



Federal Ministry of Health
Ethiopia

Infection Prevention and Patient Safety Training Resource Package Participant's Manual

April 2012
Addis Ababa, Ethiopia

This publication was made possible through the support of the U.S. President's Emergency Plan for AIDS Relief (PEPFAR) through the U.S. Agency for International Development under contract number GHH-I-00-07-00059-00, AIDS Support and Technical Assistance Resources (AIDSTAR-One) Project, Sector I, Task Order 1.

The authors' views expressed in this publication do not necessarily reflect the views of the U.S. Agency for International Development or the United States Government.


Foreword

The Federal Ministry of Health's health care reform initiative aims to ensure the provision of quality health services at all levels. Among these, protection of patients, health care workers, and visitors from infections acquired in health care facilities is the main strategy to the reform initiative. In most health care facilities, many patients suffer from infections with health care–associated micro-organisms, a condition that remains a continued threat to the health of clients and increases cost to the patient as well as to the health care system. Adequate infection prevention and patient safety practices reduce the risk of acquiring infections like HIV, hepatitis B and C, and common bacterial and viral infections. As a result, the Ministry is working relentlessly to scale up the infection prevention and patient safety programs in order to reinforce the practice in health facilities.

Infection prevention and patient safety in health care settings is a nationwide initiative that involves the regular implementation of recommended infection prevention practices in every aspect of patient care. Such practices include hand hygiene, injection safety and medication safety, and health care waste management, among others. Resource limitation makes it difficult to control the infection rates and exposure of patients and health service providers to health care–associated infections. Accordingly, materials, human resources, training, policies, and guidelines are needed to promote appropriate infection prevention and patient safety practices.

This infection prevention and patient safety training resource package is a supplement to the *Ethiopian Hospital Reform Implementation Guidelines* and the *National Infection Prevention and Patient Safety Reference Manual* and is intended to serve as a training guide for health service providers and managers found at the different levels of the health system. The resource package is developed based on in-country experiences and internationally acclaimed standard recommendations. It is geared toward using innovative methods that are implemented in all parts of the world to reduce the overhead cost of the infection prevention and patient safety program. It is believed that health service providers, health service and program managers, and all other stakeholders will use this resource package effectively to prevent infections from occurring in health care facilities.

The Ministry would like to thank all individuals and institutions who contributed to the development of this infection prevention and patient safety resource package.



Dr. Abraham Endeshaw
Director, Medical Services Directorate
Federal Ministry of Health

Table of Contents

Acknowledgments.....	iii
Acronyms	vii
How to Use the Infection Prevention and Patient Safety Training Resource Package	1
Overview of the Training.....	2
Course Syllabus for Six-Day Basic Infection Prevention and Patient Safety Training.....	5
Module 1: Introduction to Infection Prevention and Patient Safety.....	10
Module 2: Standard Precautions.....	23
Module 3: Hand Hygiene.....	27
Module 4: Personal Protective Equipment.....	38
Module 5: Safe Injection Practices.....	52
Module 6: Surgical Antisepsis	65
Module 7: Safe Surgery and Safe Practice in the Operating Room.....	77
Module 8: Instrument Processing and Handling.....	88
Module 9: Processing Linen and Laundry	120
Module 10: Clinical Laboratory Services.....	126
Module 11: Blood Safety	130
Module 12: Traffic Flow and Activity Patterns	137
Module 13: Transmission-Based Precautions for Health Care Facilities	140
Module 14: Tuberculosis Infection Prevention and Control in Health Care Settings.....	145
Module 15: Housekeeping.....	149
Module 16: Health Care Waste Management	158
Module 17: Medication Safety.....	167
Module 18: Post-Exposure Prophylaxis	173
Module 19: Food and Water Safety.....	184
Module 20: Client Education on Infection Prevention and Patient Safety	188
Module 21: Health Care Risk Management.....	192
Module 22: Managing Infection Prevention and Patient Safety Programs.....	198
Appendix 1. Infection Prevention and Patient Safety Needs Matrix: Operational Action Plan Sheet 207	
Appendix 2. How to Use the Infection Prevention and Patient Safety Stations.....	208
Appendix 3. Post-Exposure Prophylaxis Follow-Up Card.....	225
Appendix 4. Post-Exposure Prophylaxis Register.....	215
References	228

Acknowledgments

Behavioral change in infection prevention and control and patient safety practices in the health care settings requires, at a minimum, building the capacity of all health care staff through training. However, over the past five years in Ethiopia, the quality of this resource-intensive intervention has been suboptimal in addressing national standards due to the lack of integration with patient safety principles.

The Federal Ministry of Health (FMOH), cognizant of the gap, was determined to improve the merit and effectiveness of the Infection Prevention and Patient Safety (IPPS) program at large and decided to develop a standardized IPPS training package in October 2010. Since then, the National Infection Prevention and Patient Safety Advisory Technical Working Group (IPPS ATWG) and the President's Emergency Plan for AIDS Relief (PEPFAR), funded through the U.S. Agency for International Development (USAID) AIDSTAR-One/Ethiopia project, have worked closely to produce this important material. The early draft of the material went through a series of technical reviews by subject experts and enhancements by the IPPS ATWG, leading to an organized document that was ready for a national consultation. A national consultative workshop was held during which expert inputs were gathered and incorporated. The last activities include consolidation of the document with technical input from John Snow, Inc. (JSI), the implementing organization of the AIDSTAR-One/Ethiopia project.

The FMOH gratefully acknowledges the commitment and technical support of the IPPS ATWG members along with their organizations and key contributors who made the development of this IPPS training material a reality.

The Ministry specially thanks the AIDSTAR-One/Ethiopia project for the technical support and financial assistance provided in the preparation of this document.

The FMOH acknowledges the commitment and technical support of the IPPS ATWG members along with their respective organizations and key contributors who made the development of this *Infection Prevention and Patient Safety Participant's Manual* a reality. This document is made possible by the concerted effort of stakeholders working under the

Technical Working Group. The Technical Working Group is responsible for any and all content in this guide.

National Infection Prevention and Patient Safety Advisory Technical Working Group

Members:

Abebaw Derso	Federal Ministry of Health	Medical Services Directorate
Dr. Kurabachew Abera	JSI/AIDSTAR-One (AIDS Technical Assistance and Resource)	
W/t Yodit Kidanemariam	Johns Hopkins Program for International Education in Gynecology and Obstetrics (JHPIEGO) (an affiliate of Johns Hopkins University)	
Dr. Fahmi Mohammed	World Health Organization (WHO)	
Dr. Daniel Atnafu	John Hopkins University Technical Support for the Ethiopian HIV/AIDS Initiative (JHU/TSEHAI)	
Gebremedhin Kidanemariam	Management Sciences for Health/HIV & AIDS Care and Support Program (MSH/HCSPP)	
Dr. Abera Refissa	International Center for AIDS Care and Treatment Programs (ICAP), Columbia University	
Dr. Dawit Endale	International Training and Education Center for Health (I- TECH)	
Sr. Nishit Enyew	University of California, San Diego (UCSD), HIV/AIDS	

	Prevention, Treatment, Care and Support Program	
Asnake Kasahun	JSI/AIDSTAR-One	
Huda Mohammed	Supply Chain Management Systems (SCMS)	
Dr. Shewaminale Yohannes	Federal Ministry of Health	Medical Services Directorate

Contributors:

Asnake Kasahun	JSI/AIDSTAR-One
Fekadu Abebe	JSI/AIDSTAR-One
Dr. Samuel Habte	Le Monde Health and Development, Consultant
Dagem Aschenaki	JSI/AIDSTAR-One
Solomon Tassew	JSI/AIDSTAR-One
Demelash Zeleke	JSI/AIDSTAR-One
Antenane Enyew	Le Monde Health and Development, Consultant
Tenager Tedesse	JSI/AIDSTAR-One
Andargachew Eniyew	Le Monde Health and Development, Consultant
Mohammed Taha	Jimma University
Dereje Meaza	Haromaya University
Gobeze Negash	JSI/AIDSTAR-One
Melaku Meleka	JSI/AIDSTAR-One
Haftu Berhe	Mekelle University
Shemsedin Shifa	Wollo University
Sr. Yayeneabeba Tadesse	Ethiopian Nurses Association
Yohannes Ayalew	Hawassa University
Dawit Hailu	Ethiopian Midwifery Association
Dereje Ayele	JSI/AIDSTAR-One
Aschalew Abayneh	Amanuel Hospital
Birara Fekadie	Tikur Anbessa Hospital

Tewodros Fantahun	St. Paul Hospital
Timnit Berhe	Yekatit 12 Hospital
Wassihun Kassaye	Ras Desta Hospital
Samuel Altaye	Johns Hopkins University/Technical Support for the Ethiopian HIV/AIDS Initiative
Mussie Habtamu	St. Peter Hospital
Mentwab Teshome	Zewditu Hospital
Mengisteab Hailu	Alert Hospital
Genene Bekele	JSI/AIDSTAR-One
Atsede Kifle	Minilik II Hospital
Alemtsehay Kelemework	Ghandi Hospital

Acronyms

AIDS	acquired immunodeficiency syndrome
ARV	antiretroviral
BSC	biologic safety cabinet
BSI	body substance isolation
BSL	biosafety level
CDC	Centers for Disease Control and Prevention
CHG	chlorhexidine gluconate
FMOH	Federal Ministry of Health
HBV	hepatitis B virus
HCV	hepatitis C virus
HIV	human immunodeficiency virus
HLD	high-level disinfection
IP	infection prevention
IPC	infection prevention and control
IPPS	infection prevention and patient safety
IUD	intrauterine device
MMIS	Making Medical Injections Safer
MVA	manual vacuum aspiration
NaDCC	sodium dichloroisocyanurate
OR	operating room
PCMX	para-chloro-metaxilenol
PEP	post-exposure prophylaxis
PPE	personal protective equipment
PPP	PowerPoint presentation
PS	patient safety

SSI	surgical site infection
TB	tuberculosis
TP	total parts
TTI	transfusion-transmissible infection
UP	universal precautions
USAID	U.S. Agency for International Development
UV	ultraviolet
WHO	World Health Organization

How to Use the Infection Prevention and Patient Safety Training Resource Package

The Infection Prevention and Patient Safety Training Resource Package

This Infection Prevention and Patient Safety (IPPS) training package is designed to develop or strengthens the capacity of health care providers to protect themselves, their patients or clients, and the community from health care–acquired infections.

Generally, the IPPS training resource package includes the following components:

1. *Infection Prevention and Patient Safety Reference Manual for Service Providers and Managers in Health Care Facilities of Ethiopia*
2. *Infection Prevention and Patient Safety Resource Package: Facilitator’s Guide*
3. *Infection Prevention and Patient Safety Resource Package: Participant’s Manual*
4. *Video presentations*

Participants are also encouraged to read the *Ethiopian Hospital Reform Implementation Guidelines*.

Purpose of the Infection Prevention and Patient Safety Participant’s Manual

This manual is prepared to help trainees acquire effective training on IPPS. The manual will serve as a guide on how to do each activity and also provides detailed notes on each topic.

How the Manual Is Organized

The organization and materials of the participant’s manual are prepared to offer the provision of syllabus-structured modular teaching designed based on evidence-based competencies that are reflective of current infection prevention practices. It describes the purpose, objectives, and content of the different modules. Content is further structured into handouts of subtopics with detailed notes on background information, guides on how to do activities, and the materials needed for individual and group performance. Through participation, the activities encourage the participants to see, analyze, and share their practice and experiences with IPPS. Generally, the participant’s manual offers the following options for its implementation.

Group-Based Training

A basic six-day IPPS training for health care workers is presented in the course overview, and a detailed schedule and outline are provided. The six-day IPPS training covers a total of 22 modules. The modules are organized based on their similarity to each other, flow of action, and rational sequence. It is recommended that the participants follow the sequence of modules in the schedule and outline. Each module is presented in an interactive and user-friendly format. PowerPoint presentation (PPP) slides are also provided for each module separately.

On-the-Job Training

Based on participants' needs or system requirements, the manual is designed as a flexible tool that fits for a sequential (complete or partial) modular approach for educating health care providers. It is an important resource to assist in continued capacity building of staffs in infection prevention and control (IPC)/PS. It is an important aid for healthcare institutions to plan and conduct trainings on-the-job and monitor improvements in practice & attitude of their staffs in relation to IPC/PS.

Overview of the Training

Training Design

This training is designed for health care professionals. The course builds on each participant's past knowledge and experience and takes advantage of the individual's motivation to accomplish the learning tasks in a minimum amount of time. Training emphasizes doing, not just knowing, and uses competency-based evaluation of performance.

This training differs from traditional courses in several ways.

- It uses a pre-training questionnaire to determine participants' individual and group knowledge on IPPS.
- The health care facility's needs or gaps in IPPS are identified in advance or throughout the training using the Infection Prevention and Patient Safety Needs Matrix: Operational Action Plan.

- Practical sessions focus on using practical and simple IPPS practices that minimize costs.
- Learning progress is assessed using checklists, and each participant's performance is assessed by an IPPS trainer using competency-based skills checklists.

Achievement and maintenance of certification in IPPS is one of the FMOH's strategic priorities for all professionals engaged in health care delivery. The national credential denotes mastery of fundamental knowledge required for competent performance of current infection prevention practice. As a result, mastery of both the content and skill components is set as the basis for successful completion of the training.

Evaluation

This IPPS training is designed to produce health care workers at all levels who are qualified to use recommended basic IPPS principles and practices for primary and hospital care services.

Qualification is a statement offered by the training organization that the participant has met the requirements of the training in knowledge and skills. This does *not* imply certification, because personnel can be certified only by an authorized organization or agency. Qualification is based on the participant's achievement in two areas:

Knowledge: A score of at least 85 percent on the post-training questionnaire

Skills: Satisfactory performance of recommended selected IPPS practices during a simulated situation. Responsibility for the participant becoming qualified is shared among the participant and the trainer. Both participants and trainers can keep track of their progress on the selected IPPS skills using the Participant Monitoring Sheet.

The evaluation methods used in the training are as follows:

- **Post-training test.** This knowledge assessment will be given at the time in the training when all subject areas have been presented. A score of 85 percent or more indicates knowledge-based mastery of the material presented in the reference manual. For any participants scoring less than 85 percent on their first attempt, the IPPS trainer should review the results with the participant individually and provide guidance on using the reference manual to learn the required information. Participants scoring less than 85 percent can retake the training test at any time during the

remainder of the course, after they have had time to study the selected areas of the reference manual.

- **IPPS checklists (station checklists).** The IPPS trainer will use selected checklists to assess each participant as the participant performs IPPS activities or practices in the simulated clinical setting. In determining whether the participant is qualified, the trainer(s) will observe and rate the participant's performance for each step of the skill or activity. The participant must be rated "satisfactory" in each skill or activity to be evaluated as qualified.

Within three to six months of qualification, it is recommended that an IPPS trainer or supervisor follow up with participants at their facilities using the same IPPS checklists or other consistent IPPS performance standards. Follow-up is crucial to maximize the transfer of learning and improve job performance, which is the main goal of a learning intervention. During the follow-up, the trainer or supervisor should provide direct feedback to the participant and review the implementation of the action plan with the participant, supervisor, and co-workers.

This review provides the opportunity to identify and discuss progress to date as well as any start-up issues or constraints to service delivery (e.g., lack of instruments, supplies, support staff, IPPS policies). It also provides feedback on the training and its appropriateness to local conditions. Without this type of feedback, training can easily become routine, stagnant, and irrelevant to service delivery need.

Course Syllabus for Six-Day Basic Infection Prevention and Patient Safety Training

Training Description

The six-day basic IPPS training is designed to provide all levels of health care workers with the basic IPPS knowledge and skills they need to use recommended IPPS principles and practices in primary health care and hospital settings with limited resources.

Goal of Basic IPPS Training

- To make health care facilities safer places.

Training Objectives

- To influence in a positive way the attitudes of the participant toward the benefits of using appropriate IPPS principles and practices
- To provide the participant with training in simple, inexpensive IPPS practices and processes
- To provide the participant with the knowledge and skills needed to implement and/or improve IPPS principles and practices in his or her home facility

Participant Learning Objectives

The learning objectives of the six-day training course are presented in each module.

Training/Learning Methods

- Brainstorming
- Games
- Gallery walk
- Group discussions
- Buzz groups
- Individual and group exercises
- Role play and simulations
- Videotapes and discussions

- Illustrative lectures
- Individual reflection
- Demonstrations
- Site observations or facility visits

Learning Materials

This guide is designed to be used with the following materials:

- *Infection Prevention and Patient Safety Reference Manual for Service Providers and Managers in Health Care Facilities of Ethiopia*
- *Infection Prevention and Patient Safety Training Resource Package: Facilitator's Guide*
- Training videotapes: *Infection Prevention Guidelines for Health Care Facilities with Limited Resources: Overview and Practical Training Demonstration Segments and Safe Practices in the Operating Room*

Participant Selection Criteria

Participants in the training are health professionals working at various levels in the health care system of the country.

Methods of Evaluation

Participant

- Pre- and post-training questionnaires
- IPPS checklists (to be completed by trainer)

The training

- Training evaluation (to be completed by each participant)

Number of Hours

48 hours (six-day course)

Suggested Training Composition

- Fourteen to twenty five participants
- Two to four IPPS trainers

Basic Six-Day Infection Prevention and Patient Safety Training Schedule

Time	Module	Topic	Duration
Day One			
8:30 a.m.–8:40 a.m.		Registration	10 minutes
8:40 a.m.–10:45 a.m.		Welcome and introduction	40 minutes
		Participant expectations	10 minutes
		Review course materials	5 minutes
		Group norm	10 minutes
		Pre-test	35 minutes
		Training overview	25 minutes
10:45 a.m.–11:00 a.m.		Tea break	
11:00 a.m.–12:30 p.m.	1	Module 1: Introduction to Infection Prevention and Patient Safety	1 hour, 30 minutes
12:30 p.m.–2:00 p.m.		Lunch	
2:00 p.m.–2:45 p.m.	2	Warm-up	5 minutes
		Module 2: Standard Precautions	40 minutes
2:45 p.m.–3:30 p.m.	3	Module 3: Hand Hygiene	45 minutes
3:30 p.m.–3:45 p.m.		Tea break	
3:45 p.m.–5:00 p.m.	3	Module 3: Hand Hygiene	1 hour, 15 minutes
5:00 p.m.–5:10 p.m.		Daily course evaluation	10 minutes
Day Two			
8:30 a.m.–8:45 a.m.		Daily recap and warm-up	15 minutes
8:45 a.m.–10:45 a.m.	4	Module 4: Personal Protective Equipment	2 hours
10:45 a.m.–11:00 a.m.		Tea break	
11:00 a.m.–12:30 p.m.	5	Module 5: Safe Injection Practices	1 hour, 30 minutes
12:30 p.m.–2:00 p.m.		Lunch	
2:00 p.m.–3:45 p.m.	5	Module 5: Safe Injection Practices	1 hour, 45 minutes
3:45 p.m.–4:00 p.m.		Tea break	
4:00 p.m.–5:25 p.m.	6	Module 6: Surgical Antisepsis	1 hour, 25 minutes
5:25 p.m.–5:30 p.m.		Daily course evaluation	5 minutes
Day Three			
8:30 a.m.–8:40 a.m.		Daily recap and warm up	10 minutes
8:40 a.m.–10:10 a.m.	7	Module 7: Safe Surgery and Safe Practice in the Operating Room	1 hour, 30 minutes
10:10 a.m.–10:30 a.m.	8	Module 8: Instrument Processing and Handling	20 minutes
10:30 a.m.–10:45 a.m.		Tea break	

Time	Module	Topic	Duration
10:45 a.m.–12:30 p.m.	8	Module 8: Instrument Processing and Handling	1 hour, 45 minutes
12:30 p.m.–2:00 p.m.		Lunch	
2:00 p.m.–3:35 p.m.	8	Module 8: Instrument Processing and Handling	1 hour, 35 minutes
3:35 p.m.–3:50 p.m.		Tea break	
3:50 p.m.–5:00 p.m.	9	Module 9: Processing Linen and Laundry	1 hour, 10 minutes
5:00 p.m.–5:10 p.m.		Daily course evaluation	10 minutes
Day Four			
8:30 a.m.–8:35 a.m.		Daily recap and warm-up	5 minutes
8:35 a.m.–9:35 a.m.	10	Module 10: Clinical Laboratory Services	1 hour
9:35 a.m.–10:15 a.m.	11	Module 11: Blood Safety	40 minutes
10:15 a.m.–10:30 a.m.		Tea break	
10:30 a.m.–11:30 a.m.	12	Module 12: Traffic Flow and Activity Patterns	1 hour
11:30 a.m.–12:30 p.m.	13	Module 13: Transmission-Based Precautions for Health Care Facilities	1 hour
12:30 p.m.–2:00 p.m.		Lunch	
2:00 p.m.–3:45 p.m.	14	Module 14: Tuberculosis Infection Prevention and Control in Health Care Settings	1 hour, 45 minutes
3:45 p.m.–4:00 p.m.		Tea break	
4:00 p.m.–5:15 p.m.	15	Module 15: Housekeeping	1 hour, 15 minutes
5:15 p.m.–5:30 p.m.		Daily course evaluation	15 minutes
Day Five			
8:30 a.m.–8:35 a.m.		Daily recap and warm-up	5 minutes
8:35 a.m.–10:20 a.m.	16	Module 16: Health Care Waste Management	1 hour, 45 minutes
10:20 a.m.–10:35 a.m.		Tea break	
10:35 a.m.–11:50 a.m.	17	Module 17: Medication Safety	1 hour, 15 minutes
11:50 a.m.–12:30 p.m.	18	Module 18: Post-Exposure Prophylaxis	40 minutes
12:30 p.m.–2:00 p.m.		Lunch	
2:00 p.m.–2:45 p.m.	19	Module 19: Food and Water Safety	45 minutes
2:45 p.m.–3:30 p.m.	20	Module 20: Client Education on Infection Prevention and Patient Safety	45 minutes
3:30 p.m.–3:45 p.m.		Tea break	
3:45 p.m.–4:25 p.m.	21	Module 21: Health Care Risk	40 minutes

Time	Module	Topic	Duration
		Management	
4:25 p.m.–5:25 p.m.		IPPS station	1 hour
5:25 p.m.–5:30 p.m.		Daily course evaluation	5 minutes
Day Six			
8:30 a.m.–8:40 a.m.		Daily recap and warm-up	10 minutes
8:40 a.m.–9:00 a.m.		Health facility visit briefing	20 minutes
9:00 a.m.–10:45 a.m.		Health facility visit	1 hour, 45 minutes
10:45 a.m.–11:00 a.m.		Tea break	
11:00 a.m.–12:30 p.m.		Health facility visit group presentation	1 hour, 30 minutes
12:30 p.m.–2:00 p.m.		Lunch	
2:00 p.m.–3:30 p.m.	22	Module 22: Managing Infection Prevention and Patient Safety Programs	1 hour, 30 minutes
3:30 p.m.–3:45 p.m.		Tea break	
3:45 p.m.–5:45 p.m.		Work plan, post-training assessment, final training evaluation, and closing	2 hours

Module 1: Introduction to Infection Prevention and Patient Safety

Module Objective

- ❖ To enable health care workers to understand how infections are transmitted in health care facilities and identify the associated risks to health care workers, patients/clients, and the community at large.

