of wastes, which is then covered regularly (daily) by the staff present on site. Appropriate engineering preparations of the site and a favourable geological setting (providing an isolation of waste from the environment) are required.

Septicaemia: Severe generalized infection resulting from dissemination of pathogenic micro-organisms and their toxins.

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

Sharps: Any object that can penetrate the skin including, but not limited to, needles, scalpels, broken glass, broken capillary tubes, and exposed ends of dental wires.

Single use syringe: An all plastic syringe designed for a single use, with a separate, steel needle. However, because there is no mechanism to prevent re-use, this type of syringe may in fact be used more than once.

Solid sharps: A sharp that does not have a lumen through which material can flow (e.g. suture needle, scalpel).

Standard Precautions: An approach to infection prevention and control recommended by the Centers for Disease Control and Prevention since 1996. Standard precautions synthesize the major features of **universal precautions** (designed to reduce the risk of transmission of bloodbourne pathogens from blood and body fluids) and **body substance isolation** (designed to reduce the risk of transmission of pathogens from moist body substances). Standard precautions apply to: (1) blood; (2) all body fluids, secretions and excretions, regardless of whether or not they

contain visible blood; (3) non-intact skin; and (4) mucous membranes. Standard precautions are designed to reduce the risk of transmission of microorganisms from both recognized and unrecognized sources of infection in health facilities, and apply to all patients regardless of their diagnosis or presumed infectious status.

Sterile: Free from living micro-organisms.

Sterilizable syringe: Either all plastic or all glass syringe with steel needle. This type of syringe is designed for re-use after proper cleaning and sterilization in a steam sterilizer or autoclave. The use of these syringes is associated with infection and is not recommended.

Subcutaneous injection: An injection delivered under the skin.

Syringe with re-use prevention feature: A specially modified plastic syringe that includes a mechanism to discourage re-use.

Toxic shock syndrome: An acute, sometimes fatal, intoxication by an infectious agent during which organ activity is blocked causing severe shock and hypotension.

Universal precautions: An approach to infection control that treats all human blood, body fluids and other potentially infectious materials as if they were infectious for HIV and HBV or other bloodbourne pathogens.

Vaccination: The administration of vaccine either orally or by injection to produce active immunity to a disease.

Work practice controls: Actions that reduce the likelihood of exposure by altering the manner in which a task is performed (e.g., visual inspection of a sharps receptacle for hazards before attempting disposal).

APPENDIX 2

MONTHLY REPORT AND ORDER FORM-JSI-MMIS-TZ (QRO –form)

From (month) _____to (month) _____

Name of hospital_____

Please calculate and fill in the shaded areas your answers.

Description of item	Balance B/F	Received	Issued	Loss/ adjusted	Ending Balance	Quantity to Order
	(A)	(B)	(C)	(D)	(E)	(F)
					[A+B-C ± D]	[C X 3] - E
Insulin Syringes 1 ml	2000	O	1200	+20	820	
AD - Syringes 2 ml Fixed Needle	500	1800	0	0		
AD - Syringes 5 ml Fixed Needle	3000	1200	700	0	3500	
AD Syringes 2ml Detachable Needle	200	600	300	-15	485	
AD Syringes 5ml Detachable Needle	250	2000	960	-30	1260	
AD Syringes 10ml Detachable Needle	700	1500	350	+10	1860	
Manual Retractable Syringe 3ml	100	1300	1100	0	300	
Manual Retractable Syringe 5ml	400	1800	900	+150	1315	
Manual RetractableSyringe10ml	50	1100	600	0	550	
Automatic Retractable syringe 3ml	0	1700	1700		0	5100
Automatic Retract. Syringe 5 ml	0	200	2000	0	0	
Automatic Retractable Syringe 10 ml	30	800	600	0	230	
Safety Boxes 5 liters	20	1000	900	0	120	
Needle Removers/cutters	0	20	10	-2	8	
Others (specify)						

Compiled by:

Name:_____Signature_____Designation_____Date_____

APPENDIX 3

EXERCISE TO FILL IN DAILY ACTIVITY REGISTER

MINISTRY OF HEALTH AND SOCIAL WELFARE

Daily Activity Register

Name of section/ Unit_____ Facility Name_____
District_____Region_____Month_____Year___
2 ml

Syringe size		2cc			
Date (A)	Voucher To/From (B)	Quantity Received (C)	Quantity Used (D)	±Adjustments (E)	Quantity on Hand (F)
01/09/05	B/F	-	-	-	200
01/09/05	-	-	16	-	
02/09/05	-	-	17	-	
02/09/05	MSD 644		-	-	547
03/09/05	-	-		-	390
04/09/05	-	-	15	-	
05/09/05	MSD 700		-	-	539
15/09/05			130	-	
20/09/05	MSD961		-	-	739
21/09/05	-	-	150	-	
30/09/05	-	-	120	-	469
30/09/05	-	-	-	+5	

Fill numbers in empty shaded spaces.