Learning Objectives

By the end of this module, participants will be able to:

- Describe the magnitude of nosocomial infections.
- Identify the risk of infections in the health care delivery setting.
- Explain the disease transmission cycle and measures to halt the spread of disease at health care delivery settings.
- Describe the role of the Centers for Disease Control and Prevention (CDC) isolation guidelines in preventing health care–acquired infections.
- Explain IPPS.
- Identify the recommended activities to improve IPPS practices.
- Demonstrate barrier methods while caring for a patient with an infectious disease.

Module Content

Handout 1.1: Risk of Infection in Health Care Settings

Handout 1.2: Overview of Infectious Disease

Handout 1.3: Overview of Infection Prevention and Patient Safety

Handout 1.1: Risk of Infection in Health Care Settings

How Risky Is Working in Health Care Facilities?

Health care facilities are ideal settings for the transmission of nosocomial infections in the following ways:

- i) Invasive procedures have the potential to introduce microorganisms.
- ii) Service providers and support staff are constantly performing clinical procedures or other activities (susceptible host).
- iii) Clients receiving services may be harboring micro organisms.

Who Is at Risk of Infections?

Service providers and support staff: Health care personnel, including support staff (e.g., housekeeping, laundry staff, and maintenance), who work in health care settings are at risk of exposure to serious, potentially life-threatening infections such as HIV, hepatitis B virus (HBV), and hepatitis C virus (HCV). Direct contact with blood and other body fluids is the most common or frequent risk that health care workers encounter while caring for patients. Service providers are at risk, for example, during clinical procedures, when handling sharps, and from the inappropriate disposal of medical waste. Material cleaning and housekeeping staff who process instruments and other items, clean up after procedures, clean operating theaters and procedure rooms, and dispose of waste are particularly at risk.

In developing countries, the risk of needle-stick injuries and accidental exposure to blood or body fluids is even higher. In Ethiopia, there are limited studies, but a survey done in 2003–04 on 40 health facilities in Ethiopia reported that 32 percent of the health care workers reported needle-stick injuries over a 12-month period (JSI/Making Medical Injections Safer [MMIS] 2005).

Clients: Clients are at risk of infections when:

- Service providers do not wash their hands before and after providing care to each client and before and after every procedure (cross-contamination).
- Service providers do not adequately prepare clients before clinical procedure.
- Service providers do not correctly process instruments and other items used in clinical procedures.
- Medical waste is disposed of inappropriately.

The community: Members of the community are also at risk of infections, particularly from inappropriate disposal of medical waste, such as contaminated sharps materials.

Handout 1.2: Overview of Infectious Disease

Important Concepts and Definitions

- **Microorganisms:** are the causative agents of infection, including bacteria, viruses, fungi, and parasites.
- **Infection:** means an invasion and multiplication of microorganisms in body tissues, which may be clinically apparent or result in local cellular injury.
- **Disease:** means any deviation from or interruption of the normal structure or function of any body part, organ, or system that is manifested by a characteristic set of symptoms and signs and whose etiology, pathology, and prognosis may be known or unknown.
- **Infectious microorganisms:** microorganisms capable of producing disease in appropriate hosts.
- **Infection prevention and control:** is the action of placing barriers between a susceptible host (person lacking effective natural or acquired protection) and the microorganism.
- **Patient safety:** has been defined as the reduction and mitigation of unsafe acts within the health care system as well as through the use of best practices shown to lead to optimal patient outcomes.
- **Protective barriers:** are physical, mechanical, or chemical processes that help prevent the spread of infectious microorganisms from person to person (patient, health care client, or health worker) and/or from equipment, instruments, and environmental surfaces to people.
- **Nosocomial infections:** is a term used interchangeably with “health care facility–acquired infections” or “health care–associated infections” and is defined as an infection acquired in a health care facility by a patient who was admitted for a reason other than that infection.

The terms **asepsis (aseptic technique)**, **antisepsis**, **decontamination**, **cleaning**, **high-level disinfection**, and **sterilization** often are confusing. As per the *Infection Prevention and Patient Safety Reference Manual for Service Providers and Managers in Health Care Facilities of Ethiopia*, Federal Ministry of Health, 2011, the following definitions will be used in this training module:

- **Asepsis and aseptic technique:** A combination of efforts made to prevent entry of microorganisms into any area of the body where they are likely to cause infection.
- **Antisepsis:** A process of reducing the number of microorganisms on skin, mucous membranes, or other body tissue by applying an antimicrobial (antiseptic) agent.
- **Decontamination:** A process that makes inanimate objects safer to be handled by staff before cleaning (i.e., inactivates HBV, HCV, and HIV and reduces, but does not eliminate, the number of other contaminating microorganisms).
- **Cleaning:** A process that physically removes all visible dust, soil, blood, or other body fluids from an inanimate object as well as removes a sufficient number of microorganisms to reduce risk 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:** The process that eliminates all microorganisms except some bacterial endospores from inanimate objects by boiling, steaming, or using chemical disinfectants.
- **Sterilization:** 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 sterilization, or radiation.

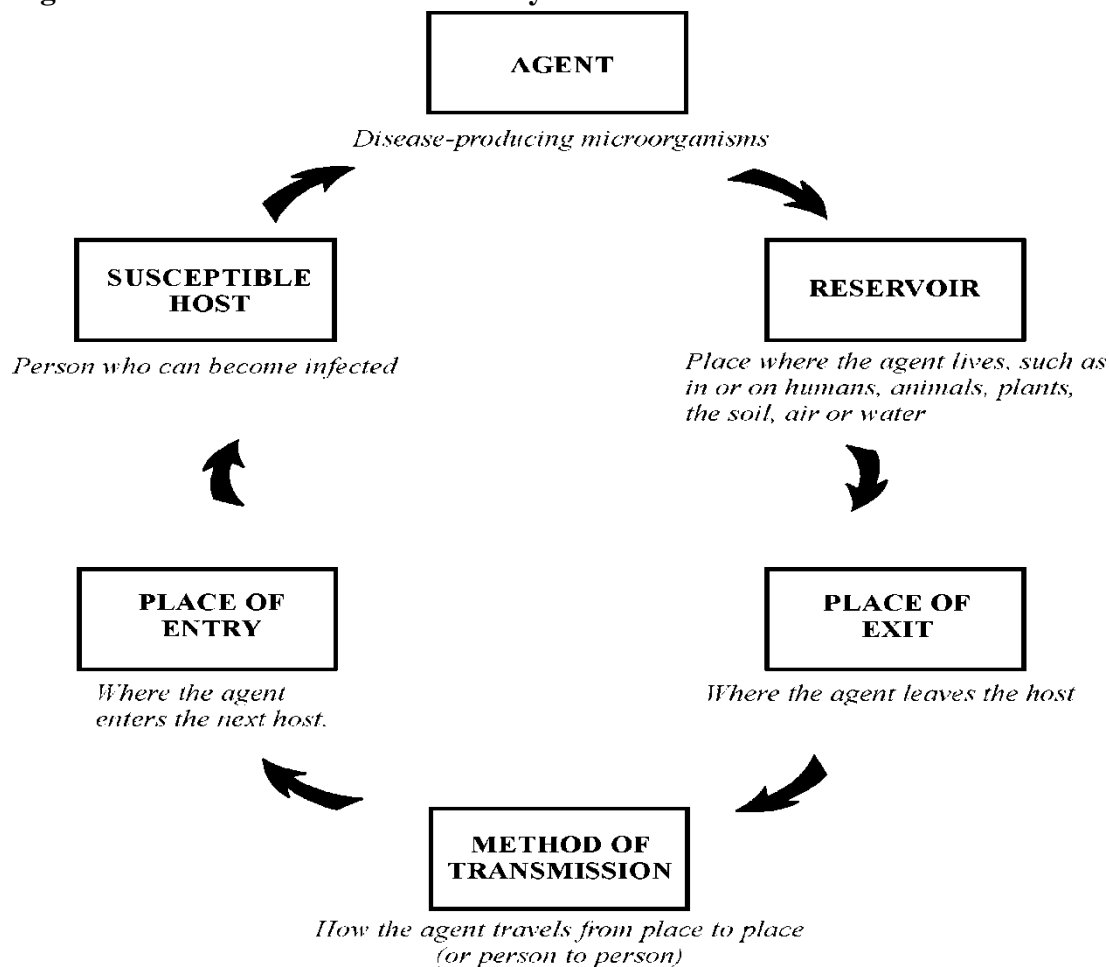
The Disease Transmission Cycle

Microorganisms can be classified as bacteria, viruses, fungi, and protozoa. Bacteria can be further divided into three categories: vegetative (e.g., *Staphylococcus*), mycobacteria (e.g., tuberculosis [TB]), and endospores (e.g., tetanus). Of all the common infectious agents, endospores are the most difficult to kill due to their protective coating.

All humans are susceptible to bacterial infections and also to most viral agents. The number (dose) of organisms necessary to produce infection in a susceptible host varies with the location.

The disease transmission cycle, shown in Figure 1.1, describes how infections are transmitted from one person to another.

Figure 1.1. The disease transmission cycle



Adapted from: Association for Professionals in Infection Control and Epidemiology, Inc. 1983; World Health Organization (WHO)/Western Pacific Region Office 1990.

As shown in Figure 1.1, for bacterial, viral, and other infectious agents to successfully survive and spread, certain factors or conditions must exist. The essential factor for the transmission of disease-causing microorganisms from person to person comprises the following six components:

- i. **Agent:** The microorganism that can cause infection or disease. The infectious agent can include bacteria, viruses, fungi, and parasites.
- ii. **Host or reservoir:** The reservoir of an agent is the habitat in which an infectious agent normally lives, grows, and/or multiplies. Reservoirs include humans, animals, and the environment (plants, soil, air, water, etc.). Solutions, instruments, and other items used in clinical procedures can also serve as reservoirs for potentially infectious microorganisms.
- iii. **Portal of exit:** The gateway through which the agent leaves the host or reservoir. The infectious agent can leave the reservoir through the bloodstream, broken skin (e.g., puncture, cut, surgical site, rash), mucous membranes (e.g., eyes, nose, mouth), respiratory tract (e.g., upper respiratory), genitourinary tract (e.g., vagina, penis), gastrointestinal tract (e.g., mouth, anus), or placenta by means of blood, excretions, secretions, or droplets that come from these places. However, the agent must have the right environment in which to survive until it infects another person. For example, the bacteria that cause TB can survive in sputum for weeks but will be killed by sunlight within a few hours.
- iv. **Method of transmission:** After an agent exits its natural reservoir, it may be transmitted to a susceptible host in numerous ways. These modes of transmission are classified as:
 - **Direct transmission:** An immediate transfer of the agent from a reservoir to a susceptible host by direct contact or droplet spread.
 - a. **Direct contact:** This occurs through kissing, skin-to-skin contact, and sexual intercourse. Direct contact refers also to contact with soil or vegetation harboring infectious organisms. Thus, infectious mononucleosis (“kissing disease”) and gonorrhea are spread from person to person by direct contact. Hookworm is spread by direct contact with contaminated soil.
 - b. **Droplet spread:** This refers to spray with relatively large, short-range aerosols produced by sneezing, coughing, or even talking. Droplet spread is classified as direct because transmission is by direct spray over a few feet, before the droplets fall to the ground (e.g., influenza, TB).

- **Indirect transmission:** In indirect transmission, an agent is carried from a reservoir to a susceptible host by suspended air particles (airborne) or by animate (vector) or inanimate (vehicle-borne) intermediaries.
 - a. **Airborne:** The infectious agent can be carried by air currents (e.g., measles, TB).
 - b. **Vehicle-borne:** The infectious agent can be transmitted indirectly from the reservoir to a susceptible host by material that maintains the life of the infectious agent. Such vehicles include food (e.g., *Salmonella*), blood (e.g., HBV, HIV), water (e.g., cholera, *Shigella*), or instruments and other items.
 - c. **Vector-borne:**
 - i. **Biological:** The infectious agent can be transmitted to a susceptible host through insects and other invertebrate animals (e.g., mosquitoes can transmit malaria and yellow fever; fleas can transmit plague).
 - ii. **Mechanical:** The infectious agent is carried by certain animals without having any biological change (flies can carry and transmit *Vibrio cholera*).

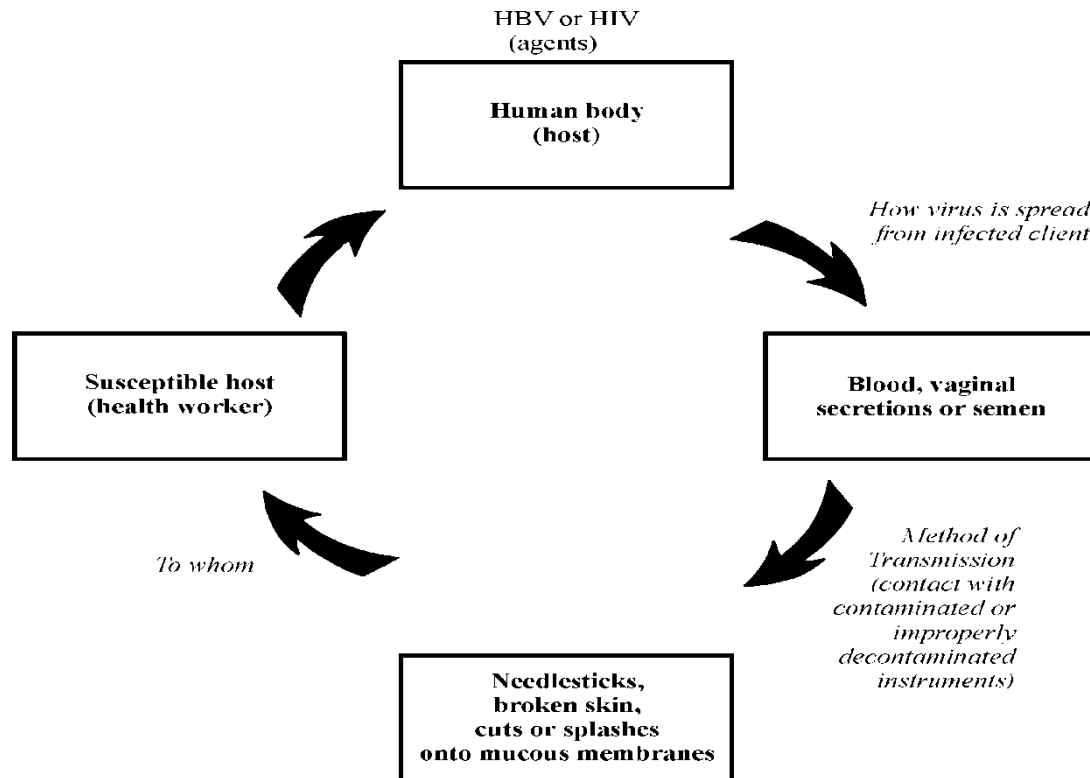
Infection prevention in a health care setting primarily deals with preventing the spread of infectious diseases through the air, blood or body fluids, and contact, including droplet, fecal-oral, and food-borne routes.

- v. **Portal of entry:** The gateway through which an infectious agent enters into the susceptible host. These portals of entry could be mouth, nose, skin, or other (including the respiratory system, vascular system, genitourinary system, and placenta).
- vi. **Susceptible host:** An organism that catches the infectious agent/pathogen. People are exposed to disease-causing agents every day but do not always get sick. For the purpose of this training, susceptible hosts include clients, service providers, support staff, and members of the community.

Figure 1.2 indicates the transmission cycle for HBV and HIV viruses from an infected person to a susceptible host. Spread of these viruses from person to person can occur when staff

(physician, nurse, or housekeeping personnel) are exposed to the blood or body fluids of an infected person (e.g., needle-stick injury).

Figure 1.2. Transmission of HBV and HIV from patients to health care workers



Handout 1.3: Overview of Infection Prevention and Patient Safety

Preventing Infectious Diseases

To prevent the transmission of infections, the disease transmission cycle needs to be broken at some point. Hence, understanding the disease transmission cycle is important if health care workers are to:

- Prevent transmission of microorganisms from patient to patient, from patient to provider, or from provider to patient during medical and surgical procedures as well as from health facilities to the general community.
- Teach others the factors required for transmission to occur.
- Most importantly, teach others how to break the disease transmission cycle.

In a health care facility, this can be accomplished by following proper IPPS practice, such as the following:

- Reducing the number of microorganisms present (e.g., hand washing, cleaning of instruments)
- Killing, inhibiting, or inactivating microorganisms (e.g., hand washing with a waterless alcohol preparation, decontamination, sterilization, or high-level disinfection [HLD])
- Creating barriers to prevent infectious agents from spreading (e.g., wearing gloves or personal protective equipment [PPE])
- Reducing or eliminating risky practices (e.g., by using hands-free technique in the operation room, using disposable gloves and syringes, etc.)
- Making sure that people, especially health care workers, are immune or vaccinated
- Reducing adverse events (e.g., by improving data collection, epidemiological surveys of adverse events, training on prevention of adverse events)

Spaulding Categories of Potential Infection Risk

In 1968, Spaulding proposed three categories of potential infection risk to serve as the basis for selecting the prevention practice or process to use (e.g., sterilization or medical instruments, gloves, and other items) when caring for patients.

This classification has stood the test of time and still serves as a good basis for setting priorities for any infection prevention program. The Spaulding categories are summarized below:

- **Critical:** These items and practices affect normally sterile tissues or the blood system and represent the highest level of infection risk. Failure to provide management of sterile or, where appropriate, high-level disinfected items is most likely to result in infections that are most serious.
- **Semi-critical:** These items and practices are second in importance and affect mucous membranes and small areas of nonintact skin. Management needs are considerable and require knowledge and skills in handling many invasive devices (e.g., gastrointestinal endoscopes and vaginal specula), performing decontamination, cleaning and high-level disinfection, and gloving for personnel who touch mucous membranes and nonintact skin.
- **Noncritical:** Management of items and practices that involve intact skin and represent the lowest level of risk. Poor management of noncritical items such as overuse of examination gloves often consumes a major share of resources while providing only limited benefits. (Spaulding 1968).

CDC Isolation Guidelines

- In 1970, the CDC introduced disease-specific isolation categories.
- In 1985, universal precautions (UP) were introduced
 - Due to advent of blood-borne diseases such as HIV and resurgence of TB
 - To protect health care providers from HIV and blood-borne infections
 - UP did not address risk to patients and risk from other potentially infected body fluids (e.g., semen, amniotic fluid, or mucous secretions) and hence needed modification (CDC 1985).
- Body substance isolation (BSI) was introduced in 1987.
 - It included protection measures for patients and health personnel from all infectious fluids not just blood.
 - It included measures to protect patient-to-patient and health personnel-to-patient transmissions, which are neglected by UP.
 - It also included protective immunization of susceptible patients and staff.

- But it had shortcomings like added cost of PPE, especially gloves, and confusion with UP (Lynch and Jakson 1990; Patterson et al. 1991).

Current CDC Guidelines

- Introduced in 1996 to replace UP and BSI guidelines
- Incorporates major parts of both UP and BSI into a single set of guidelines that operate at two levels:
 - Standard precautions
 - Transmission-based precautions (Garner and the Hospital Infection Control Practices Advisory Committee 1996)

Overview of Standard and Transmission-Based Precautions

Standard precautions: are guidelines designed for use in caring for all people—both clients and patients—attending health care facilities. They apply to blood, all body fluids, secretions and excretions (except sweat), nonintact skin, and mucous membranes. The details of their use and issues related to implementing them are covered in Module 2.

Transmission-based precautions: are the second-level precautions intended for use in patients known to be or highly suspected of being infected or colonized with pathogens transmitted by: 1) **air** (TB, chicken pox, measles, etc.), 2) **droplet** (influenza, mumps and rubella), or 3) **contact** (hepatitis A or E and other enteric pathogens, herpes simplex, and skin or eye infections). Their use is described in more detail in Module 13.

Note: In all cases, whether they are used alone or in combination, transmission-based precautions must be used in conjunction with the standard precautions.

Overview of Patient Safety

Patient safety (PS) refers to the reduction and mitigation of unsafe acts within the health care system as well as through the use of best practices shown to lead to optimal patient outcomes.

PS initiatives include all of the three global health challenges, namely: clean care is safer care, safe surgery, and prevention of antimicrobial resistance. The implementation of PS both improves care and enhances the morale and satisfaction level of health workers.

Recommended Activities to Improve Infection Prevention and Patient Safety Practices

- Use appropriate hand hygiene techniques.
- Use PPE.
- Use antiseptic agents for cleansing the skin or mucous membranes, cleaning wounds, or performing hand rubs or surgical hand scrubs.
- Process instruments and other items that come in contact with blood, body fluids, secretions, and excretions, and properly store and handle processed instruments.
- Routinely clean and disinfect the environment where patients are cared for.
- Safely dispose of infectious waste materials to protect those who handle them and prevent injury or spread of infection to the community.
- Properly handle specimens (blood, tissue, excretions, and secretions).
- Manage traffic flow and activity patterns in wards, procedure areas, and operating rooms (ORs).
- Follow proper isolation precautions for infectious patients or, until infection is ruled out, if secretions or excretions cannot otherwise be contained.
- Manage safe and proper disposal of health care waste.
- Report accidental exposure to blood and body fluids.
- Minimize preoperative stays in health care facilities.
- Ensure rational prescription of drugs and maximize clinical effectiveness.
- Conduct intensive sensitization campaigns and special training programs on the prevention of adverse events on a regular basis for health care workers.
- Provide continuous supportive supervision and monitoring of IP practices and infection rates.
- Include PS in the curricula of health-related training institutions.
- Provide patient charters or rights in local languages.
- Involve clients/patients in raising their awareness on PS.
- Vaccinate staff against HBV and other vaccine-preventable pathogens.
- Improve surgical outcomes for patients.
- Institute regulations to control the quality of medicines.