APPENDIX 4

MAKING A HEALTHCARE WASTE MANAGEMENT PLAN FOR YOUR FACILITY

Name of Facility:	**Date:**

Define Staff Roles

Who is responsible for supervising HCWM at your facility? *Name*: *Contact*: **Attach supervision structure organogram of your facility.**
Who is responsible for performing waste disposal for each area of your facility?
Attach job descriptions for all cadres involved in HCWM.

Outline Current HCWM Status at Facility

Define type and amounts of waste generated.

Type	**Amount (per week)**
Non-infectious waste	
Infectious waste	
Highly infectious waste	
Sharps waste	

Outline HCWM practices used currently.

Concept	**Current Practice**
Is waste classified and segregated into different categories/coloured waste bins? Describe how.	
How are sharps (needles) collected? ***Where are the safety boxes used?***	
Are full safety boxes recorded? ***Where are they stored?*** ***How are they transported to their final disposal location?***	

How are different categories of waste disposed of? Describe the disposal process.	

Outline Ideal Practices: Establishing Standards

Concept	Standard
Segregating waste (different types, corresponding colours of waste liners)	
Prioritizing sharps (use of safety boxes or needle removers, if applicable)	
Recording, handling and transport of safety boxes	
Final waste disposal for each category of waste (including sharps barrel, if applicable)	
Hepatitis B and tetanus toxoid immunization for all cadres of staff	

List Improvements Needed

What capital improvements are needed at your facility?

Item	Date for Introduction	Total Cost	Responsible Party

What supplies are needed for the next 6 months? (PPE, cleaning supplies, waste bin, liners, safety boxes)

Supplies	Quantity	Total Cost

What training is needed at your facility for each cadre of staff?

Cadre of Staff	Training Topics	Date for Completion

Outline Monitoring Schedule

List the person responsible to perform the monitoring for each cadre of staff and the frequency with which they will be monitored.

Cadre of Staff	Supervisor	Frequency to be Monitored

List the forms to be used to monitor HCWM activities and the frequency with which activities will be monitored.

Form	Frequency to be Monitored

Date for introduction of this plan:

APPENDIX 5

PRE-/POST- ASSESSMENT FOR TRAINING OF TRAINER

Time allowed: 1 hour

Total Marks: 50 (2 marks each question)

1. What is WHO/SIGN three part strategy for injection safety?
2. Name three principles of adult learning.
3. List the types of interpersonal communication.
4. Define behaviour change.
5. Name four skills or techniques of counseling
6. What is injection safety?
7. What is infection prevention and control?
8. Name four diseases transmitted by unsafe injection practices
9. Name four occasions in which hand hygiene is required
10. Name four 'right' ways to give a safe injection
11. Name two 'best' practices in safe injection
12. What is the first thing to do when you get a needlestick or sharps injury?
13. Name four groups at risk of getting needlestick injuries
14. Recapping with one hand is acceptable (True/False)
15. Define an adverse event
16. Name three of the logistician seven 'rights'
17. Name four components of the logistics cycle
18. Exercise: If you had 1000 5 ml syringes at the beginning of January, you received 2000 of the same at the end of June, and you have 600 at the end of December, what will be your AMCR assuming there were no stock-outs?
19. List the categories of waste and their appropriate bin colour
20. How can the community be affected by unsafe waste management practices?
21. Name the steps of proper waste disposal
22. Name four things that should be disposed of in a safety box.
23. To what level should you fill safety boxes before closing and sealing them?
    ½ _____; Full _____; ¾ _____
24. Give two reasons why it would be beneficial to reduce the number of injections given to patients.
25. Identify one treatment alternative to injections

APPENDIX 6

PRE-/POST- ASSESSMENT FOR HEALTH WORKERS

Time allowed: 1 hour

Total Marks: 50

1. What is WHO/SIGN three part strategy for injection safety? (3)
2. Define behaviour change (3)
3. Name four skills to techniques of counseling (2)
4. What is injection safety? (2)
5. What is infection prevention and control? (2)
6. Name four diseases transmitted by unsafe injection practices (2)
7. Name four occasions in which hand hygiene is required (2)
8. Name four 'right' ways to give a safe injection (2)
9. Name two 'best' practices in safe injection (2)
10. What is the first thing you should do when you get a needlestick or sharps injury? (2)
11. Name four groups at risk of getting needlestick injuries (4)
12. Recapping with one hand is acceptable (True/False) (3)
13. Define an adverse event (2)
14. List the categories of waste and their appropriate bin colour (5)
15. How can the community be affected by unsafe waste management practices? (3)
16. Name the steps of proper waste disposal (3)
17. Name four things that should be disposed in a safety box. (3)
18. To what level should you fill safety boxes before closing and sealing them?
    ½ _____; Full _____; ¾ _____ (2)
19. Give two reasons why it would be beneficial to reduce the number of injections given to patients. (4)