- Increase partnerships between patients, family members, health professionals, and policymakers to affect meaningful change in PS.
- Improve basic data collection and promote research to know the real magnitude of the PS problem. Research priorities should include epidemiological surveys of adverse events.
- Provide regular reporting of all adverse events occurring in all health care facilities.

Module 2: Standard Precautions

Module Objective

- ❖ To enable participants to understand the basic concept, principles, and purpose of standard precautions.

Learning Objectives

By the end of this module, participants will be able to:

- Define standard precautions.
- Explain the purpose of standard precautions.
- List the components of standard precautions.

Module Content

Handout 2.1: Standard Precautions: Definition and Purpose

Handout 2.1: Standard Precautions: Definition and Purpose

The guidelines issued by the CDC in 1996 involve a two-level approach, namely standard precautions and transmission-based precautions. Standard precautions combine the major features of universal precautions and body substance isolation.

Standard precautions are guidelines designed to create a physical, mechanical, or chemical barrier between microorganisms and a person to prevent the spread of infection (i.e., the barrier serves to break the disease transmission cycle).

Examples of Barriers

- **Physical:** PPE (gloves, face masks, goggles, gowns, plastic or rubber aprons, and drapes)
- **Mechanical:** HLD by boiling or steaming and sterilization by autoclaving or dry heat ovens
- **Chemical:** Antiseptics (alcohol-based antiseptic agents) and high-level disinfectants (chlorine and glutaraldehydes)

Their implementation is meant to reduce the risk of transmitting microorganisms from known or unknown sources of infection (e.g., patients, contaminated objects, used needles and syringes, etc.) within the health care system. Applying standard precautions has become the primary strategy to preventing health care–associated infection in hospitalized patients. The application of standard precautions during patient care is determined by the nature of the health care worker–patient interaction and the extent of anticipated blood, body fluid, or pathogen exposure.

Principles and Key Components of Standard Precautions

Standard precautions are based on the principle that all blood, body fluids, secretions, excretions (except sweat), nonintact skin, and mucous membranes may contain transmissible infectious agents. Because most people with blood-borne viral infections such as HIV and HBV do not have symptoms and cannot be visibly recognized as being infected, standard

precautions are designed for the care of all persons, patients, clients, and staff—regardless of whether they are infected.

Table 2.1 shows the key components of standard precautions and some recommendations.

Table 2.1. Key components and recommendations of standard precautions

Component	Some Recommendations
Hand hygiene (hand wash with soap and water or use an antiseptic hand rub)	<ul style="list-style-type: none"> • After touching blood, body fluids, secretions, excretions, and contaminated items • Immediately after removing gloves • Between patient contacts • Before performing a procedure
Gloves	<ul style="list-style-type: none"> • For contact with blood, body fluids, secretions/excretions, or contaminated items • For contact with mucous membranes and nonintact skin
Gown/apron	<ul style="list-style-type: none"> • Protect skin from blood or body fluid contact • Prevent soiling of clothing during procedures that may involve contact with blood or any body fluids (secretions/excretions)
Linen	<ul style="list-style-type: none"> • Handle soiled linen in a manner that prevents touching of skin or mucous membranes • Do not pre-rinse soiled linens in patient care areas
Mask, goggles, and face shield	<ul style="list-style-type: none"> • Protect mucous membranes of eyes, nose, and mouth when contact with blood and body fluids is likely or possible
Soiled patient care equipment	<ul style="list-style-type: none"> • Handle soiled equipment in a manner to prevent contact with skin or mucous membranes and to prevent contamination of clothing or the environment • Clean reusable equipment prior to reuse
Environmental control	<ul style="list-style-type: none"> • Develop procedures for routine care, cleaning, and disinfection of equipment and environmental surfaces, especially frequently touched surfaces in patient care areas
Textiles and laundry	<ul style="list-style-type: none"> • Handle in a manner that prevents transfer of microorganisms to others and to the environment
Needles and other sharps	<ul style="list-style-type: none"> • Avoid recapping, bending, breaking, or hand-manipulating used needles; if recapping is required, use a one-handed scoop technique only • Avoid removing used needles from disposable syringes • Place used sharps in puncture-resistant container at point of use

Component	Some Recommendations
Patient resuscitation	<ul style="list-style-type: none"> • Use mouthpiece, resuscitation bags, or other ventilation devices to avoid mouth-to-mouth resuscitation
Patient placement	<ul style="list-style-type: none"> • Place patients who contaminate the environment or cannot maintain appropriate hygiene in private rooms • Place patients on airborne, droplet, or contact precautions in appropriate rooms
Respiratory hygiene/cough etiquette	<ul style="list-style-type: none"> • Instruct symptomatic persons to cover mouth/nose when sneezing/coughing or use tissue papers and dispose in no-touch receptacle • Observe hand hygiene after soiling of hands with respiratory secretions • Wear a surgical mask if tolerated or maintain spatial separation, more than three feet if possible

Module 3: Hand Hygiene

Module Objective

- ❖ To enable participants to understand hand hygiene techniques.

Learning Objectives

By the end of this module, participants will be able to:

- Explain the rationale for hand hygiene.
- List the kinds of hand hygiene techniques.
- Explain the purpose of each kind of hand hygiene technique.
- Demonstrate how to prepare and use antiseptic hand rub.
- Demonstrate the different hand hygiene techniques.
- Mention common poor practices related with hand hygiene.
- Identify strategies for improving hand hygiene practices.

Module Content

Handout 3.1: Why Hand Hygiene Is Important

Handout 3.2: Hand Washing

Handout 3.3: Hand Antisepsis and Antiseptic Hand Rub

Handout 3.4: Surgical Hand Scrub

Handout 3.5: Improving Hand Hygiene Practices

Handout 3.1: Why Hand Hygiene Is Important

Hand hygiene is a general term referring to any action of hand cleansing. It includes care of the hands, nails, and skin.

Proper hand hygiene is a key component in minimizing the spread of disease and in maintaining an infection-free environment. Hand hygiene significantly reduces the number of disease-causing microorganisms on hands and arms and can minimize cross-contamination (e.g., from health worker to patient). It is the most important way to reduce the spread of infections in the health care setting. Hand hygiene practices such as hand washing and surgical hand scrubbing are intended to prevent hand-borne infections by removing dirt and debris and inhibiting or killing microorganisms on skin. This includes not only most of the organisms acquired through contact with patients and the environment, but also some of the permanent ones that live in the deeper layers of the skin.

Studies indicated that failure to perform appropriate hand hygiene is considered to be the leading cause of health care–associated infections and the spread of multidrug-resistant microorganisms and has been recognized as a significant contributor to outbreaks (Boyce and Pittel 2002).

Hand Hygiene Practices

Hand hygiene can be accomplished by:

- Hand washing
- Hand antisepsis
- Antiseptic hand rub
- Surgical hand scrub

From the various hand hygiene practices available, the use of soap and water remains the most common and the most important when hands are visibly soiled. For hand hygiene in the absence of dirt or debris, however, alternatives such as antiseptic hand rubs, which are rapid acting, inexpensive, and easy to make, are gaining acceptance, especially where access to sinks and clean water is limited.

The decision of which type of hand hygiene practice to use depends on:

- Intensity of contact with patient and/or blood and body fluids
- The likelihood of microbial transmission
- Patient's susceptibility to infection
- Procedure being performed

Handout 3.2: Hand Washing

The purpose of hand washing with plain soap and water is to mechanically remove soil and debris from skin and reduce the number of transient microorganisms. Hand washing with plain soap and clean water is as effective as washing with antimicrobial soaps (Pereira, Lee, and Wade 1997). But if the tap water is contaminated, hand washing with plain soap is only effective in removing dirt and debris. If tap water is contaminated, use water that has been boiled for 10 minutes and filtered to remove particulate matter (if necessary), or use chlorinated water.

When Do We Wash Our Hands?

- Immediately after arriving and leaving work (the health facility)
- Before and after examining (coming in direct contact with) a client/patient
- After touching contaminated instruments or items
- After exposure to mucous membranes, blood, body fluids, secretions, or excretions
- Before putting on gloves and after removing them
- Whenever our hands become visibly soiled
- After blowing nose or covering a sneeze
- Before eating or serving food
- After visiting the toilet

Note: Hands should be washed with soap and clean water (or an antiseptic hand rub) after removing gloves because the gloves may have tiny holes or tears, and bacteria can rapidly multiply on gloved hands due to the moist and warm environment within the glove (CDC 1989; Korniewicz et al. 1990).

Steps for Routine Hand Washing

- Thoroughly wet hands with water.
- Apply plain soap (antiseptic agent is not necessary).
- Vigorously rub all areas of hands and fingers for 10 to 15 seconds, paying close attention to areas under fingernails and between fingers.
- Rinse hands thoroughly with clean water.
- Dry hands with personal dry clean towel or paper towel.
- Use a paper towel or a single-use towel after drying hands to turn off the water (faucet handles are contaminated).

When drying hands, using common towels should be avoided. Shared towels may harbor microorganisms and contaminate hands even after proper hand washing.

Note:

- If bar soap is used, provide small bars and soap racks that drain.
- Use running water and avoid dipping hands into a basin containing standing water.
- If liquid soap is being used, do not add soap to a partially empty liquid soap dispenser. This practice of “topping off” dispensers may lead to bacterial contamination of the soap. Liquid soap dispensers should be thoroughly washed and dried before refilling.
- A bucket with a tap or a bucket with a pitcher or jug can be used if running water is not available.
- Used water should be collected in a basin and discarded in a latrine if a drain is not available.

Figure 3.1. Hand-washing techniques with soap and water

Hand washing Technique with Soap and Water



WHO Guidelines on Hand Hygiene in Health Care (advanced draft) / Modified according to EN1500

Handout 3.3: Hand Antisepsis and Antiseptic Hand Rub

Hand Antisepsis

The purpose of hand antisepsis is to remove soil and debris and reduce both transient and resident flora on the hands. The technique for hand antisepsis is similar to hand washing except that it involves use of soap containing an antimicrobial agent (often chlorhexidine, iodophors, or triclosan) instead of plain soap or detergent. Medicum, Life Boy, and Dettol are some of the commonly found soaps with antimicrobial agents.

Hand antisepsis should be done before:

- Examining or caring for highly susceptible patients (e.g., premature infants, elderly patients, patients with advanced AIDS)
- Performing an invasive procedure such as placement of an intravascular device
- Leaving the room of patients on contact precautions (e.g., with hepatitis A or E) or who have drug-resistant infections

Antiseptic Hand Rub

Hand rub product is more effective in killing transient and resident flora than plain or medicated soap and water. Antiseptic hand rub is quicker and easier to use and gives a greater initial reduction in hand flora (Girou et al. 2002). Hand rubs also contain a small amount of an emollient such as glycerin, propylene glycol, or sorbitol that protects and softens skin. It is also less irritating to skin than medicated soaps. But, if hands are visibly soiled, hand washing with water and a hand-washing agent should be done first.

Alcohol-based hand rubs provide several advantages compared with hand washing with soap and water because they:

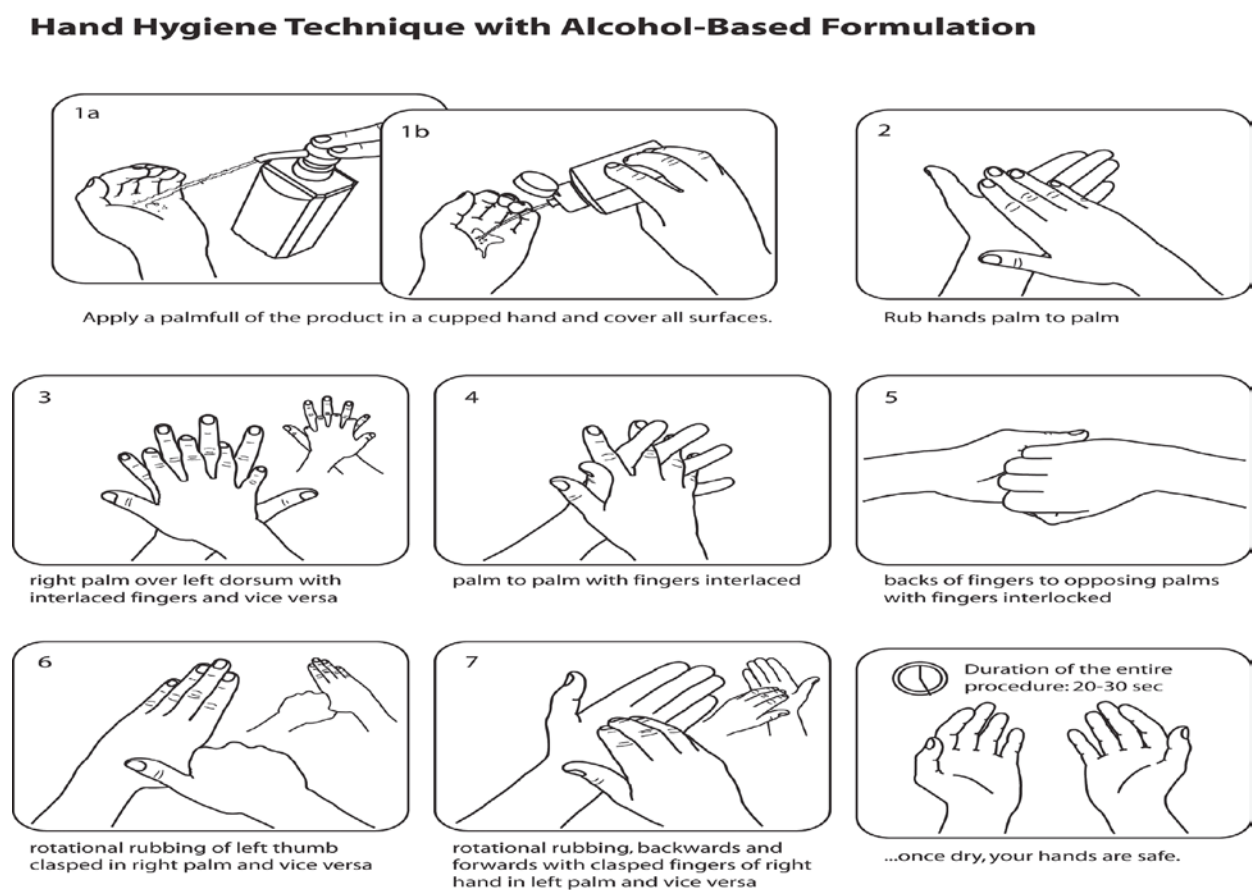
- Require less time
- Act faster
- Are more accessible than sinks
- Are more effective for standard hand washing than soap
- Can provide improved skin condition

A nonirritating, antiseptic hand rub can be made by adding glycerin, propylene glycol, or sorbitol to alcohol (2 mL in 100 mL of 60 to 90 percent ethyl or isopropyl alcohol solution) (Larson 1999).

The technique for performing antiseptic hand rub is as follows:

- Apply enough (5 mL) alcohol-based hand rub to cover the entire surface of hands and fingers.
- Rub the solution vigorously into hands, especially between the fingers and under the nails until dry (15 to 30 seconds).
- Do not rinse hands after applying hand rub.

Figure 3.2. Hand-washing technique with alcohol-based hand rub



WHO Guidelines on Hand Hygiene in Health Care (advanced draft) / Modified according to EN1500

Handout 3.4: Surgical Hand Scrub

The purpose of surgical hand scrub is to mechanically remove soil, debris, and transient organisms and to reduce resident flora prior to performing any surgical procedure and for the duration of the procedure. The goal is to prevent wound contamination by microorganisms from the hands and arms of the surgeon and assistants if there is a break in the integrity of the gloves or gown.

The steps in surgical hand scrub include the following:

1. Remove all rings, watches, and bracelets.
2. Thoroughly wash hands, especially between fingers, and forearms up to the elbows with soap and water. (If a brush is used, it should be cleaned and either sterilized or high-level disinfected before reuse or shared with others. Sponges, if used, should be discarded.)
3. Clean nails with a nail cleaner.
4. Rinse hands and forearms thoroughly with clean, running water.
5. Apply an antiseptic agent (e.g., 2 to 4 percent chlorhexidine gluconate [CHG]) to all surfaces of hands and forearms to the elbows and rub hands and forearms vigorously for at least two minutes.
6. Rinse hands and arms thoroughly, holding hands higher than the elbows (if tap water is contaminated, use boiled and cooled water or chlorinated water and filter if necessary).
7. Keep hands up and away from the body, do not touch any surface or articles, and dry the hands and forearms with a sterile towel.
8. Put sterile surgical gloves on both hands.

Applying an antiseptic minimizes the number of microorganisms on hands under the gloves and minimizes growth of flora during surgery. Skin damage caused by allergic reactions provides an ideal place for microorganisms to multiply and should be avoided. Personnel with allergies to antiseptics may use plain soap followed by applying the waterless, alcohol-based hand rub.

Handout 3.5: Improving Hand Hygiene Practices

Why Health Care Professionals Don't Wash Their Hands

Although hand hygiene is the primary measure proven to be effective in preventing health care–associated infections and the spread of antimicrobial resistance, health care workers encounter difficulties in complying with hand hygiene indications at different levels. Reasons for why health care professionals don't wash their hands include the following (adapted from Alvarado 2000).

The belief that:

- Hand washing between every patient encounter is unnecessary.
- Hand washing does not affect clinical outcome.
- Hand washing is unnecessary when gloves are worn.
- Routine or frequent hand washing is unnecessary.
- Frequent hand washing interrupts efficient patient care.
- Frequent hand washing damages skin and causes cracking, dryness, irritation, and dermatitis.
- Hand washing damages nails and nail polish.
- Hand washing facilities are not conveniently placed or well designed.
- Hand washing is inconvenient.
- Hand washing takes too much time.

The failure of supervisors and managers to:

- Establish a hand-washing policy.
- Involve administrators in hand-washing policy.
- Effectively communicate hand-washing policy.
- Demonstrate hand-washing policy through actions.
- Enforce hand-washing policy.
- Ensure a supply of clean running water.

The following are some of the measures that can be taken to improve compliance with hand hygiene.

- Have supplies available and at “point of use.”

- Disseminate and promote guidelines.
- Reinforce guidelines.
- Involve everybody.
- Give positive feedback.
- Reward role modeling.
- Benchmark best practices.

Other Issues and Considerations Related to Hand Hygiene

Gloves:

- Wearing gloves does not replace the need for hand hygiene.

Hand lotions and hand creams:

- To minimize contact dermatitis related to frequent hand washing (more than 30 times per shift) due to the use of harsh detergents and frequent exposures to antiseptic agents, health care workers may use hand lotions, creams, and moisturizing skin care products. Such products should be water based and without fragrance. Oil-based barrier products, such as those containing petroleum jelly (Vaseline or lanolin), should not be used because they damage latex rubber gloves.

Lesions and skin breaks:

- Cuticles, hands, and forearms should be free from lesions (dermatitis or eczema) and skin breaks. Cuts and abrasions should be covered with waterproof dressings.

Fingernails and artificial nails:

- Long nails may serve as a reservoir for microorganisms, and long nails, either natural or artificial, tend to puncture gloves more easily. As a result, it is recommended that nails be kept moderately short and be less than 0.5 cm long beyond the fingertip. The use of artificial nails by health workers should be restricted (WHO 2009a).

Nail polish:

- Dark-colored nail polish may prevent dirt and debris under fingernails from being seen and removed. Although there is no restriction to wearing nail polish, it is suggested that surgical team members and staff working in specialty areas wear freshly applied, clear nail polish. Chipped nail polish supports the growth of larger numbers of organisms on fingernails compared to freshly polished or natural nails.

Jewelry:

- Although several studies have shown that skin under rings is more heavily colonized than comparable areas of skin on fingers without rings, at the present time, it is not known whether wearing rings results in greater transmission of pathogens. It is suggested that surgical team members not wear rings because it may be more difficult for them to put on surgical gloves without tearing them (WHO 2009b).

Monitoring Hand Hygiene Compliance

Monitoring hand hygiene practices is an activity of crucial importance to assess baseline compliance by health care workers, to evaluate the impact of promotion interventions, and to provide feedback to health care workers. Compliance with hand hygiene can be evaluated directly or indirectly. Direct methods include observation, patient assessment, and self-report; indirect methods include monitoring consumption of products, such as soap or a hand rub, and electronic monitoring of the use of hand-washing basins.

Module 4: Personal Protective Equipment

Module Objective

- ❖ To enable participants to understand how to properly use PPE.

Learning Objectives

By the end of this module, participants will be able to:

- List PPE.
- Describe the use, effectiveness, and limitations of PPE.
- List types of gloves.
- Demonstrate the correct way of donning and removing PPE (gloves, masks, etc.)
- Identify the types of drapes and demonstrate how to use them.

Module Content

Handout 4.1: Personal Protective Equipment

Handout 4.2: Gloves

Handout 4.1: Personal Protective Equipment

Protective barriers and clothing are now commonly referred to as PPE. PPE includes gloves, masks/respirators, eyewear (face shields, goggles, or glasses), caps, gowns, aprons, and other items. The basic principle behind wearing PPE is to provide a physical barrier/protection for health care providers and patients/clients from microorganisms. The most effective barriers are made of treated fabrics or synthetic materials that do not allow water or other liquids (blood or body fluids) to penetrate them. However, these fluid-resistant materials are not widely available because they are expensive. In many countries, caps, masks, gowns, and drapes are made of cloth or paper. Lightweight cotton cloth (with a thread count of 140/inch²) is the material most commonly used for surgical clothing (masks, caps, and gowns) and drapes in many countries. Unfortunately, lightweight cotton does not provide an effective barrier because moisture can pass through it easily, allowing contamination.

Table 4.1. Types of personal protective equipment

Type of Personal Protective Equipment	Must Be Used For:	Primarily Protects:
Caps, gowns/scrub suits, masks, aprons, drapes	Invasive procedures where tissue beneath the skin is exposed	Service provider and client
Closed boots or shoes (open sandals are not acceptable)	Situations involving sharp instruments or when contact with blood and/or body fluids is likely	Service provider
Goggles or glasses, masks, apron or mackintosh	Situations where splashing of blood, body fluids, secretions, or excretions is likely	Service provider
Apron or Mackintosh	Situations where splashing or spillage of blood, body fluids, secretions, or excretions is likely	Service provider
Masks	Situation that call for airborne or droplet transmission precautions	Service providers
Sterile drapes	Major or minor surgical procedures	Client

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.

Masks

- Masks are worn in an attempt to contain moisture droplets expelled as health workers or surgical staff speak, cough, or sneeze, as well as to prevent accidental splashes of blood or other contaminated body fluids from entering health workers' noses or mouths. Unless the masks are made of fluid-resistant materials, they are not effective in preventing either very well. Masks should be large enough to cover the nose, lower face, jaw, and all facial hair. When removing, handle masks by the strings because the center of the mask contains the most contamination.

Respirators

5. Particulate respirators are specialized types of masks that are worn by health care personnel to protect them from inhalation exposure to airborne infectious agents that are less than 5 µm in size. These include infectious droplet nuclei from patients with *Mycobacterium tuberculosis* and dust particles that contain infectious particles, such as spores of environmental fungi (e.g., *Aspergillus* spp.). The N95 disposable, particulate, air-purifying respirator is the type used most commonly by health care personnel. (For safe donning and removing of respirator, refer to page 60 of *Infection Prevention and Patient Safety Reference Manual for Service Providers and Managers in Health Care Facilities of Ethiopia*).

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 goggles, and faces shields.

Scrub suits or cover gowns

- Scrub suits are worn over, or instead of, street clothes. The main use of cover gowns is to protect the health care workers' clothing.

Surgical gowns

- Surgical gowns are intended to protect patients from microorganisms present on the abdomen and arms of the health care staff during surgery. Lightweight cloth gowns, generally available in Ethiopia, however, offer little protection. Under the circumstances, either wear a plastic apron before putting on the surgical gowns or, if

large spills occur, take a shower or bathe as soon as possible after completing the surgery or the procedure. When surgical gowns are worn, sleeves should either taper gently toward the wrists or end with elastic or ties around the wrists. (Large, droopy sleeves invite accidental contamination.) In addition, the cuffs of the surgical gloves should completely cover the end of the sleeves.

Mackintosh or plastic apron

- Plastic aprons are used to protect clothing or surfaces from contamination. Aprons made of rubber or plastic provide a waterproof barrier along the front of the health care worker's body and should also be worn during cleaning and procedures where there is a likelihood of splashes or spillage of blood, body fluids, secretions, or excretions (e.g., when conducting deliveries).

Footwear

- Footwear is worn to protect feet from injury by sharp or heavy items or fluids that may accidentally fall or drip on them. For this reason, sandals, "thongs," or shoes made of soft materials are not acceptable.

Drapes

- Drapes are used to create an operative field around an incision, wrap instruments and other items for sterilization, cover tables in the operating room (OR), and keep clients warm during surgical procedures.
- There are four types of drapes:
 - **Towel drapes** (used for drying hands, squaring off the operative site, and wrapping small items)
 - **Drapes or lap sheets** (used for covering the patient)
 - **Site drapes** (used for minor surgical procedures and have a circular opening)
 - **Pack wrapper drapes** (large drapes that become a table cover when the sterile instrument pack is opened)

Using drapes for a surgical procedure:

All drapes should be applied around a completely dry, wide area of the skin around the site of incision to reduce risk of contamination.

- If sterile drapes are used, sterile surgical gloves should be worn when placing the drapes (when putting drapes in place, care must be taken not to touch the patient's body with gloved hands).
- Drapes should be handled as little as possible and should never be shaken or flapped. Always hold drapes above the area to be draped, and discard the drape if it falls below this area.

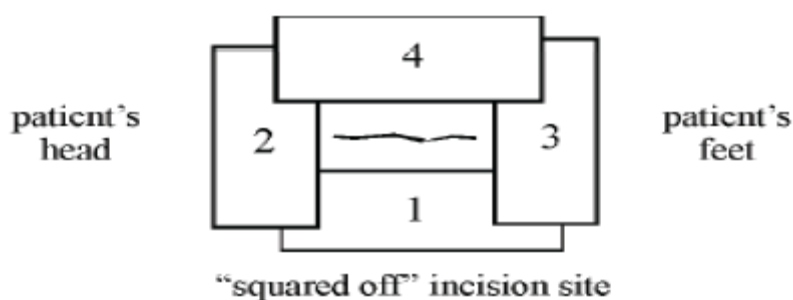
For a minor surgical procedure:

- Use a site drape if the open skin required around the incision is not bigger than 5 cm.
- Place the hole in the drape over the prepped incision site and do not move it once it has touched the skin.
- If the site being draped is not sterile, put on sterile gloves after placing the drape on the patient to avoid contaminating the gloves.

For a major surgical procedure:

- Use large drapes or lap sheets to cover the patient's body. These drapes do not need to be sterile because they will not be near the incision site. They should be clean and dry.
- After preparing the skin, place sterile towel drapes to square off the incision site.
- Begin by placing the drape on the area closest to you to decrease the chances of contamination.
- Holding one side of the drape, allow the other side to touch the abdominal skin about two inches away from the proposed incision site. Gently drop the rest of the drape onto the abdomen. Once in place, the drape should never be moved closer to the incision. It can, however, be pulled away from it.

Figure 4.1. Squaring of a work area



- Place three additional drapes (2, 3, and 4 in Figure 4.1) to square off the work area.

- Use nonperforating towel clips to secure the corners of the towel drapes.

During procedure:

- Do not use the patient's body or the draped area for placing instruments.
- Keep all instruments on the instrument stand covered with a sterile towel or drape.
- Do not lean against or on the table during surgery.
- If a drape is torn or cut during a procedure, it should be covered with a new drape. Do not, however, place a new drape on top of a drape that has become wet.

Remember:

- Once a sterile drape touches the patient's skin, it is no longer sterile.
- Sterile cloth drapes do not replace good aseptic technique.

Handout 4.2: Gloves

Hand hygiene, coupled with the use of protective gloves, is a key component in minimizing the spread of disease and maintaining an infection-free environment.

Health care workers wear gloves for the following three reasons:

1. To reduce the risk of staff acquiring bacterial infections from patients
2. To prevent staff from transmitting their skin flora to patients
3. To reduce contamination of the hands of staff by microorganisms that can be transmitted from one patient to another (cross-contamination)

Types of Gloves

Three types of gloves are used in health care facilities:

1. **Surgical gloves** should be used when performing invasive medical or surgical procedures. The best surgical gloves are made of latex rubber, because of rubber's natural elasticity, sensitivity, and durability. In addition, it provides a comfortable fit. Current standards in Ethiopia recommend that high-level disinfected surgical gloves are the only acceptable alternative if sterile surgical gloves are not available, when performing surgical or invasive procedures (FMOH, *Infection Prevention and Patient Safety Reference Manual for Service Providers and Managers in Health Care Facilities of Ethiopia*, February 2011).
2. **Clean examination gloves** provide protection to health care workers when performing many of their routine duties. These can be used when there is contact with mucous membranes and nonintact skin (e.g., performing medical examinations and procedures such as pelvic examinations).
3. **Utility or heavy-duty household gloves** should be worn for processing instruments, equipment, and other items; for handling and disposing of contaminated waste; and when cleaning contaminated surfaces. Double gloving using either new examination gloves or reprocessed surgical gloves provides some protection in case utility gloves are not available.

When to Wear Gloves

Depending on the situation, surgical gloves, clean examination gloves, or utility gloves should be worn by all staff when:

- There is reasonable chance of hands coming in contact with blood or other body fluids, mucous membranes, or nonintact skin.
- They perform invasive medical procedures (e.g., inserting vascular devices such as peripheral venous lines).
- They handle contaminated waste items or touch contaminated surfaces.

Note:

- When using latex rubber gloves, do not use hand creams or lotions that contain mineral oil, petroleum jelly (Vaseline), or lanolin to protect your hands because they may cause the gloves to break down within minutes.
- A separate pair of gloves must be used for each client to avoid cross-contamination or when moving from one site to another site on the same patient (i.e., from respiratory care to a dressing change).
- It is preferable to use new and single-use (disposable) gloves.

Removing and discarding or reprocessing gloves:

- If gloves are to be discarded, briefly immerse them in 0.5 percent chlorine solution, remove, and dispose in a container for contaminated waste.
- If gloves are to be reprocessed and reused, immerse them in a 0.5 percent chlorine solution briefly, remove gloves by inverting them, and then soak the gloves in the 0.5 percent chlorine solution for 10 minutes before cleaning and processing them (FMOH, *Infection Prevention and Patient Safety Reference Manual for Service Providers and Managers in Health Care Facilities of Ethiopia*, February 2011).

Figures 4.2 to 4.5 show how to don and remove gloves.

Figure 4.2. How to don examination gloves

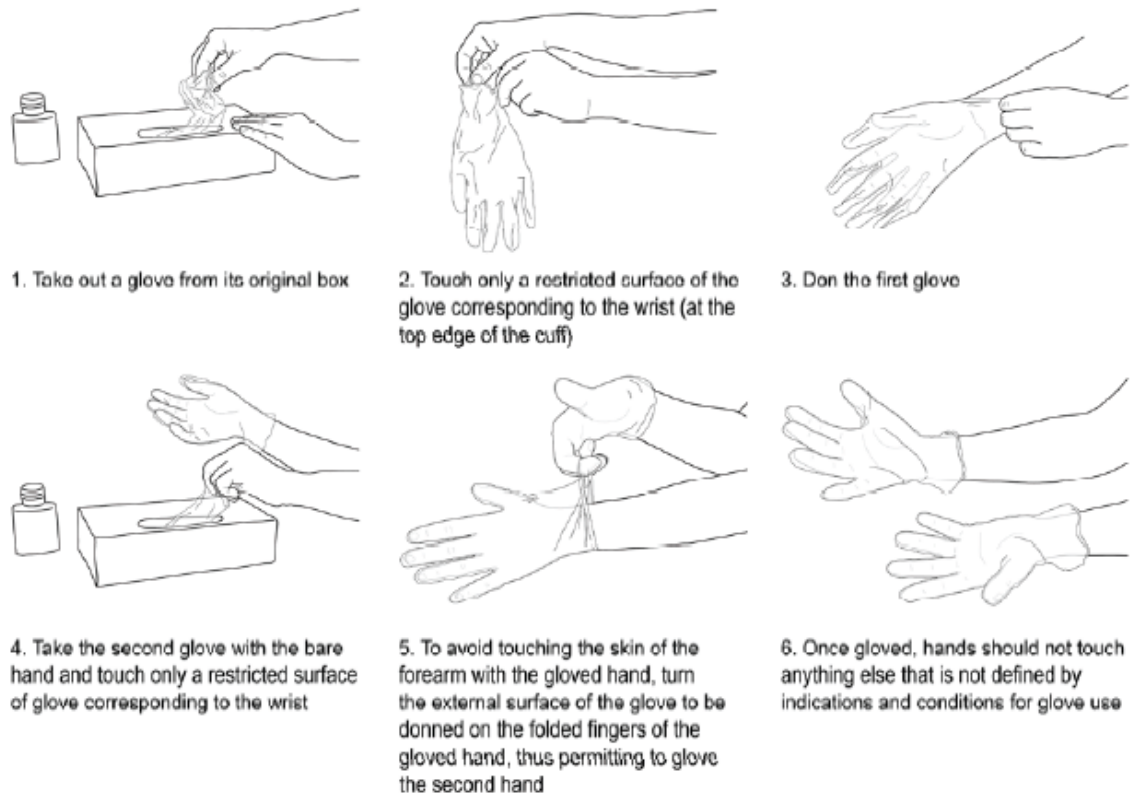
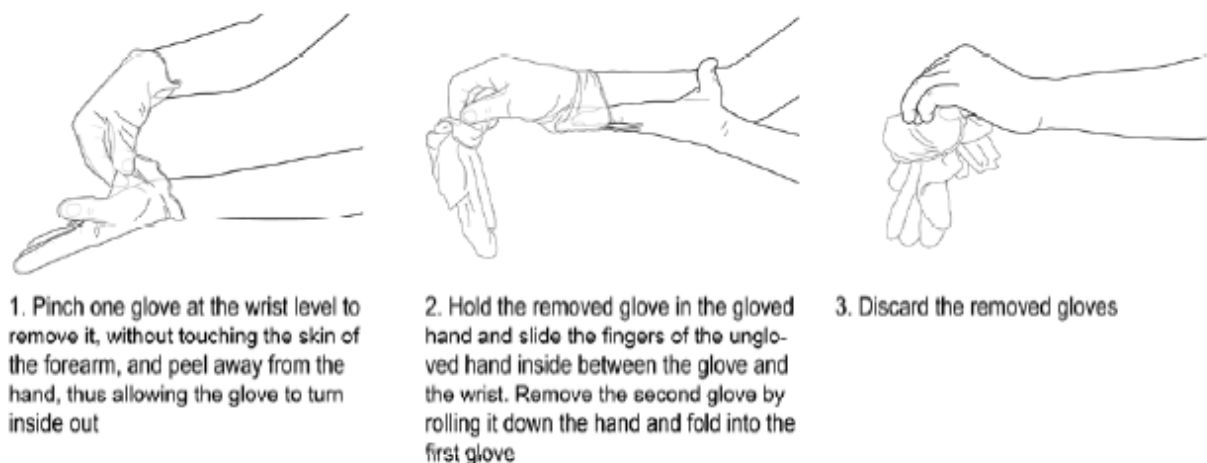
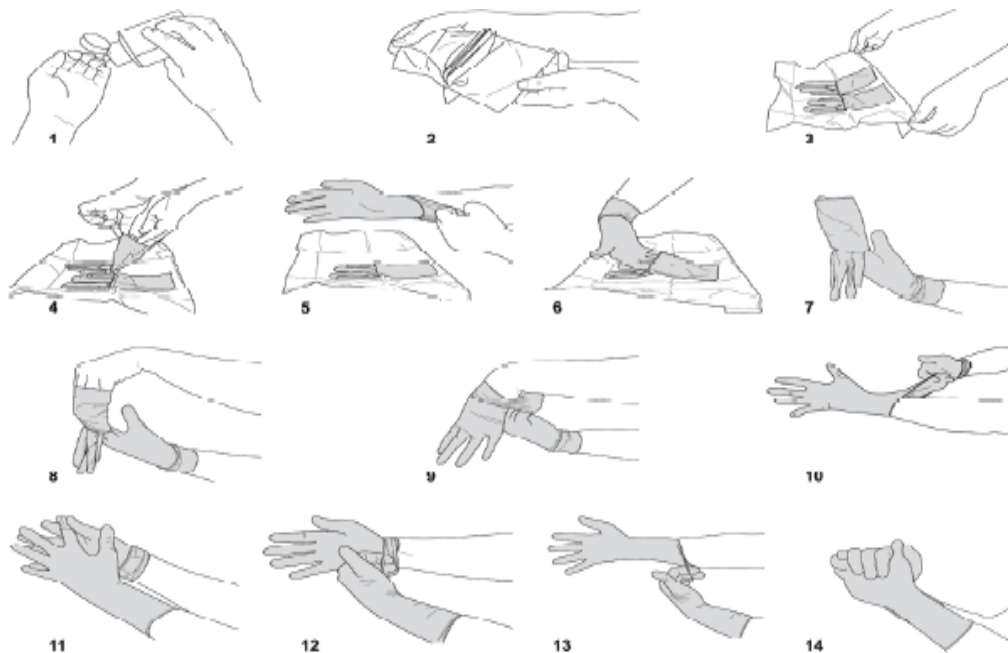


Figure 4.3. How to remove examination gloves



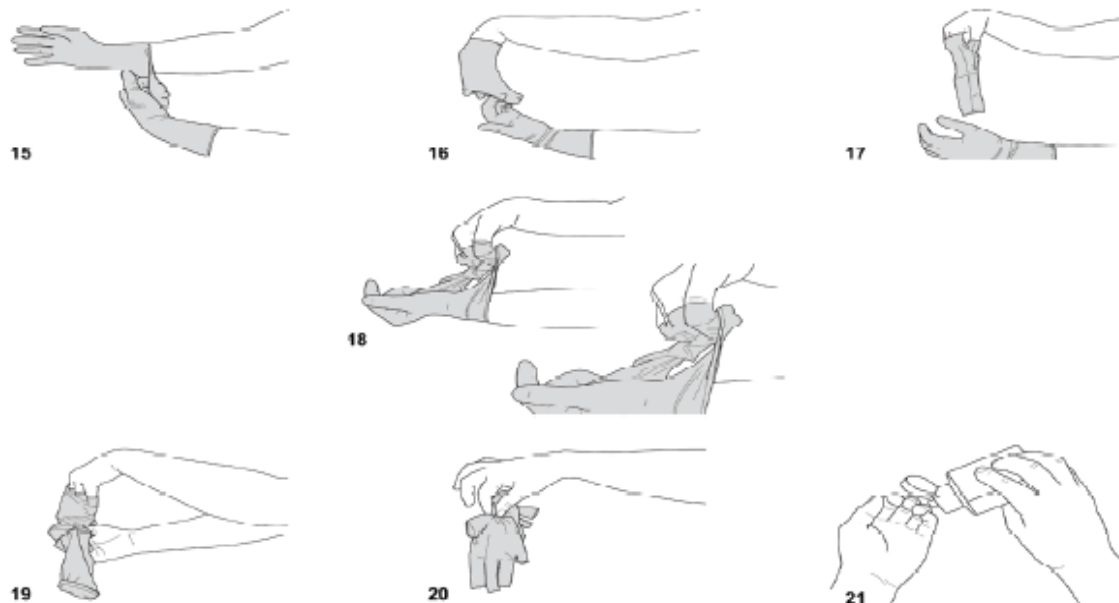
4. Then, perform hand hygiene by rubbing with an alcohol-based handrub or by washing with soap and water

Figure 4.4. How to don sterile gloves



1. Perform hand hygiene before an "aseptic procedure" by handrubbing or hand washing.
2. Check the package for integrity. Open the first non-sterile packaging by peeling it completely off the heat seal to expose the second sterile wrapper, but without touching it.
3. Place the second sterile package on a clean, dry surface without touching the surface. Open the package and fold it towards the bottom so as to unfold the paper and keep it open.
4. Using the thumb and index finger of one hand, carefully grasp the folded cuff edge of the glove.
5. Slip the other hand into the glove in a single movement, keeping the folded cuff at the wrist level.
- 6-7. Pick up the second glove by sliding the fingers of the gloved hand underneath the cuff of the glove.
- 8-10. In a single movement, slip the second glove on to the ungloved hand while avoiding any contact/resting of the gloved hand on surfaces other than the glove to be donned (contact/resting constitutes a lack of asepsis and requires a change of glove).
11. If necessary, after donning both gloves, adjust the fingers and interdigital spaces until the gloves fit comfortably.
- 12-13. Unfold the cuff of the first gloved hand by gently slipping the fingers of the other hand inside the fold, making sure to avoid any contact with a surface other than the outer surface of the glove (lack of asepsis requiring a change of gloves).
14. The hands are gloved and must touch exclusively sterile devices or the previously-disinfected patient's body area.

Figure 4.5. How to remove sterile gloves



- 15-17. Remove the first glove by peeling it back with the fingers of the opposite hand. Remove the glove by rolling it inside out to the second finger joints (do not remove completely).
18. Remove the other glove by turning its outer edge on the fingers of the partially ungloved hand.
19. Remove the glove by turning it inside out entirely to ensure that the skin of the health-care worker is always and exclusively in contact with the inner surface of the glove.
20. Discard gloves.
21. Perform hand hygiene after glove removal according to the recommended indication.

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

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

When to Double Glove

Even the best-quality, new latex rubber surgical gloves may leak up to 4 percent of the time. Moreover, latex gloves, especially when exposed to fat in wounds, gradually become weaker and lose their integrity. Although double gloving is of little benefit in preventing blood exposure if needle-sticks or other injuries occur, it may decrease the risk of blood to hand contact.

Double gloving can be used during the following:

- Procedures that involve coming in contact with large amounts of blood or other body fluids (e.g., vaginal deliveries and cesarean sections)
- Orthopedic procedures in which sharp bone fragments, wire sutures, and other sharps are likely to be encountered
- Surgical procedures lasting more than 30 minutes

When to Use Elbow-Length Gloves

Elbow-length gloves should be used during vaginal deliveries and cesarean sections when the chance of coming in contact with blood is 25 percent and 35 percent, respectively. Elbow-length gloves are also recommended while performing procedures like manual removal of placenta and any other procedure where there is a contact with a large volume of blood or body fluids. They provide protection of the hand including the forearm(s).

When ready-made, elbow-length gloves are not available, an effective alternative can be easily made from previously used surgical latex gloves that have been reprocessed (decontaminated, cleaned, and dried, and either sterilized or high-level disinfected).

The steps for making elbow-length gloves are as follows (Figure 4.6):

1. Cut one finger (one or more fingers depending on the size of your hands) completely off each glove just below where all the fingers join the gloves.
2. Sterilize or HLD two or three pairs of cut-off (fingerless) gloves according to the recommended process for each method, and store the gloves after final processing in a sterile or high-level disinfected container until needed (FMOH, *Infection Prevention and Patient Safety Reference Manual for Service Providers and Managers in Health Care Facilities of Ethiopia*, February 2011)

How to Use Elbow-Length Gloves

- Perform surgical hand scrub.
- Put intact sterile gloves on both hands so that the distal end of the fingerless gloves is completely covered.
- Put on fingerless sterile gloves and pull up to the forearms.

Figure 4.6. How to make and use elbow-length gloves

1



2



3



4



Some Dos and Don'ts Regarding Gloves

☒ Do

- Wear the correct size gloves, particularly for surgical gloves. A poorly fitting glove can limit your ability to perform the task and may get damaged easily.
- Change surgical gloves periodically (every 45 minutes) during long cases because the protective effect of latex gloves decreases with time and unapparent tears may occur.
- Keep fingernails trimmed moderately short (less than 3 mm beyond the fingertip) to reduce the risk of tears.
- Pull gloves up over cuffs of gown (if worn) to protect the wrists.
- Use water-soluble hand lotions and moisturizers often to prevent hands from drying and cracking due to frequent hand washing and gloving.

☒ Don't

- Use oil-based hand lotions or creams because they will damage latex surgical and examination gloves.
- Use latex gloves if you or the patient has an allergy to latex.
- Store gloves in areas where there are extremes of temperature (e.g., direct sunlight; near the heater, air conditioner, ultraviolet light, or x-ray machine). These conditions may damage the gloves (cause breakdown of the material they are made of), thus reducing their effectiveness as a barrier.
- Reprocess gloves that are cracked or have detectable holes/tears (FMOH, *Infection Prevention and Patient Safety Reference Manual for Service Providers and Managers in Health Care Facilities of Ethiopia*, February 2011).
- Reprocess examination gloves for reuse (FMOH, *Infection Prevention and Patient Safety Reference Manual for Service Providers and Managers in Health Care Facilities of Ethiopia*, February 2011).