20. Identify one treatment alternative to injections

(1)

APPENDIX 7

PRE-/POST- ASSESSMENT FOR SUPPLIES STAFF

Time allowed: 1 hour

Total Marks: 20

1. Name three of the Logistician seven 'rights'.

2. Forecasting and procurement is dependent on consumption data from health facilities/Service Delivery Points. Yes/No

3. Storage, distribution and transportation are together generally called

    a. Inventory management
    b. Forecasting
    c. Procurement
    d. None of the above
    e. a and b

4. Which is usually referred to as the engine that drive the logistics cycle

    a. Issues voucher
    b. Tally card
    c. Procurement
    d. Logistics information
    e. Transport

5. Amount of time it takes between placing an order and receiving the commodities in your store is

    a. Pipeline length
    b. Lead time

6. A distribution system where higher level decides what goods to go where is called

    a. Pull system
    b. Indent system
    c. Requisition system
    d. Push system

7. If you have 500 Syringes of 2ml at the beginning of January, received 1000 of the same at the end of June and have 300 at the end of December, what is your AMCR assuming there were no stock-outs

8. In a Lake Victoria MMIS store, there is a balance of 200,000 pieces of syringes and needles at the end of first quarter, 2004; the AMCR for the store is 50,000 pieces. What is the MOS?

9. In one of the Lake Tanganyika MMIS Store, the AMCR for syringes and needles is 10,000 of 5 ml; the Store is supposed to keep a maximum of 2 months supply. Ending balance at the end of 2nd quarter of 2004 was 3,000. What quantity does the store need to order?

10. Which of the following is not a stock keeping record?

    a. Bin Card
    b. Inventory Control Card
    c. Parking List
    d. Ledger Card.

APPENDIX 8

PRE-/POST- ASSESSMENT FOR HEALTHCARE WASTE MANAGEMENT STAFF

Time allowed: 45 Minutes

Total Marks: 20

1. Which of the following is considered sharps waste?
   a. Syringe with no needle attached
   b. Vaccine vial
   c. Gloves
   d. Syringe and needle

2. Which of the following is not infectious?
   a. Dressing gauze soiled with body fluids
   b. Placenta
   c. Used syringes
   d. Coca cola OR soda bottle
   e. Used surgical blades

3. In what type of receptacle should sharps waste be collected?

4. What is the proper way to store the receptacle (in 3 above)?

5. Name three types of protective clothing that must be worn when handling waste.

6. Name one way to make the final disposal of waste in your facility safer.

7. Name the colour code for wastes and mention which type goes into each specific bin colour

8. You do not need to wear gloves when you are carrying full sharps boxes to waste storage areas and when preparing waste for final disposal as long as the boxes are closed (True or False)

9. Filled, closed safety boxes should be stored in a locked area away from the public (State whether you agree or disagree)

10. What is the first thing you should do when you get a needlestick or sharps injury?

APPENDIX 9

COURSE EVALUATION

a. How do you rate the planning and organization of this training?

Good [] Fair [] Poor [] No comment []

b. How were your accommodations?

Good [] Fair [] Poor [] No Comment []

c. How were the meals?

Good [] Adequate [] Inadequate [] Bad []
No comment []

d. Generally, how was the duration of the training compared with the objectives covered?

Adequate [] Short [] Too Long [] Just Enough []

e. Do you feel the objectives of the training were achieved?
Yes [] No []

If no, please explain:

_____
_____
_____

f. How were the facilitators? []

Clear in their presentations []

Not clear in their presentations []

Lacked confidence in themselves []

Very useful to participants []

Inadequate in their knowledge base []

g. Any other observations or comments on facilitators:

_____
_____
_____
_____

h. Did you find the methods used in this training effective?
Yes [] No []

If no, what would you suggest for future training?

_____
_____
_____

i. How do you rate the training materials?

Useful [] Adequate [] Not adequate []
Not useful [] Too much [] Not clear []

j. Give your suggestion on the training materials for future training.

_____
_____
_____
_____

k. Do you feel your expectations for this training were met?
Yes [] No []

If No, Why?

_____
_____
_____
_____
_____

l. Do you feel now you are well prepared to go and train the next level of health workers in your district?

Yes [] No []
If Nno, why?

_____
_____
_____
_____

m. What is your feeling about the Pre and Post-assessment given during this training?
Too Difficult []

Too Simple []

Useful []

Not Useful []

Not Necessary []

Will help us in the next training?

Yes []
No []

n. What is your overall assessment of this training?

_____
_____
_____

o. What are your recommendations to improve future trainings on injection safety?

_____
_____

Thank you.

APPENDIX 10:

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