Module 5: Safe Injection Practices

Module Objective

- ❖ To enable participants to understand the basic concepts of safe injection and the risk and impact of unsafe injections.

Learning Objectives

By the end of this module, participants will be able to:

- Define injection safety and related terms.
- Describe the magnitude of unsafe injection.
- Identify risks factors leading to unsafe injection.
- Recognize the risks and impact associated with unsafe injection practices.
- Identify the role of prescribers and providers in injection safety.
- Mention injection devices and their safety features.
- Demonstrate best practices for safe injection.

Module Content

Handout 5.1: Introduction to Injection Safety and Magnitude of Unsafe Injections

Handout 5.2: Risks and Impact of Unsafe Injection Practices

Handout 5.3: The Role of Prescribers and Providers in Injection Safety

Handout 5.4: Injection and Safety Devices

Handout 5.5: Safe Injection Administration and Best Practice for Safe Injections

Handout 5.1: Introduction to Injection Safety and Magnitude of Unsafe Injections

Definitions

- **Safe Injection:** An injection that is given using appropriate equipment and that does not harm the recipient, does not expose the provider to any avoidable risk, and does not result in any waste that is dangerous.
- **Unsafe injection:** A practice that could harm the recipient, the provider, or the community and/or may result in waste that is dangerous.

- **Needle-stick 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.
- **Auto-disable syringe:** A specially modified plastic syringe with a fixed needle that is automatically disabled after a single use.
- **Safety device:** A nonneedle 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 (Occupational Safety and Health Administration). Safety devices include:
 1. Safety boxes
 2. Waste bins
 3. Bin lines
- **Safety (sharps) box:** A puncture/leak-proof container designed to hold used sharps safely during collection, disposal, and destruction.

Magnitude of unsafe injection practice:

- Sixteen billion injections are given each year in developing and transitional countries.
- Of those, 90 to 95 percent are therapeutic, and 5 to 10 percent are given for immunization.
- Seventy percent of these injections are unnecessary; oral medications could have been prescribed (WHO 2006).

According to a recent injection safety survey in four regions (Making Medical Injections Safer 2006):

- Four percent of injection providers reported reuse of syringes and needles within six months prior to the survey.
- Six percent of injection providers reported to have needle-stick injury within six months prior to the survey.
- Forty-seven percent of the patients preferred to take injections.
- Twenty-five percent of injection providers believed that oral medications are less effective than injections for the treatment of fever caused by minor illness.

Handout 5.2: Risks and Impact of Unsafe Injection Practices

The risks of unsafe injection practices have been well documented for the three primary blood-borne pathogens: HIV, HBV, and HCV.

These blood-borne pathogens also contribute to illness among health workers:

- Each day, thousands of people around the world experience accidental exposure to blood and other body fluids or tissues while performing their work duties. Health care workers are especially vulnerable. The risk of acquiring HIV is approximately 0.09 percent after a mucous membrane exposure to blood and is approximately 0.3% after a percutaneous exposure (Cardo et al. 1997). The risk of acquiring HIV percutaneously is associated with deeper injuries, visibly bloody devices, and more advanced disease (likely due to a higher viral load) in the source patient. Hollow-bore needle exposures have higher risk of transmission than solid-bore needle exposures.
- Among susceptible health workers who do not receive post-exposure prophylaxis (PEP), the risk of infection after needle-stick injury is 23 to 62 percent for HBV and 0 to 7 percent for HCV (Werner and Grady 1982).
- Infections may also be transmitted (to other health workers and to patients) from cross-contamination of health workers' hands, medications, medical equipment and devices, or environmental surfaces. Thus, proper injection techniques and procedures contribute to the safety of both patients and health workers.

Risks associated with unsafe injection practices include the following:

- Transmission of infections
- Paralysis: Injection of a drug into a nerve can lead to damage to the nerve. This can result in weakness of the limb (lameness).
- Drug reactions: Abnormal response of the body to a drug. The most life threatening is anaphylaxis (sudden collapse of the circulatory system as a result of immunological response to the injected drug).
- Abscesses
- Trauma
- Death
- Litigation

Risk groups:

- Patients/clients
- Health care workers
- Health care waste management personnel
- Communities

Table 5.1. Conditions causing risk to health care workers, patients/clients, and the community

Community	Patients/Clients	Health Care Workers
<ul style="list-style-type: none"> • Unsafe waste disposal system in health facilities • Receiving injections from informal injectors • Sharps left in place that is accessible to the public, especially children • Sharing needles and syringes • Reusing needles and syringes 	<ul style="list-style-type: none"> • Use of injections when there are other suitable alternatives • Applying pressure to bleeding sites with dirty material or finger • Drug administered at incorrect anatomical site; for example: infants vaccinated at the buttocks rather than anterolateral thigh • Giving large boluses of intramuscular injections • Injecting a nerve • Use of new syringes and needles but from damaged or compromised packaging • Reuse of syringes and needles • Use of opened multi-use vials stored beyond recommended time • Needle left in the septum of a multi-dose vial (contaminated drug use) • Using wrong diluents or wrong amount • Use of expired drugs • Syringes loaded with different medications 	<ul style="list-style-type: none"> • Shortage or absence of appropriate injection and safety devices • Carrying or handling used needles before disposal • Placing needle on a surface prior to disposal • Recapping needles (either one or two handed) • Manually detaching needles from syringes • Manipulating used sharps (cleaning, bending, breaking, or cutting hypodermic needles) • Passing on sharps from one health worker to another • Sharps found in unexpected places like linen • Used sharps disposed of in any container besides a safety (sharps) box • Overfilling of sharps containers • Using a syringe on an agitated patient without assistant, or patient/client

	<ul style="list-style-type: none"> • Loading syringe with multiple doses • Drugs and vaccines stored in the same refrigerator • Accidental switching of drugs • Health workers not following aseptic techniques • Patient/client moves during administration of injection • Sharps found in unexpected places like linen • Self-medication • Unsafe waste disposal system in health facilities • Sharps left in place that is accessible to the public 	<p>moves during administration of injection</p> <ul style="list-style-type: none"> • Unsafe waste disposal system in health facilities • Sharps left in place that is accessible to health workers
--	---	--

Impact of Unsafe Injections

Unsafe injections impact on health, psychosocial status, and the economy.

Health Impact

The estimated global burden of disease for the year 2000 from unsafe injection practices for these pathogens included (WHO 2010):

- Twenty-one million HBV infections (32 percent of new HBV infections)
- Two million HCV infections (40 percent of new HCV infections)
- 260,000 HIV infections (5 percent of new HIV infections)

Psychosocial Impact

Psychosocial impact can be seen at individual, family, community, and country levels.

Individual and family:

- Stigma, discrimination, and social isolation following infections like HIV

- Stress associated with HIV
- Burden on family and the community (decrease in productivity, orphaned children)
- Risk of transmitting infections to family and the community

Community and country:

- Loss of productive population
- High rate of dependency
- Increased transmission of diseases in the population
- Deepening poverty

Economic Impact

- Each year, unsafe injection results in a significant effect on a national economy.
- The economic impact can be seen as direct and indirect.

Direct costs:

- Examples of direct cost include the following:
 - Cost of baseline and follow-up laboratory testing of an exposed health care worker and testing the source patient
 - Cost of PEP and other treatment that might be given
- If there are complications, such as side effects from PEP, there will be additional costs to manage needle-stick injuries.
- Investigation and treatment cost of unsafe injection

Indirect costs:

- Whenever a sharps injury occurs, there are significant opportunity costs to consider. Time and wages normally associated with assigned responsibilities are diverted to receiving or providing exposure-related care. These are indirect costs and include:
 - Lost productivity associated with the time required for reporting and receiving initial and follow-up treatment for the exposure
 - If infection develops, the lost productivity would be worse (disability, death, dependents will be endangered, etc.). Moreover, the acquired

infection (e.g., HIV, HBV) would be taken home, and the risk of transmission to the community would increase.

- Health care provider time to evaluate and treat an employee
- Health care provider time to evaluate and test the source patient, including obtaining informed consent for testing

Handout 5.3: The Role of Prescribers and Providers in Injection Safety

Eliminating unnecessary injections represents one of the highest priorities to injection safety. Therefore, if an oral alternative is available, injections should only be used in:

- Life-threatening conditions
- Malabsorption syndromes
- Occurrences of inability to swallow

Prescribers and service providers should also:

- Encourage patients to accept oral medications when possible. Injections should be given only when necessary.
- Explain the risks associated with injections.
- Explain to patients the need to take oral drugs as prescribed and review these instructions with them.
- Inform patients about the potential side effects of medications that are being prescribed.
- Explore why patients prefer injections.

Handout 5.4: Injection and Safety Devices

Safety devices: are devices that are used to protect patients/clients, health workers, and the community from the risks of health care wastes.

Safety devices include:

- A. Safety boxes
- B. Waste bins
- C. Bin liners

Table 5.2. Description of safety devices and their advantages and disadvantages

Safety Device	How to Use Device	What Goes in a Safety Box	What Should Not Go in a Safety Box
Safety boxes	<ul style="list-style-type: none">• There are instructions on the box on how to assemble it.• Safety boxes should be filled until they are three-quarters full and then destroyed immediately.• Do not force too many syringes into an already three-quarters filled safety box.• Put the safety boxes on the working table and within arm's reach of where the injection is given to avoid walking while carrying needles.	<p>The list includes (but is not limited to):</p> <ul style="list-style-type: none">• Disposable syringes• Needles• Needles from intravenous bags• Lancets	<p>The following materials should not go in a safety box:</p> <ul style="list-style-type: none">• Latex gloves• Intravenous bags or extension tubes• Dressing materials (like adhesive tape and gauze)• Compresses• Cotton pads• Empty vials and ampoules• Broken thermometers
Safety Device	Characteristics	Advantages	Disadvantages
Waste bins	<ul style="list-style-type: none">• Used for segregating different categories of health care waste	<ul style="list-style-type: none">• Contains the waste• Used for interim storage of health care waste and nonsharp materials• Can be reused• Can be color coded	<ul style="list-style-type: none">• Separate bin needed in each treatment area for each type of waste• Attractive for other uses
Bin liner	Use: Separates waste	<ul style="list-style-type: none">• Helps to identify	<ul style="list-style-type: none">• Not biodegradable

	<p>categories according to risk</p> <p>Color-coded plastic bags for lining waste bins:</p> <p>Black color code – Noninfectious (general) waste such as paper, packaging materials, bottles, food</p> <p>Yellow color code – Infectious waste such as gauze, dressing, gloves</p> <p>Red color code – Highly infectious waste such as anatomical parts, blood, and other very infectious waste</p>	<p>easily the degree of risk of waste</p> <ul style="list-style-type: none"> Contains waste and fluid and keeps it away from people and the environment 	<ul style="list-style-type: none"> Not puncture resistant Requires resupply
--	--	--	---

Table 5.3. Types of injection devices and their advantages and disadvantages

Type of Injection Device	Advantages	Disadvantages
Auto-disable syringes	<ul style="list-style-type: none"> Cannot be reused Eliminate cross-infection among patients 	<ul style="list-style-type: none"> More expensive than standard disposable Have no safety (needle-stick prevention) features Need collection and disposal system
Manually retractable	<ul style="list-style-type: none"> Cannot be reused Safety feature: needle retracts inside barrel (needle-stick prevention) Eliminates cross-infection among patients because cannot be reused 	<ul style="list-style-type: none"> Not automatic Relies on goodwill of health workers High cost Needs collection and disposal system
Automatically retractable	<ul style="list-style-type: none"> Cannot be reused Automatic safety feature: needle retracts inside barrel (needle-stick prevention) Eliminates cross-infection among patients because cannot be reused 	<ul style="list-style-type: none"> Most expensive Needs collection and disposal system

Standard disposable	<ul style="list-style-type: none"> • Less expensive • Available on local market • Eliminates cross-infection among patients 	<ul style="list-style-type: none"> • If reused, can transmit blood-borne pathogens. Never reuse disposable syringes; they are only designed to be used once. • Has no reuse prevention or safety features • Needs sharps safety box or needle remover • Carries a high risk of infection if not used or disposed of properly • Needs collection and disposal system
---------------------	--	--

Handout 5.5: Safe Injection Administration and Best Practice for Safe Injection

Table 5.4. The right way to give safe injection

The Rights	Standards (Always Check and Verify All “Rights”)	Method of Verification	Verified By:
Right patient	<ul style="list-style-type: none"> • What is the name on the prescription? • Is this the right patient? 	<ul style="list-style-type: none"> • Ask patient/guardian. 	Injection provider
Right drug	<ul style="list-style-type: none"> • Is the name of the drug on the prescription the same as the injection you are about to administer? 	<ul style="list-style-type: none"> • Verify name of drug on prescription with injection to be administered. • If you are unsure, verify with physician or pharmacist. 	Injection provider
Right formulation	<ul style="list-style-type: none"> • Could the medication be given orally instead of as an injection? 	<ul style="list-style-type: none"> • Discuss with patient available choices. 	Injection prescriber
Right injection equipment	<ul style="list-style-type: none"> • Use only new sterile non-reusable syringes. 	<ul style="list-style-type: none"> • Check to ensure that syringe/needle package is unbroken. 	Injection provider

Right dosage	<ul style="list-style-type: none"> • Check drug dosage against patient's age and weight. 	<ul style="list-style-type: none"> • Read the pharmaceutical recommendations of the drug. • If unsure, verify with the physician/prescriber. 	Injection prescriber and injection provider
Right time	<ul style="list-style-type: none"> • Follow specific dose interval. 	<ul style="list-style-type: none"> • Be mindful of the action of the drug and why the time interval should be followed. • Explain the importance of this to the patient. 	Injection prescriber and injection provider
Right route	<ul style="list-style-type: none"> • Use the correct route. 	<ul style="list-style-type: none"> • Observe the directions of the prescriber. • Check prescription or other related records. 	Injection provider
Right storage	<ul style="list-style-type: none"> • Right temperature; vaccine vial monitor shake test. 	<ul style="list-style-type: none"> • Check cold chain issues including vaccine vial monitor. 	Pharmacy, health care worker, and injection provider
Right method of disposal	<ul style="list-style-type: none"> • Do not recap needle. • Dispose of used syringe and needle immediately after use in appropriate safety box. 	<ul style="list-style-type: none"> • Check the safety box for correct method of disposal. 	Injection provider

Best Practices for Administering Injections

- Select safe medicines:
 - Handle medicines properly, including keeping them in a clean environment.
 - Label clearly.
 - Observe proper storage conditions, including temperature and humidity (as recommended by manufacturer).
 - Check expiry dates.
- Use of new, sterile equipment:
 - Use new, sterile, standard disposable or safety syringe from sealed package.
 - Verify the integrity of the disposable or safety syringe and needle package. Do not use a syringe or needle coming from a damaged package or exposed to humidity or water. Open the package in front of the patient.
 - Use syringes with reuse prevention features.
- Avoid contamination (observe aseptic technique):
 - Wash hands.
 - Prepare on clean surface.
 - Do not touch part of needle that will come in contact with patient's tissue.
 - Do not leave the needle in the rubber cap of the vial.
- Reconstitute drugs or vaccines safely:
 - Use new sterile syringe and needle for each reconstitution.
 - Use the correct diluents/water for injection.
 - Reconstitute according to the manufacturers' specifications.
- Dispose of injection wastes and sharps properly:
 - Immediately dispose of needle and syringe in puncture- and leak-proof container after injection. Do not recap before disposal. Do not carry used sharps around or set them down anywhere before putting them in the safety (sharps) box.
 - Place safety (sharps) boxes at the point of use, within arm's reach of the provider.
 - Do not use safety (sharps) boxes that are open, overflowing, or punctured. Get a new one.

- Seal safety (sharps) box if it is three-quarters full.
- Store full safety (sharps) boxes awaiting final disposal in a secure area that is inaccessible to the general public.
- Disseminate public health information:
 - Educate patients on risks of contracting diseases like AIDS, HBV, and HCV from reused injection equipment. Patients should always insist on having a new, unopened package with a disposable needle and syringe whenever they get an injection.
 - Encourage patients to accept oral medications when possible. Injections should be given only when necessary. Explain to patients the need to take oral drugs as prescribed. Explain to patients that oral medications are just as effective as injectable medications.
 - Educate patients on the potential side effects of medications you are giving them.

Module 6: Surgical Antisepsis

Module Objective

- ❖ To help participants understand how to select and use appropriate antisepsis in the prevention of surgical wound infections.

Learning Objectives

By the end of this module, participants will be able to:

- Define surgical antisepsis and disinfectants.
- Define wound infection.
- List common causes of wound infection.
- Identify the safest and most effective antiseptics.
- Select and use the appropriate antiseptics for skin and mucus preparation.
- Explain the appropriate way to store and dispense antiseptics.

Module Content

Handout 6.1: Defining Antiseptics and Identifying Appropriate Antiseptics

Handout 6.2: Wound Infections

Handout 6.3: Use of Antiseptics for Surgical Antisepsis

Handout 6.4: Appropriate Storage and Dispensing of Antiseptics

Handout 6.1: Defining Antiseptics and Identifying Appropriate Antiseptics

Definitions

- **Antiseptic and antimicrobial agents** (terms used interchangeably): are chemicals that are applied to the skin or other living tissue to inhibit or kill microorganisms (both transient and resident), thereby reducing the total bacterial load. Examples include alcohols (ethyl and isopropyl), iodine solutions, iodophors, chlorhexidine, and triclosan.
- **Antisepsis:** is a process of reducing the number of microorganisms on skin, mucous membranes, or other body tissue by applying an antimicrobial (antiseptic) agent.

- **Organ/space surgical site infection (SSI):** is an infection of any part of the body other than the incised body wall parts that were opened or handled during an operation.
- **SSIs:** are incisional or organ/space infections occurring within 30 days after an operation or within one year if an implant is present. Incision SSIs are further divided into superficial incisional (only involves skin and subcutaneous tissue) and deep incisional (involves deeper soft tissue, including fascia and muscle layers).
- **Disinfectants:** are chemicals that destroy or inactivate microorganisms on inanimate objects, such as instruments or surfaces.

Commonly Used Antiseptics

Many chemicals qualify as antiseptics. The following are recommended antiseptic solutions generally available in many parts of the world:

- Alcohols: 60 to 90 percent (ethyl, isopropyl, or “methylated spirit”)
- Chlorhexidine gluconate (CHG; 2 to 4 percent)
- CHG and cetrimide; various concentrations at least 2 percent (e.g., Savlon)
- Three percent iodine; aqueous iodine and alcohol-containing (tincture of iodine) products
- Iodophors: 7.5 to 10 percent
- Chloroxylenol 0.5 to 4 percent (para-chloro-metaxylenol [PCMX]) various concentrations (e.g., Dettol)
- Triclosan: 0.2 to 2 percent

Advantages and Limitations of Commonly Used Antiseptics

Alcohol Solutions (Ethyl or Isopropyl)

Ethyl and isopropyl alcohol (60 to 90 percent) are excellent antiseptics that are commonly available and inexpensive. They should not be used on mucous membranes (e.g., for vaginal preparation) because alcohols dry and irritate mucous membranes, which, in turn, promotes the growth of microorganisms.

Alcohols are among the safest known antiseptics. A 60 to 70 percent solution of ethyl or isopropyl alcohol is effective, less drying to the skin, and less expensive than higher concentrations.

Advantages

- Rapidly kill all fungi and bacteria including mycobacteria; isopropyl alcohol kills most viruses, including HBV, HCV, and HIV; ethyl alcohol kills all viruses.
- Although alcohols have no persistent killing effect, the rapid reduction of microorganisms on skin protects against regrowth of organisms, even under gloves, for several hours.
- They are relatively inexpensive and widely available throughout the world.

Limitations

- Need emollient (e.g., glycerin or propylene glycol) to prevent drying of skin (ethyl alcohol may be less drying than isopropyl)
- Easily inactivated by organic materials
- Flammable (requires storage in cool, well-ventilated areas)
- Will damage rubber (latex) over time
- Not good cleaning agents

Chlorhexidine Gluconate (CHG)

CHG is an excellent antiseptic. Two to four percent CHG is the recommended concentration.

Advantages

- Broad spectrum of antimicrobial action
- Persistent action on skin (chemically active for at least six hours)
- Chemical protection (the number of microorganisms inhibited) increases with repeated use
- Minimally affected by organic material
- Several products available commercially; most common is in detergent base or as a waterless, alcohol-based antiseptic hand rub

Limitations

- Expensive and not always available

- Action reduced or neutralized by natural soaps, substances present in hard tap water, and some hand creams
- Not effective against tubercle bacillus; only fairly active against fungi
- Cannot be used above pH of 8 because it decomposes
- Avoid contact with eyes as it can cause conjunctivitis

Iodine and Iodophor Solutions

Three percent iodine solutions are effective antiseptics and are available as both aqueous (Lugol) and tincture (iodine in 70 percent alcohol) solutions. Seven and a half to ten percent iodophors are solutions of iodine mixed with a carrier, a complexing agent such as polyvinylpyrrolidone (povidone) that releases small amounts of iodine.

Iodophors have a broad spectrum of activity. They kill vegetative bacteria, mycobacteria, viruses, and fungi; however, they require up to two minutes of contact time to release free iodine, which is the active chemical. Once released, the free iodine has rapid killing action. In addition, iodophors generally are nontoxic and nonirritating to skin and mucous membranes unless the person is allergic to iodine (Larson 1995).

Advantages

- They have a broad spectrum of antimicrobial action.
- Aqueous iodine preparations are inexpensive, effective, and widely available.
- Iodophors are nonirritating to skin or mucous membranes (unless the person is allergic to iodine), making them ideal for vaginal use (e.g., before intrauterine device insertion).
- Up to 3 percent aqueous solutions do not stain skin.

Limitations

- They have slow to intermediate antimicrobial action.
- Iodophors have little residual effect.

- Like alcohols, iodine and iodophors are rapidly inactivated by organic materials, such as blood or sputum.
- Tincture or aqueous iodine may cause skin irritation and staining and must be removed from skin after drying (use alcohol to remove the stain).
- Absorption of free iodine through skin and mucous membranes may cause hypothyroidism in newborn infants, so use should be limited.
- Allergic reactions to iodine and iodophors can occur, so check patient for history of allergy.
- Iodine (aqueous or tincture) must never be used on mucous membranes because of its rapid absorption and irritation to the epithelium.

Chloroxylenol

Chloroxylenol (PCMX) is a halogenated derivative of xylene that is widely available in concentrations of 0.5 to 4 percent. Chloroxylenol destroys microorganisms by breaking down the cell wall. It has low germicidal activity (Favero 1985) compared with alcohols, iodine, and iodophors and is less effective in decreasing skin flora than either CHG or iodophors (Sheena and Stiles 1982).

Advantages

- Broad spectrum of activity
- Only minimally affected by organic materials
- Residual effect persists for several hours
- Minimally affected by organic matter

Limitations

- Inactivated by soaps (nonionic surfactants), making it less useful for skin preparation
- Should not be used on newborns due to rapid absorption and potential toxicity

Triclosan

Triclosan is a colorless substance that has been incorporated into soaps as an antimicrobial agent. Concentrations from 0.2 to 2.0 percent have moderate antimicrobial activity against gram-positive cocci, mycobacteria, and yeast but not gram-negative bacilli, especially *Pseudomonas aeruginosa* (Larson 1995).

Advantages

- Broad spectrum of activity
- Excellent persistence
- Minimally affected by organic matter

Limitations

- Not effective against *P. aeruginosa* or other gram-negative bacilli
- Bacteriostatic (only inhibits growth)

In choosing an antiseptic, the desired characteristics to consider are:

- Absorption and persistence of the antiseptics
- Safety and efficacy
- Acceptability to staff and clients
- Cost

Handout 6.2: Wound Infections

- Surgical site infections (SSIs) remain a major cause of nosocomial (health care–associated) infections, and rates are increasing globally (Alvarado 2000).
- In countries where resources are limited, even basic life-saving operations, such as appendectomies and cesarean sections, are associated with high infection rates and mortality.
- Postoperative wound infection remains a leading cause of health care–associated infections, especially in developing countries.
- The majority of postoperative infections are caused by microorganisms normally found on the patient’s skin or from mucous membranes adjacent to the surgical site, and less often from other sites or from surgeons or the assistants.
- Organisms associated with SSIs vary with the type of procedure and the anatomic location of the operation. *Staphylococcus aureus* (coagulase-negative staphylococci), *Enterococcus* species, and *Escherichia coli* are the three most frequently isolated pathogens.

- Infections caused by antimicrobial-resistant pathogens and fungal SSIs have increased significantly in the last decade in part because of the dramatic increase in the number of patients with HIV.
- For most SSIs, the source of the pathogen(s) comes from the patient's skin, mucous membranes, or bowel, and rarely from another infected site in the body (endogenous sources).
- Exogenous sources of SSI pathogens are occasionally responsible. These include:
 - Organisms from members of the surgical team (e.g., hands, nose, or other body parts)
 - Contaminated surfaces in the operating room, even the air
 - Contaminated instruments, surgical gloves, or other items used in the surgery
- Exogenous organisms are primarily aerobic staphylococci or streptococci species (with the exception of tetanus endospores). Although fungi are widely present in the environment, they rarely cause SSIs.

Table 6.1. Patient and operative characteristics that may increase the risk of surgical site infections

Patient

- Malnutrition
- Diabetes (uncontrolled) and presence of other chronic diseases
- Smoking or use of other tobacco products (should be stopped at least 30 days before elective surgery)
- Obesity
- Age
- Coexistent infections at a remote body site
- Colonization with microorganisms
- Immunodeficiency (HIV or chronic corticosteroid use)
- Length of preoperative stay

Operation

- Preoperative shaving of the operation site
- Increased length of surgical procedure (estimated that infection rate nearly doubles with each hour of surgery)
- Antimicrobial prophylaxis
- Poor operating room ventilation
- Inadequate instrument processing (cleaning, HLD, or sterilization)
- Foreign material in the surgical site
- Inadequate surgical drains
- Prolonged preoperative hospitalization
- Surgical technique
 - Poor hemostasis
 - Failure to obliterate dead space
 - Tissue trauma

Adapted from: Society for Healthcare Epidemiology of America, Association for Professionals in Infection Control and Epidemiology, Inc., Centers for Disease Control and Prevention, and Surgical Infection Society, 1990.

Handout 6.3: Use of Antiseptics for Surgical Antisepsis

Selection of antimicrobial agents for skin preparation is based on:

- Patient sensitivity (history of allergy)
- Skin condition at operative site (wound, etc.)
- Site of the operation (e.g., mucous membrane)

Skin preparation for intravenous line:

- Wash hands with soap and clean water or use an alcohol-based hand rub if hands are not visibly dirty.
- Open the infusion set using aseptic technique (do not touch ends of the tubing).
- Put clean examination gloves on both hands.
- Clean insertion site with antiseptic solution (alcohol, chlorhexidine, or iodophor) in using a circular motion outward from insertion site.
- Place sterile gauze (2 × 2 cm) over the venipuncture.
- Place any blood-contaminated waste into the yellow or infectious waste bin before removing gloves.

Skin Preparation Prior to Surgical Procedures

Applying an antiseptic solution minimizes the number of microorganisms around the surgical wound that may contaminate and cause infection.

Instructions

- **Step 1: Do not shave hair** around the operative site. Shaving increases the risk of infection 5- to 10-fold because the tiny nicks in the skin provide an ideal setting for microorganisms to grow and multiply (Nichols 1991; Seropian and Reynolds 1971). If hair must be cut, trim the hair close to the skin surface with scissors immediately before surgery.
- **Step 2:** Ask the patient about **allergic reactions** (e.g., to iodine preparations) before selecting an antiseptic solution.

- **Step 3:** If the skin or external genital area is visibly soiled, gently wash with soap and clean water and dry the area before applying the antiseptic.

Select the antiseptic solution from the following recommended products:

- Alcohols (60 to 90 percent ethyl, isopropyl, or “methylated spirit”)
- CHG: 2 to 4 percent
- CHG and cetrimide, various concentrations at least 2 percent (e.g., Savlon)
- Three percent iodine; aqueous iodine and alcohol-containing (tincture of iodine) products
- Iodophors: 7.5 to 10 percent, various concentrations
- Chloroxylenol: 0.5 to 4 percent (PCMX) various concentrations (e.g., Dettol).
- **Step 4:** Using dry, high-level disinfected forceps and new cotton or gauze squares soaked in antiseptic, thoroughly cleanse the skin. Work from the operative site outward for several centimeters. (A circular motion from the center out helps to prevent recontamination of the operative site with local skin bacteria.) Do not allow the antiseptic to pool underneath the client’s body; this can irritate or burn the skin.
- **Step 5:** Allow the antiseptic enough time to be effective before beginning the procedure. For example, when an iodophor is used, allow two minutes or wait until the skin is visibly dry before proceeding because free iodine, the active agent, is only released slowly. Generally, always allow the antiseptic enough time to dry.

Skin Preparation for Injections

- According to the WHO and its Safe Injection Global Network, “swabbing of clean skin with an antiseptic solution prior to giving an injection is unnecessary,” because evidence has shown it does not affect the risk of infection.
- Wiping the skin with an antiseptic before giving an intradermal, subcutaneous, or intramuscular injection does not reduced the risk of infection (Hutin et al. 2001).
- If the injection site is visibly soiled, wash the site with soap and water and dry with a clean towel, and then give the injection.

Patients receiving injections regularly (e.g., using Depo-Provera for contraception) should be taught to wash the injection site (arm or buttocks) with soap and clean water just prior to coming to the clinic or receiving the injection in their home.

Instructions for Cervical or Vaginal Preparation

For cervical and vaginal antisepsis, prior to inserting a uterine elevator for mini-laparotomy or doing an endometrial biopsy, select an aqueous (water-based) antiseptic such as an iodophor (povidone-iodine) or 2 to 4 percent CHG (e.g., Savlon when properly prepared). Do not use alcohols or alcohol-containing preparations, such as Dettol. Alcohols burn, and they also dry and irritate mucous membranes, which in turn promotes the growth of microorganisms. In addition, hexachlorophene is neurotoxic (Larson 1988) and should not be used on mucous membranes, such as the vaginal mucosa, because it is readily absorbed (Larson 1995).

- **Step 1:** Ask the patient about **allergic reactions** (e.g., to iodine preparations) before selecting an antiseptic solution.
- **Step 2:** If the external genital area is visibly soiled, gently wash with soap and clean water and dry the area before applying the antiseptic.

Step 3: After inserting the speculum, apply antiseptic solution liberally to the cervix and vagina (twice). It is not necessary to clean the external genital area with antiseptic solution if it appears clean.

- **Step 4:** If an iodophor is used, allow time (two minutes) before proceeding.

Handout 6.4: Appropriate Storage and Dispensing of Antiseptics

- All antiseptics can become contaminated by microorganisms that can then cause subsequent infection when used for hand washing or skin preparation.
- The following can prevent contamination of antiseptic solutions:
 - Use antiseptics in small quantities. If antiseptics are provided in large containers, pour a small quantity at a time into a reusable container for daily use.

- Establish a routine schedule for preparing new solutions and cleaning reusable containers. (Solutions are at increased risk of becoming contaminated after one week of storage.) Do not “top off” antiseptic dispensers.
- Make sure the correct name of the solution is on the container (labeled correctly) each time you refill it. Reusable containers should also be labeled with the date each time they are washed, dried, and refilled.
- Never soak and store gauze or cotton wool in any antiseptic because this promotes contamination.
- Wash reusable antiseptic containers thoroughly with soap and clean water, rinse with boiled water if available, and drip dry before refilling
- 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).
- Always follow the manufacturer’s instructions for diluting an antiseptic solution.

Module 7: Safe Surgery and Safe Practice in the Operating Room

Module Objective

- ❖ To help participants understand the recommended practices in the operating room in order to prevent potential risks of infection for patients and health care workers.

Learning Objectives

By the end of this module, participants will be able to:

- Identify the risks of working in the operating room (OR).
- Identify which instruments cause the most injuries.
- Explain how to prevent injuries from sharps.
- Identify strategies to design safer surgical procedures.
- Describe surgical care standards.
- Appropriately use the WHO Surgical Safety Checklist.

Module Content

Handout 7.1: Risks and Safe Practices in the Operating Room

Handout 7.2: Safe Surgical Care Standards

Handout 7.1: Risks and Safe Practices in the Operating Room

Safe Practices in the Operating Room

Safety in the surgical unit, whether it is located in a large specialty hospital or freestanding primary health care clinic, has not kept pace with the urgent need for prevention strategies. Preventing infections after an operation is a complex process that begins in the OR by preparing and maintaining a safe environment for performing the surgery. Surgical aseptic techniques are designed to create such an environment by controlling the four main sources of infectious organisms:

- The patient
- The surgical staff
- Equipment and instruments
- The OR environment

Although the patient is often the source of surgical infections, the other three sources are important and should not be overlooked.

Specific techniques required to establish and maintain surgical asepsis and make the surgical environment safer include the following:

- **Patient considerations:** Skin cleaning preoperatively, skin antisepsis, and wound covering
- **Surgical staff considerations:** Hand hygiene (hand washing and/or hand rub with waterless, alcohol-based antiseptic agents); use and removal of gloves and gowns
- **Equipment and room preparation considerations:** Traffic flow and activity patterns, as well as housekeeping practices and decontamination, cleaning, and either sterilization or HLD of instruments, gloves, and other items
- **Environmental considerations:** Maintaining an aseptic operating field and using safer operating practices and techniques

Risks in the Operating Room

- Staff usually use and pass instruments without looking or letting the other person know.
- Confined workplace; visibility in the room may be poor.

- Increased risk of injuries due to urgency, anxiety, stress, frustration, and anger.
- Exposure to blood without health worker knowledge during operation increases duration of contact with blood.
- Minor finger cuts and scratches increase the risk of transmission.
- Exposure to blood and other body fluids containing HIV, HBV, and HCV.
- Instruments that are designed to penetrate patients' tissue can just as easily injure the provider.
- Blood is almost everywhere, increasing the exposure to potentially infectious sources.

Instruments That Can Cause Injuries in the Operating Room

The vast majority of sharps injuries in hospitals occur in the OR, and most are due to scalpel and suture needle injuries. Many other items can also cause sharps injuries and glove tears resulting in exposure to blood. Some of the most important are:

- Hypodermic needles
- Wire sutures
- Laparoscopy and surgical drain trocars
- Orthopedic drill bits, screws, pins, wires, and saws
- Needlepoint cautery tips
- Skin hooks and towel clips
- Sharp-pointed scissors and sharp-tipped mosquito forceps
- Dissecting forceps
- Sharp-toothed tenaculi
- Broken medication ampoules
- Spinal needles
- Sharp bone edges and bone fragments.

When Do Injuries Occur?

Scalpel injuries most often occur when:

- Putting on and taking off the disposable blade
- Passing the scalpel hand to hand between team members
- Cutting (e.g., in using fingers to hold or spread tissue or cutting toward the fingers of the surgeon or assistant)

- Before and after using the scalpel: leaving it on the operative field, dropping it on your own or the assistant's foot, and reaching for scalpels sliding off the drapes
- Placing the scalpel in an overfilled sharps container or a poorly located container

Suture needle injuries most often occur when:

- Loading or repositioning the needle in the needle holder
- Passing the needle hand to hand between team members
- Suturing: using fingers to hold tissue or to guide the needle, sewing toward the surgeon or assistant, and holding back other tissues by the surgeon or assistant
- Tying with the needle still attached or left on the operative field
- Before and after using the needle: leaving it on the operative field, dropping it on your own or the assistant's foot, and reaching for suture needles or needles loaded in the needle holder sliding off the drapes
- Placing needles in an overfilled sharps container or a poorly located container

To prevent injuries:

- Use a small Mayo forceps (not fingers) when holding the scalpel blade, when putting it on, or when taking it off or when loading the suture needle. (Alternatively, use disposable scalpels with a permanent blade or scalpels with a retractable 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.
- Always remove sharps from the field immediately after use.
- Make sure that sharps containers are replaced when they are three-quarters full and place containers as close to where sharps are being used as conveniently possible (i.e., within arm's reach).

The “Hands-Free” Technique for Passing Surgical Instruments

- A safer method of passing sharp instruments (scalpels, suture needles, and sharp scissors) during surgery, called the “hands-free” technique, is recommended.
- This technique for sharps is inexpensive, simple to use, and ensures that the surgeon, assistant, or scrub nurse never touches the same instrument at the same time.

- Instruments passed with the hands-free technique (besides those listed earlier) include anything sharp enough to puncture a glove (e.g., trocars, sharp-tipped mosquito forceps, and loaded needle holders).
- Using the hands-free technique, the assistant or scrub nurse places a sterile or high-level disinfected kidney basin, or other suitable small container, on the operative field between him or herself and the surgeon.
- The container is designated as the safe or neutral zone in which sharps are placed before and immediately after use. Various items, such as basins, mats, or trays, including part of a sterile instrument stand or a designated area on the operative field, have been used as the safe zone.
- To maintain sharpness of scalpel blades, use a plastic container or place a sterile cloth in a metal container. For example, the assistant or scrub nurse alerts the surgeon that a sharp instrument has been placed in or on the safe zone, with the handle pointing toward the surgeon, by saying “scalpel” or “sharp” while placing it there. The surgeon then picks up the instrument and returns it to the container after use, this time with the handle pointing away from him or her.

Designing Safer Operations

Designing a safer operation may include:

- Brief preoperative discussion of how sharps will be handled by the surgeon, assistant, or scrub nurse.
- Surgical team discussion and review on how to make each step in the operation safer, from securing the towel drapes around the proposed incision with nonperforating towel clips to using blunt-tipped needles for closure of all layers except the skin (CDC 1997; Dauleh, Irving, and Townell 1994).
- The use of hand-held straight suture needles to close skin incisions is especially dangerous, with a higher injury rate than with curved needles carried in a needle holder. Anesthesiologists, radiologists, and others who close small incisions after placement of vascular catheters or cut-downs should be made aware of this hazard. Examples of instruments or devices that protect the surgical team without sacrificing patient safety or staff performance are shown in Table 7.1.
- The risk associated with assisting or being the scrub nurse in surgery may be reduced by anticipating (preferably knowing) the needs of the surgeon for each step of the

operation in advance. Where procedures are short, this can be accomplished by developing checklists that lay out each step (or task) in the operation or procedure in the sequence in which they usually will be performed. An additional advantage of this review is that it can help protect patients from injury or increased blood loss.

Table 7.1. Reducing the risk of exposure in the operating room

Function	Safer	Less Safe	Least Safe
Skin incision	Cautery	Disposable scalp	Scalpel with removable blade
Cutting	Scissors, blunt tip or cautery probe	Scissors, sharp tip	Scalpel
Hemostasis	Blunt suture needles, staples, or cautery	Sharp suture needles	Wire sutures
Sponging with gauze while using a scalpel	Surgeon does sponging; assistant only retracts	Assistant sponges but only by request	Assistant sponges spontaneously (no communication)
Retraction	Blunt retractor	Sharp retractor	Fingers or hands
Sharps transfer	Neutral zone	Hand to hand (communication)	Hand to hand (no communication)
Surgical gloves	Double gloving	Single pair of gloves or double gloving with reprocessed gloves	Single pair of reprocessed gloves
Closing peritoneum (small, 2- to 3-cm incision)	Do not close	Purse-string closure using tissue forceps to grasp needle	Purse-string closure using fingers to grasp needle

Blunt Needles for Suturing

The range of “bluntness” in commercially available blunt-tipped needles varies from minimally blunt (no extra effort needed to use them) to very blunt (does not penetrate tissue such as fascia and requires conscious effort). **Minimally blunt needles** can be used for closure of all layers from fascia to skin. **Intermediate blunt needles** require some additional conscious effort to close fascia, but are safer to use. **Very blunt needles** are seldom used except when operating deep in the pelvis where the needle absolutely must be retrieved with fingers. The technique for using blunt needles is as follows:

- **Step 1:** Use a strong needle holder and lock it fully.
- **Step 2:** Position the needle in the mid-curve, rather than three-quarters of the way back, to prevent slippage or bending the needle. (This usually is not necessary when using minimally blunt needles.)

- **Step 3:** Grasp and hold the tissue to be sutured with a tissue forceps to make it easier for the needle to go through the tissue being sutured. In general, the blunter the tip, the more important it is to follow these three steps.

Handout 7.2: Safe Surgical Care Standards

Safe surgery is surgery that does not harm and/or expose the patient and/or the provider to any avoidable risk.

The WHO Surgical Safety Checklist:

- Has improved compliance with standards and decreased complications from surgery. In sites that ranged from small district hospitals to large medical centers in diverse geographical settings, the use of a 19-item checklist reduced the complications and mortality associated with a variety of surgical procedures by greater than 30 percent.
- The effect of the checklist was of similar magnitude in both high- and low-/middle-income countries. The checklist has been designed to be simple to use and applicable in many settings (FMOH, *Infection Prevention and Patient Safety Reference Manual for Service Providers and Managers in Health Care Facilities of Ethiopia*, February 2011).
- The safe surgery checklist is now in use in Ethiopia in a few hospitals by a few surgeons. It is being promoted but not consistently used by the members of the Society of Surgeons and Anesthesiologists.

Monitoring and Evaluation of Surgical Care

- Monitoring and evaluation of outcomes are essential components of surgical care.
- In hospitals where results of surgical care are not routinely tracked and postoperative complications are not recorded or where surveillance mechanisms have not been sufficient to identify poor practices, the WHO highly recommends that a monitoring system be established.
- As a means of surgical surveillance at hospital and other health facility levels, death on the day of surgery and postoperative in-hospital deaths should be collected systematically by facilities and clinicians. Mortality rates can help surgeons identify safety shortfalls and provide guidance to clinicians for improvements in care.

- For those facilities with the capacity and ability to do so, SSI rates are also important outcome measures.
- Deaths, complications, and process measures can also be incorporated into the evaluation system and may help identify safety lapses and areas for improvement. Improved compliance has been associated with better outcomes and may identify weaknesses in the system of care delivery.
- In most Ethiopian health facilities, postoperative complications are supposed to be recorded on the surgery report; however, postoperative complications are not always recorded and are not routinely tracked in the facility report, and surveillance mechanisms are not always sufficient to identify poor practices in place.

Implementation of the Surgical Safety Checklist and Monitoring and Evaluation of Surgical Outcomes

The implementation of the Surgical Safety Checklist includes the following:

- The checklist involves the coordination of the operating team (surgeons, anesthesia providers, and nurses) to discuss key safety checks prior to specific phases of perioperative care: a “sign in” prior to induction of anesthesia, a “time out” prior to skin incision, and a “sign out” before the team leaves the operating room.
- Many of the checks are already done routinely in some institutions, but surprisingly, few operating teams accomplish them all consistently, even in the most advanced settings.
- Surgical care is complex and involves dozens of steps that must be optimized for individual patients. To minimize unnecessary loss of life and serious complications, an operating team has 10 basic essential objectives in any surgical case, which the WHO safe surgery guidelines support:
 1. The team will operate on the correct patient at the correct site.
 2. The team will use methods known to prevent harm from administration of anesthetics, while protecting the patient from pain.
 3. The team will recognize and effectively prepare for life-threatening loss of airway or respiratory function.
 4. The team will recognize and effectively prepare for risk of high blood loss.

5. The team will avoid inducing an allergic or adverse drug reaction for which the patient is known to be at significant risk.
6. The team will consistently use methods known to minimize the risk for SSI.
7. The team will prevent inadvertent retention of instruments and sponges in surgical wounds.
8. The team will secure and accurately identify all surgical specimens.
9. The team will effectively communicate and exchange critical information for the safe conduct of the operation.
10. Hospitals and public health systems will establish routine surveillance of surgical capacity, volume, and result.

World Health Organization Surgical Safety Checklist

Surgical Safety Checklist



World Health
Organization

Patient Safety
A World Alliance for Better Health Care

Before induction of anaesthesia

(with at least nurse and anaesthetist)

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

☐ Yes

Is the site marked?

☐ Yes

☐ Not applicable

Is the anaesthesia machine and medication check complete?

☐ Yes

Is the pulse oximeter on the patient and functioning?

☐ Yes

Does the patient have a:

Known allergy?

☐ No

☐ Yes

Difficult airway or aspiration risk?

☐ No

☐ Yes, and equipment/assistance available

Risk of >500ml blood loss (7ml/kg in children)?

☐ No

☐ Yes, and two IVs/central access and fluids planned

Before skin incision

(with nurse, anaesthetist and surgeon)

☐ Confirm all team members have introduced themselves by name and role.

☐ Confirm the patient's name, procedure, and where the incision will be made.

Has antibiotic prophylaxis been given within the last 60 minutes?

☐ Yes

☐ Not applicable

Anticipated Critical Events

To Surgeon:

☐ What are the critical or non-routine steps?

☐ How long will the case take?

☐ What is the anticipated blood loss?

To Anaesthetist:

☐ Are there any patient-specific concerns?

To Nursing Team:

☐ Has sterility (including indicator results) been confirmed?

☐ Are there equipment issues or any concerns?

Is essential imaging displayed?

☐ Yes

☐ Not applicable

Before patient leaves operating room

(with nurse, anaesthetist and surgeon)

Nurse Verbally Confirms:

☐ The name of the procedure

☐ Completion of instrument, sponge and needle counts

☐ Specimen labelling (read specimen labels aloud, including patient name)

☐ Whether there are any equipment problems to be addressed

To Surgeon, Anaesthetist and Nurse:

☐ What are the key concerns for recovery and management of this patient?

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

Revised 1 / 2009

© WHO, 2009

The Monitoring and Evaluation of Surgical Outcomes

The monthly facility report should include the following:

1. Death on the day of surgery must be recorded by the facility and clinician.
2. Postoperative in-hospital deaths must be recorded by the facility and clinician.
3. The frequencies of compliance with the following essential OR activities:
 - a. Marking of the operative site by the surgeon
 - b. Performance of an anesthesia safety check of the machine and medications
 - c. Use of pulse oximetry throughout administration of anesthesia in all cases
 - d. Objective evaluation of the airway
 - e. Use of sterility indicators to ensure adequacy of sterility practices
 - f. Administration of prophylactic antibiotics within one hour before skin incision (if indicated)
 - g. Verbal confirmation of patient, site, and procedure immediately before incision with all team members present
 - h. Preoperative team briefing to discuss clinical concerns, operative plan, and other critical issues
 - i. Postoperative team debriefing to discuss problems during the case and concerns for recovery and management of the patient

Module 8: Instrument Processing and Handling

Module Objective

- ❖ To equip participants with the required knowledge and skills in processing instruments and other items (before reuse) so as to reduce the transmission of infections during clinical procedures and patient care.

Learning Objectives

By the end of this module, participants will be able to:

- Describe the steps for processing instruments and other items.
- List commonly used disinfectants.
- Explain how disinfectant solutions are prepared.
- Demonstrate the steps in the decontamination, cleaning, sterilization, and HLD process.
- Explain how to store sterilized and high-level disinfected instruments and other items.

Module Content

Handout 8.1: Introduction to the Processing of Instruments and Other Items

Handout 8.2: Chemical Disinfectants

Handout 8.3: Decontamination

Handout 8.4: Cleaning

Handout 8.5: Sterilization and Storage

Handout 8.6: High-Level Disinfection and Storage

Handout 8.1: Introduction to the Processing of Instruments and Other Items

One area of infection prevention and control (IPC) in health facilities is the proper processing of instruments and other items that have come in contact with patients' bodily fluids. It is critical in reducing the transmission of infections during clinical procedures and patient care.

Every item, whether it is soiled metal instruments or a pair of surgical gloves, requires special handling and processing in order to minimize the risk of accidental injury or blood or body fluid exposure to cleaning and housekeeping staff; provide a high-quality end product (i.e., sterile or high-level disinfected instruments and other items).

The basic IPC practices recommended to reduce disease transmission from soiled instruments and other reusable items are decontamination, cleaning, and either sterilization or HLD. Regardless of the type of operative procedure, the steps in processing instruments and other items are the same as illustrated in Figure 8.1. Processing reusable medical instruments and other items is not difficult or technology intensive: it requires only a basic understanding of how to process the instruments and other items following a certain procedure.

After completing an operation or invasive medical procedure, and while still wearing gloves, the health worker should dispose of contaminated objects (gauze or cotton and other waste items) in a plastic bag or leak-proof, covered container. Next, disposable sharps (e.g., scalpel blades and suture needles) should be placed in a sharps container. Finally, all instruments and reusable items such as surgical gloves and suction cannulas, whether or not they were used in the operation, should be decontaminated by soaking for 10 minutes in a disinfectant (e.g., 0.5 percent chlorine solution). This step is especially important if these items are to be cleaned by hand (Nyström 1981).

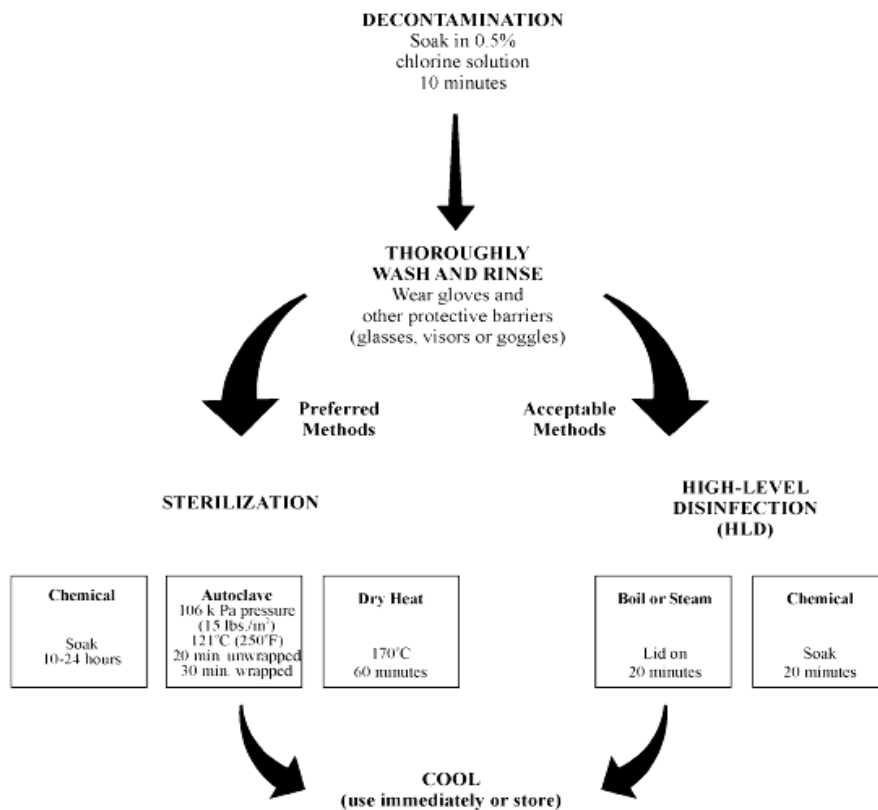
Following decontamination, the instruments and reusable items should be thoroughly cleaned with soap and water, completely rinsed, and dried. Then surgical instruments and those items that come in contact with the bloodstream or that normally touch sterile tissue beneath the skin (critical items) should be sterilized to destroy all microorganisms including bacterial endospores. (When sterilization is not feasible or equipment is not available, however, HLD by boiling, steaming, or soaking in a chemical disinfectant is the only acceptable alternative.)

Instruments and other items that touch only mucous membranes or broken skin (semi-critical items), however, only need to be high-level disinfected.

Important Definitions

- The phrase **instruments and other items**, as used in this manual, includes the following: **instruments** used during surgery or other clinical procedures, such as pelvic examination, delivery, insertion of intrauterine contraceptive device, manual vacuum aspiration (MVA), and collection of samples for testing for sexually transmitted infections, etc.; **other items** that are reused during the delivery of health services, such as pickups (lifters or Cheatle forceps), instrument drums, pans and trays, reusable gloves, and linen.
 - **Decontamination:** This is a process that makes inanimate objects safer to be handled by staff before cleaning (i.e., inactivates HBV, HCV, and HIV, and reduces the number of other microorganisms but does not eliminate them).
 - **Cleaning:** 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.
 - **HLD:** A process that eliminates all microorganisms except some bacterial endospores from inanimate objects by boiling, steaming, or using chemical disinfectants.
 - **Sterilization:** 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.

Figure 8.1. Key steps in processing instruments and other items



Handout 8.2: Chemical Disinfectants

Disinfectants are chemicals that destroy or inactivate microorganisms on inanimate objects, such as instruments and surfaces. Disinfectants are not meant to be used on the skin or mucous membranes. Many disinfectants are used alone or in combination (e.g., hydrogen peroxide and peracetic acid) in the health care setting. In most instances, a given product is designed for a specific purpose and is to be used in a certain manner. Therefore, users should read labels carefully to ensure the correct product is selected for the intended use and applied efficiently.

The most commonly used chemical disinfectants in health care settings are discussed below.

Chlorine and Chlorine-Releasing Compounds

Hypochlorites are the most widely used of the chlorine disinfectants and are available in liquid (sodium hypochlorite) and solid (calcium hypochlorite and sodium dichloroisocyanurate [NaDCC]) forms. Chlorine-releasing compounds are available in powder (calcium hypochlorite or chlorinated lime) or tablet form (NaDCC). Chlorine

solutions and compounds are high-level disinfectants because they inactivate all bacteria, viruses, fungi, and parasites, and some spores. They are fast acting; very effective against HBV, HCV, and HIV; inexpensive; and readily available. They also do not leave toxic residues and are not affected by water hardness. They are extremely useful for decontaminating soiled surgical instruments, gloves, and other items as well as large surfaces such as examination tables.

Sodium Hypochlorite (Chlorine Bleach)

Advantages:

- Usually is the least expensive and most readily available disinfectant
- Easy to prepare and use
- Quickly inactivates all viruses including HBV, HCV, and HIV, as well as killing tubercle bacillus
- Very useful for decontaminating soiled surgical instruments, gloves and other items, and large surface areas

Limitations:

- Inactivated by organic matter
- Loses potency on standing if left in open container (replace at least daily)
- May corrode metal instruments with prolonged exposure (greater than 20 minutes) to concentrations greater than 0.5 percent

To minimize corrosion:

- Solutions should not be prepared or kept in metal containers (use plastic containers when possible).
- Exposure time should not exceed 20 minutes.
- Metal items should be thoroughly rinsed with water and dried after decontamination, or they can be placed in clean water for up to one hour before washing.

Calcium Hypochlorite or Chlorinated Lime

- Calcium hypochlorite and chlorinated lime are available in powder form.
- Calcium hypochlorite contains approximately 70 percent available chlorine.
- Chlorinated lime contains approximately 35 percent available chlorine.

Advantage:

- Both decompose more slowly than sodium hypochlorite, but they still should be protected by storing away from heat and light.

Limitations:

- Inactivated by organic matter
- Like all chlorine compounds, may corrode metal with prolonged exposure (greater than 10 minutes) to concentrations greater than 0.5 percent unless thoroughly rinsed
- More difficult to prepare dilute solutions due to poor solubility in alkaline water (pH greater than 8) and amount of nondissolvable particulate matter in most products

Sodium Dichloroisocyanurate

NaDCC forms hypochlorous acid when dissolved in water. It is available as powder or tablets. NaDCC powder has 60 percent available chlorine; NaDCC tablets contain 1.5 g of available chlorine per tablet.

Advantages:

- NaDCC does not decompose as quickly as sodium or calcium hypochlorite.
- Tablets are easy to use for measuring.

Limitations:

- More expensive than sodium or calcium hypochlorite
- Like all chlorine compounds, may corrode metal with prolonged exposure (greater than 20 minutes) to concentrations greater than 0.5 percent unless thoroughly rinsed

Formaldehyde

Formaldehyde in both liquid and gaseous forms can be used as a chemical sterilant, as well as a high-level disinfectant. A commercially available solution of formaldehyde (formalin), which contains 35 to 40 percent formaldehyde by weight, should be diluted with boiled water (1:5) to a final solution containing about 8 percent formaldehyde. Formaldehyde has irritating fumes and a pungent odor and is classified as a potential carcinogen; therefore, its use must be limited, and care must be taken to protect staff when preparing and using formaldehyde solutions.

Advantages:

- Not readily inactivated by organic materials
- Can be used for up to 14 days
- Can safely be used on surgical endoscopes (laparoscopes) because 8 percent formaldehyde will not corrode metal or damage lensed instruments, plastics, or rubber

Limitations:

- Causes skin irritation
- Potential carcinogen
- Irritates the skin, eyes, and respiratory tract, even at low concentrations
- Produces a dangerous gas (bis-chloromethyl-ether) when mixed with chlorine

Considerations for use:

- Because of the potential carcinogenicity in humans and noxious fumes, liquid or gaseous formaldehyde should not be used for HLD or sterilization if other high-level disinfectants are readily available.
- Replace solution sooner than 14 days if cloudy.
- Handle with care when preparing and using formaldehyde. Gloves should be worn to avoid skin contact, eyes should be protected from splashes, and exposure time should be limited.
- Use only in a well-ventilated area.
- Thoroughly rinse equipment with sterile water or water that has been boiled and filtered (if necessary) at least three times after soaking.

Glutaraldehydes

Glutaraldehydes are widely used for chemical sterilization and HLD of medical instruments. There are many types of glutaraldehydes available worldwide. The most commonly used is an alkaline-stabilized 2 percent glutaraldehyde available commercially as Cidex® or Cidex 7®. The chemical should not be diluted unless specified in the manufacturer's instructions.

Advantages:

- Not readily inactivated by organic materials
- Generally can be used for up to 14 to 28 days
- Noncorrosive and can safely be used on surgical endoscopes (laparoscopes) because they will not corrode metal or damage lensed instruments (endoscopes), plastics, or rubber

Limitations:

- Can cause skin irritation or dermatitis with chronic exposure
- Vapors are irritating to mucous membranes (eye, nose, and mouth) and respiratory tract.
- Work best at room temperature (20–25°C or 68–77°F)
- Expensive

Iodine and Iodophor Solutions

Iodine solutions (1 to 3 percent aqueous or tincture) and iodophors (iodine complexed with an organic material) have been used primarily as antiseptics. Povidone-iodine is a commonly available iodophor, usually sold as a 7.5 to 10 percent solution (1 percent iodine). Iodophors are not high-level disinfectants because conclusive evidence is lacking that they are effective against bacterial endospores and some fungi. Also, *Pseudomonas* species, a group of gram-negative bacteria, have been known to multiply in iodophors. Iodophors must be properly diluted to be effective. Correctly diluted iodophors have more active killing power than full-strength iodophors due to the decreased availability of “free” iodine in the full-strength products.

Advantages:

- Do not cause deterioration or softening of plastic items if items are kept dry between soaking
- Diluted solutions of iodine and iodophors are nontoxic and nonirritating (unless the person is allergic to iodine).
- Can be used for disinfection of blood culture bottles and medical equipment such as thermometers

Limitations:

- Iodine is an oxidizing agent (causes rust) and should be used only for high-quality stainless steel equipment or plastic materials.
- Like alcohol and chlorine, iodine and iodophors are inactivated by organic materials; therefore, only previously cleaned instruments should be placed in iodine or iodophor solutions.
- Allergic reactions can occur in staff handling iodine solutions and iodophors.

Considerations for use:

- Primarily used as antiseptic for skin and mucous membranes (aqueous preparations only)
- Three percent aqueous solutions can be used for decontamination, but must be made fresh daily.
- Thoroughly rinse equipment with sterile water or boiled and filtered (if necessary) water at least three times after soaking.

Preventing Contamination of Disinfectants

Even though disinfectants are effective in killing microorganisms, they can easily become contaminated and their abilities will be limited. Using contaminated disinfectants can cause infections in clients if used for processing instruments and other items.

Disinfectants can become contaminated when:

- Dilution is necessary, and the water used to dilute the solution is contaminated.
- Containers in which disinfectants are placed are contaminated.
- The area in which solutions are prepared or used is not clean.

To prevent contamination:

1. Pour solutions into smaller containers for use during service delivery to avoid contaminating the stock container. Because solutions in this smaller container are opened, closed, and handled repeatedly, they are at increased risk of contamination. After one week, clean reusable containers with detergent/soap and water and air dry before refilling.
2. Label reusable containers with the date each time they are washed, dried, and refilled.
3. Always use clean (for decontamination) and/or boiled/sterile (for HLD/sterilization) water to dilute disinfectants.
4. Always use a clean (for decontamination) and/or boiled/sterile (for HLD/sterilization) container to dilute and use disinfectants.
5. Prepare and use disinfectant in a clean, less trafficked area.
6. During use, pour the amount of disinfectant needed for a given procedure and discard any remaining solution at the end of the procedure (if soiled) or at the end of the maximum allowable time for full strength of the solution.
7. Store disinfectants in a cool, dark area. Avoid storing them in direct light or excessive heat, as this may reduce their strength.

Handout 8.3: Decontamination

In instrument processing, decontamination is the first step in handling used instruments and gloves. Decontamination inactivates HBV, HCV, and HIV and reduces the number of microorganisms. It is one of the most highly effective IP measures that can minimize the risk of transmission of these viruses to health care workers, especially cleaning and housekeeping staff, when they handle soiled medical instruments, surgical gloves, or other items. The objective of decontamination is to protect individuals who handle surgical instruments and other items that have been in contact with blood or bodily fluids from serious diseases.

Before cleaning, all soiled surgical instruments, surgical gloves, and other items should be first decontaminated by placing them in a 0.5 percent chlorine solution for 10 minutes. Because of the potentially high load of microorganisms and/or other organic material (blood or other bodily fluids) on soiled items, using a 0.5 percent solution for decontamination

provides a wider margin of safety, whereas for HLD, a 0.1 percent chlorine solution can be used.

The formula for making a diluted chlorine solution from any concentrated hypochlorite solution and chlorine powder is shown as follows.

A. Formula for making a diluted solution from a concentrated solution

- Check concentration (percent concentrate) of the chlorine solution.
- Determine total parts of water using this formula.

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

- Mix one part concentrated bleach with the total parts (TP) water required.

Example: Make a dilute solution (0.5 percent) from 5 percent concentrated solution.

Step 1: Calculate TP water.

$$\left[\frac{5.0\%}{0.5\%} \right] - 1 = 10 - 1 = 9$$

Step 2: Take one part concentrated solution and add to nine parts water.

B. Formula for making chlorine solutions from dry powders

- Check concentration (percent concentrate) of the powder you are using.
- Determine grams of bleach needed using the following formula:

$$\text{Grams/Liter} = \left[\frac{\% \text{ Dilute}}{\% \text{ Concentrate}} \right] \times 1000$$

- Mix measured amount of bleach powder with one liter of water.

Example: Make a dilute chlorine solution (0.5 percent) from a concentrated powder (35 percent).

Step 1: Calculate grams/liter:

$$\left[\frac{0.5\%}{35\%} \right] \times 1000 = 14.2 \text{ g / L}$$

Step 2: Add 14.2 grams to 1 liter of water

Decontaminating Used Instruments and Other Items

1. Place all instruments in a 0.5 percent chlorine solution for 10 minutes immediately after completing the procedure.

2. Decontaminate any surfaces contaminated during the procedure by wiping them with a cloth soaked in a 0.5 percent chlorine solution.
3. Immerse gloved hands in a 0.5 percent chlorine solution.
4. Remove gloves by turning inside out. If disposing of gloves, place them in a leak-proof container or heavy-duty plastic container.
5. If reusing gloves, soak in a 0.5 percent chlorine solution for 10 minutes for decontamination.
6. Remove instruments from the 0.5 percent chlorine solution after 10 minutes and immediately rinse them with cool water to remove residual chlorine before being thoroughly cleaned.
7. Two buckets can be used in the procedure areas or operating rooms, one filled with 0.5 percent chlorine solution and one with water, so instruments can be placed in the water after 10 minutes to help prevent corrosion.

Decontamination Tips

- Use a plastic container for decontamination to help prevent:
 - Dulling of sharps (e.g., scissors) due to contact with metal containers
 - Rusting of instruments
- Use plastic containers for mixing and storing bleach solutions because metal containers are corroded rapidly and also affect the solution.
- Do not soak metal instruments that are electroplated (i.e., not 100 percent 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.
- Organic matter destroys chlorine, and freshly diluted solutions must therefore be prepared whenever the solution looks as though it needs to be changed (such as when it becomes cloudy or heavily contaminated with blood or other bodily fluids).
- Chlorine solutions gradually lose strength, and freshly diluted solutions must therefore be prepared daily. Use clean water to make the solution.
- Prepare the solution in a well-ventilated area.
- Label the container with 0.5 percent chlorine decontamination solution and note the day and time of its preparation.

- Because 0.5 percent chlorine solution is caustic, avoid direct contact with skin and eyes.
- Do not mix chlorine solutions with either formaldehyde or ammonia-based solutions because toxic gases may be produced.

Handout 8.4: Cleaning

After decontamination, cleaning is the next step in instrument processing. Cleaning is a process of physically removing infectious agents and other organic matter on which they live and thrive. This process does not necessarily destroy infectious agents. This is important because dried organic material can entrap microorganisms, including endospores, in a residue that protects them against sterilization or disinfection. Cleaning is an essential prerequisite to ensure effective disinfection or sterilization. Neither sterilization nor HLD could be effective without prior cleaning (Porter 1987).

The use of soap is important for effective cleaning because water alone will not remove protein, oils, or grease. However, the use of hand (bar) or powdered soap is discouraged because the fatty acids in bar soap react with the minerals in hard water leaving a residue or scum (insoluble calcium salt), which is difficult to remove. Using liquid soap, if available, is preferable 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 the solution so that they can be removed more easily in the cleaning process.

Do not use abrasive cleaners or steel wool because these products can scratch or pit metal or stainless steel. These scratches then become a nesting place for microorganisms, making cleaning more difficult and increasing the chance of corrosion (rusting).

Once an item is washed, it also needs to be rinsed and dried. Thorough rinsing with clean water removes any soap residue that can interfere with sterilization or HLD. After rinsing, items should be dried, especially if they will be sterilized or high-level disinfected using chemical disinfectants. Water remaining on the items (e.g., surgical instruments) dilutes the solution and may cause the process to fail.

The steps for cleaning are:

1. Wear gloves while cleaning instruments and equipment. (Thick household or utility gloves work well.)
2. Wear protective eyewear (plastic visors, face shields, goggles, or glasses), protective shoes, and a plastic apron, if available, while cleaning instruments and equipment to minimize the risk of splashing contaminated fluids into the eyes and onto the body.
3. Using a soft brush or old toothbrush, detergent, and water, scrub instruments and other items vigorously to completely remove all blood, other bodily fluids, tissue, and other foreign matter. Hold items under the surface of the water while scrubbing and cleaning to avoid splashing. Disassemble instruments and other items with multiple parts, and be sure to brush in the grooves, teeth, and joints of items where organic materials can collect and stick.
4. Rinse items thoroughly with clean water to remove all detergent. Any detergent left on the items can reduce the effectiveness of further chemical processing.
5. Allow items to air dry (or dry them with a clean towel).

Handout 8.5: Sterilization and Storage

Sterilization is the destruction of all microorganisms, including bacterial endospores. Sterilization in health facilities can be achieved by high-pressure steam (autoclaves), dry heat (oven), chemical sterilants (glutaraldehyde or formaldehyde solutions), or physical agents (radiation).

To be effective, sterilization requires time, contact, temperature, and, with steam sterilization, high pressure. Because sterilization is a process, not a single event, all components must be carried out correctly for sterilization to occur. The effectiveness of any method of sterilization is also dependent on the following four factors:

1. The type of microorganism present.
2. The number of microorganisms present.
3. The amount and type of organic material that protects the microorganisms. Blood or tissue remaining on poorly cleaned instruments acts as a shield to microorganisms during the sterilization process.
4. The number of cracks and crevices on an instrument that might harbor microorganisms.

Methods of Heat Sterilization

The most common and readily available sterilization methods are:

1. High-pressure steam sterilization (autoclaves)
2. Dry heat sterilization (oven)
3. Chemical sterilization

High-Pressure Steam Sterilization (Autoclaves)

High-pressure steam sterilization (autoclave) is an effective method of sterilization but is the most difficult to do correctly.

The temperature, pressure, and time combinations for steam sterilization are as follows:

- At a temperature of 121°C (250°F), pressure of 106 kPa (15 lb/in²) for 20 minutes for unwrapped items and 30 minutes for wrapped items.

- At a higher temperature of 132°C (270°F), pressure of 30 lb/in² for 15 minutes for wrapped items

Note: Pressure settings (kPa or lb/in²) may vary slightly depending on the sterilizer used. When possible, follow the manufacturer's recommendations.

The two reasons why steam sterilization is an effective sterilization are as follows:

1. Saturated steam is an extremely effective carrier of thermal energy that makes it many times more effective in conveying the necessary energy to the items to be sterilized than dry air.
2. Steam is an effective sterilant because any resistant, protective outer layer of the microorganisms can be softened by steam, allowing coagulation of the inner sensitive portion of the microorganisms.

Advantages:

- Most commonly used effective method of sterilization.
- Sterilization cycle time is shorter than with dry heat or chemical sterilants.

Limitations:

- Requires a continuous source of heat (wood fuel, kerosene, or electricity).
- Requires equipment (steam sterilizer) that must be expertly maintained to keep it in working condition.
- Requires strict adherence to time, temperature, and pressure settings.
- Difficult to produce dry packs because breaks in procedure are common (e.g., not allowing items to dry before removing, especially in hot, humid climates).
- Repeated sterilization cycles can cause pitting and dulling of cutting edges of instruments (i.e., scissors).
- Plastic items cannot withstand high temperatures.

Operation of Steam Sterilizer

To reliably sterilize items, steam sterilizers require the following four conditions: adequate contact, sufficient temperature, proper time, and sufficient moisture.

Contact

The most frequent reason for sterilization failure is the lack of contact between the steam and the microorganisms. This failure may be related to human error or mechanical malfunction.

Frequent causes of steam contact failure include the following:

- Failure to clean the object being sterilized adequately
- Instruments are closed, locked, or stacked
- Packages wrapped too tightly
- Packs are too crowded
- Wrong position of container
- Clogged strainer
- Other mechanical problems

Temperature

Temperature is one of the most important factors in steam sterilization. The most commonly used temperature for steam sterilization is 121°C (250°F). The only way to be certain the sterilizer is working correctly is to ensure that the temperatures at all points inside the load reach the full operating temperature of 121°C (250°F).

Timing

It takes a certain amount of time to kill microorganisms; generally, the hotter the temperature, the less time is required. At a temperature of 121°C (250°F) and pressure of 106 kPa (15 lb/in²), 20 minutes for unwrapped packs and 30 minutes for wrapped packs is sufficient to kill most microorganisms.

Moisture

Adequate moisture content of the sterilizer atmosphere is mandatory for effective sterilization by steam. Adequate moisture content means that the steam must be “saturated,” having a relative humidity of 100 percent. If the steam is not saturated (less than 100 percent relative humidity), articles in the sterilizer will remain dry or “cool,” either or both of which will interfere with the adequacy of the sterilization process.

Sterilization depends on correctly following the following practices and processes:

- Routine maintenance

- Preparing items to be sterilized
- Packaging and wrapping
- Loading and unloading the sterilizer
- Operating the sterilizer

Routine Maintenance

Although there are many brands of steam sterilizers, routine maintenance practices generally are the same regardless of the make or type. For routine maintenance:

- The outlet screen (or pin-trap) should be removed daily and cleaned using a mild soap and brush under running water.
- The chamber should be cleaned daily using a soft cloth or, for large sterilizers, a long-handled mop that is used only for this purpose. Do not use abrasives or steel wool because they may scratch the stainless steel surface and increase the occurrence of corrosion.
- All door gaskets should be cleaned daily with a lint-free cloth and checked for defects. Defective rubber gaskets should be replaced.
- The carriage (loading cart used to hold the packs placed in a sterilizer) should be cleaned daily using a mild soap and lint-free cloth. (The wheels of the loading cart also should be cleaned at this time, removing any string or other debris.)
- The exhaust line (or chamber drain) should be flushed weekly.

Preparing Items for Steam Sterilization

All instruments and other items should be decontaminated and thoroughly cleaned and dried before being sterilized. All jointed instruments should be open (or in the unlocked position) and disassembled. Reusable cloth items should be laundered and dried prior to sterilization.

Packing and Wrapping

Wrapping items to be sterilized permits sterile items to be handled and stored without being contaminated. Materials used for wrappers should:

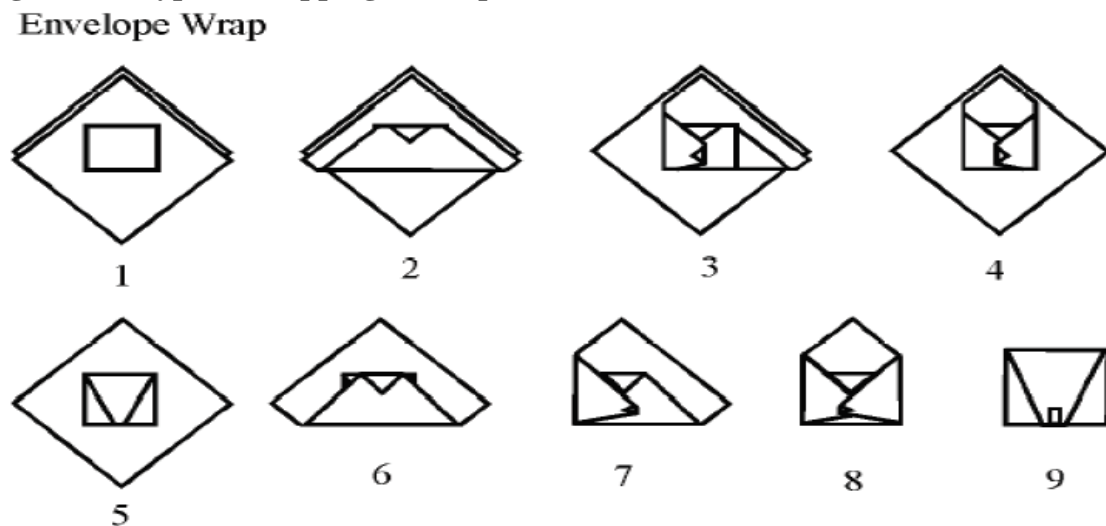
- Allow air removal and steam penetration
- Act as a barrier to microorganisms and fluids
- Resist tears and punctures and be free of holes
- Be nontoxic and low lint

- Be inexpensive

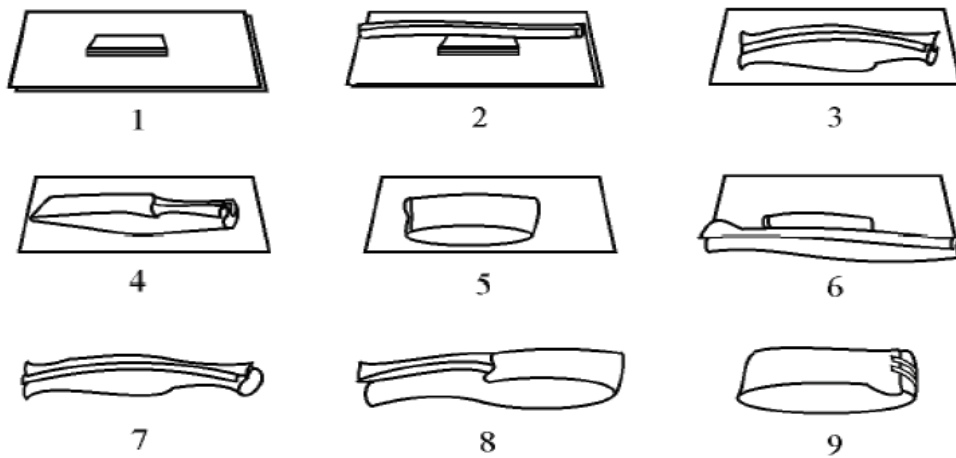
Types of materials that can be used as wrappers include:

- Muslin cloth (140 thread count): Use two double-thickness wraps (four layers in all), because this is the least effective of the materials used for wrapping. Use for both steam and dry heat sterilization.
- Paper: Double wrapping (two layers) recommended. Use for steam sterilization only and do not reuse.

Figure 8.2. Typical wrapping techniques



Square Wrap



Tips for wrapping:

- At least two layers of wrapping should always be used.
- Do not wrap packages too tightly.
- The outer wrapper of the pack can be loosely secured using linen ties.
- Do not wrap items in any waterproof material, such as plastic or canvas, for steam sterilization.
- Wrappers should not be reused if they are torn or stained with oils or if they have hard or gummy deposits.

Loading and Unloading

General principles of loading:

- When loading, leave sufficient space for steam to circulate freely. Do not overload.
- Place all packs (linen, gloves) on edge and place canisters, utensils, and treatment trays on their sides.
- Place instrument sets in trays having mesh or perforated bottoms flat on the shelves.
- In combination loads of cloth (or paper) packs and instruments trays, place linens on top shelves and trays on lower shelves.
- Surgical gloves should be sterilized by themselves or placed on the top shelves.
- Nested packs should be positioned in the same direction to help prevent air pockets, so condensation can drain and steam can circulate freely.

- Shelves (metal wire) or a loading cart must be used to ensure proper loading. It is preferable to use the cart that comes with the sterilizer.

Metals and glassware:

- Instrument sets should not exceed 8 kg (18 lb). Basin sets should not exceed 3 kg (7 lb).
- Solid containers should be placed on their sides to allow airflow out of them.

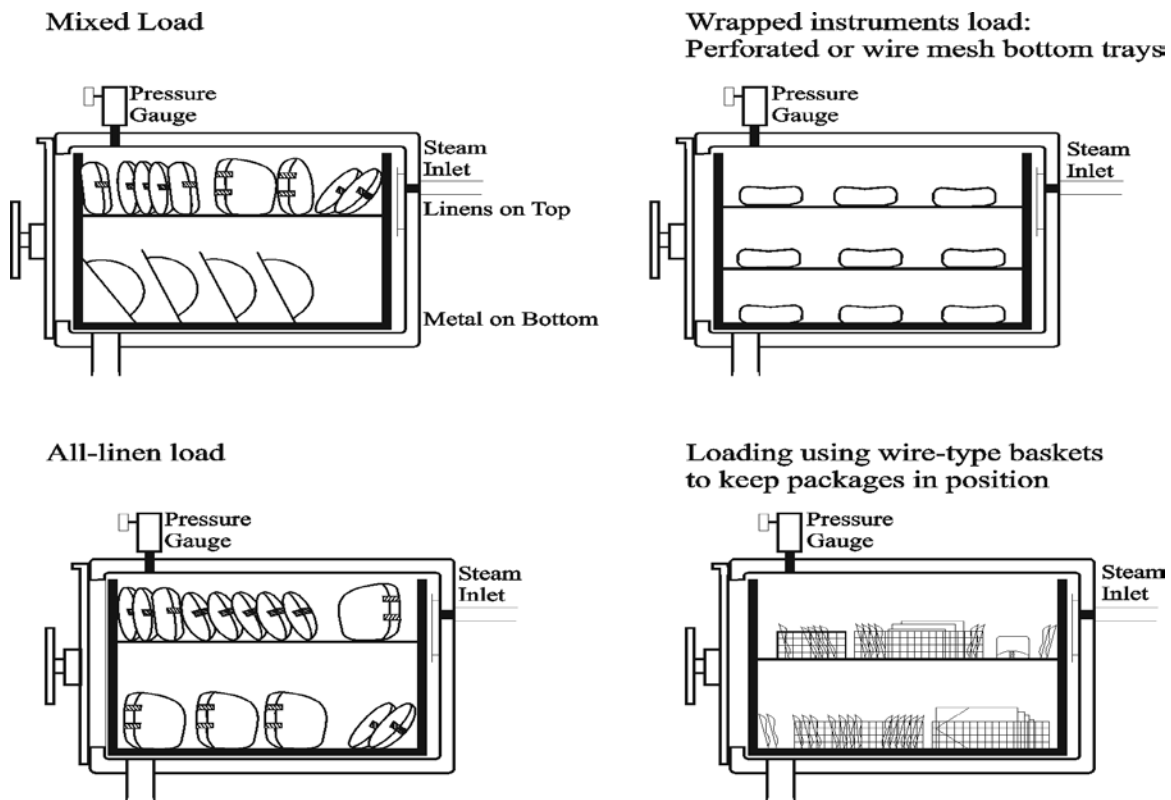
Linens:

- Linen packs should not be too large and should weigh no more than 5 kg (12 lb) to ensure steam penetration of the pack in 30 minutes (the time allowed for sterilizing wrapped items).
- Packs containing sheets, table covers, and towels are the most difficult for steam to penetrate and contact each fiber. Such packs must be placed on edge on the shelf to ensure steam penetration.

Liquids:

- Liquids must be sterilized by themselves.
- The amount of liquid in the bottle, not the size of the container, determines the time required for sterilization.
- Use only borosilicate heat-resistant glass (e.g., Pyrex®).
- Use only automatic self-sealing caps for closure.

Figure 8.3. Loading a steam sterilizer



Unloading a steam sterilizer:

- Allow instrument packs to dry completely before removal (takes 30 minutes).
- Place sterile trays and packs on surfaces padded with paper or fabric. (Do not place warm packs on cold metal surfaces because condensation will occur.)
- Store when packs reach room temperature (usually takes about an hour).
- Sterilized packs and articles should be handled gently and as little as possible.

Note: If a pack is dropped, tears, or comes in contact with moisture, it must be considered contaminated.

Instructions for operating steam sterilizer:

- Decontaminate, clean, and dry all instruments and other items to be sterilized.
- All jointed instruments should be in the opened or unlocked position, whereas instruments composed of more than one part or sliding parts should be disassembled.
- Instruments should not be held tightly together by rubber bands or any other means that will prevent steam contact with all surfaces.

- Arrange packs in the chamber to allow free circulation and penetration of steam to all surfaces.
- When using a steam sterilizer, it is best to wrap clean instruments or other clean items in a double thickness of muslin or newsprint.
- Sterilize at 121°C (250°F) for 30 minutes for wrapped items and for 20 minutes for unwrapped items; time with a clock.
- Wait 20 to 30 minutes (or until the pressure gauge reads zero) to permit the sterilizer to cool sufficiently. Then open the lid or door to allow steam to escape. Allow instrument packs to dry completely before removal, which may take up to 30 minutes.
- To prevent condensation, when removing the packs from the chamber, place sterile trays and packs on a surface padded with paper or fabric.
- After sterilizing, items wrapped in cloth or paper are considered sterile as long as the pack remains clean, dry (including no water stains), and intact. Unwrapped items must be used immediately or stored in covered, sterile containers.

Dry Heat Sterilization (Oven)

Dry heat sterilization is caused by hot air that destroys microorganisms through oxidation that causes slow destruction of the microorganisms' protein. Initially heat is absorbed by the exterior surface of an item and then passed to the next layer. Eventually, the entire object reaches the temperature needed for sterilization. Dry heat sterilization can be achieved with a simple oven as long as a thermometer is used to verify the temperature inside the oven.

Advantages:

- Effective method, as dry heat by conduction reaches all surfaces of instruments, even of instruments that cannot be disassembled
- Protective of sharps or instruments with a cutting edge (fewer problems with dulling of cutting edges)
- Leaves no chemical residue
- Eliminates “wet pack” problems in humid climates

Limitations:

- Plastic and rubber items cannot be dry heat sterilized because temperatures used (160–170°C) are too high for these materials.
- Dry heat penetrates materials slowly and unevenly.
- It requires oven and continuous source of electricity.

Instructions for Dry Heat Oven

To ensure correct operation, consult specific operating instructions supplied by the oven's manufacturer.

Step 1: Decontaminate, clean, and dry all instruments and other items to be sterilized.

Step 2: If desired, wrap instruments in aluminum foil or place in a metal container with a tight-fitting, closed lid. Wrapping helps prevent recontamination prior to use. Hypodermic or suture needles should be placed in glass tubes with cotton stoppers.

Note: When using dry heat to sterilize instruments wrapped in cloth, be sure that the temperature does not exceed 170°C/340°F.

Step 3: Place loose (unwrapped) instruments in metal containers or on trays in the oven and heat to desired temperature.

Step 4: After the desired temperature is reached, begin timing. The following temperature/time ratios are recommended

- 170°C (340°F), 60 minutes
- 160°C (320°F), 120 minutes
- 150°C (300°F), 150 minutes
- 140°C (285°F), 180 minutes
- 121°C (250°F), overnight

Note: Use dry heat only for items that can withstand a temperature of 170°C (340°F). Needles and other instruments with cutting edges should be sterilized at lower temperatures (160°C [320°F]), because higher temperatures can destroy the sharpness of cutting edges.

Depending on the temperature selected, the total cycle time (preheating, sterilization time, and cool down) will range from about 2.5 hours at 170°C to more than 8 hours at 121°C.

Step 5: After cooling, remove packs and/or metal containers and store. Loose items should be removed with sterile forceps/pickups and used immediately or placed in a sterile container with a tight-fitting lid.

Chemical Sterilization

Some high-level disinfectants will kill endospores after prolonged (10- to 24-hour) exposure. If objects need to be sterilized, but using high-pressure steam or dry heat sterilization would damage them or equipment is not available (or operational), they can be chemically sterilized. Common disinfectants that can be used for chemical sterilization include glutaraldehydes and formaldehyde. Sterilization takes place by soaking for at least 10 hours in 2 to 4 percent glutaraldehyde solution or at least 24 hours in 8 percent formaldehyde. Glutaraldehydes, such as Cidex, are often in short supply and very expensive, but they are the only practical sterilants for some instruments, such as laparoscopes, that cannot be heated. Both glutaraldehydes and formaldehyde require special handling and leave a residue on treated instruments; therefore, rinsing with sterile water is essential if the item must be kept sterile.

Advantages:

- Glutaraldehydes and formaldehyde solutions are not readily inactivated by organic materials.
- Both can be used for items that will not tolerate heat sterilization such as laparoscopes.
- Formaldehyde solutions can be used for up to 14 days (replace sooner if cloudy); some glutaraldehydes can be used for up to 28 days.

Limitations:

- Glutaraldehydes and formaldehyde are chemicals that cause skin irritation; therefore, all equipment soaked in either solution must be thoroughly rinsed with sterile water after soaking.

- Because glutaraldehydes work best at room temperature, chemical sterilization cannot be assured in cold environments (temperatures less than 200°C/680°F), even with prolonged soaking.
- Glutaraldehydes are expensive.
- Vapors from formaldehyde (classified as a potential carcinogen), and to a lesser degree glutaraldehydes, are irritating to the skin, eyes, and respiratory tract.

Instructions for Chemical Sterilization

Step 1: Decontaminate, clean, and dry all instruments and other items to be sterilized.

Step 2: Completely submerge items in a clean container filled with the chemical solution and place the lid on the container.

Step 3: Allow items to soak:

- Ten hours in a glutaraldehyde (check specific product instructions)
- At least 24 hours in 8% formaldehyde

Step 4: Remove objects from the solution with sterile forceps; rinse all surfaces three times in sterile water and air dry. Ideally, three separate (sequential) rinse containers should be used.

Step 5: Store objects in a sterile container with a tight-fitting lid if they will not be used immediately.

Monitoring Sterilization Procedures

Sterilization procedures can be monitored routinely using:

- **Biological indicators:**
 - Steam sterilizers: A highly sensitive but relatively harmless (nonpathogenic) microorganism called *Bacillus stearothermophilus* is used to test steam sterilizers. This biological indicator should be done weekly and as deemed necessary.

- Dry heat sterilizers: *Bacillus subtilis* is used on weekly basis and as deemed necessary.
- **Chemical indicators:** Chemical indicators include indicator tape or labels that monitor time, temperature, and pressure for steam sterilization and time and temperature for dry heat sterilization.
- **Mechanical indicators:** Mechanical indicators for sterilizers provide a visible record of the time, temperature, and pressure for that sterilization cycle. This is usually a printout or graph from the sterilizer, or it can be a log of time, temperature, and pressure kept by the person responsible for the sterilization process that day.

Storage of Sterile Instruments and Items

All sterile items should be stored appropriately to protect them from dust, dirt, moisture, animals, and insects. The storage area should be located next to or connected to where sterilization occurs and in a separate enclosed area with limited access that is used only to store sterile and clean patient care supplies.

Instructions for Storing Sterile Items

1. Keep the storage area clean, dry, dust-free, and lint-free.
2. Control temperature and humidity (approximate temperature 24°C and relative humidity less than 70 percent) when possible.
3. Packs and containers with sterile (or high-level disinfected) items should be stored 20 to 25 cm off the floor, 45 to 50 cm from the ceiling, and 15 to 20 cm from an outside wall.
4. Do not use cardboard boxes for storage. Cardboard boxes shed dust and debris and may harbor insects.
5. Date and rotate the supplies (first in/first out). This process serves as a reminder, but does not guarantee sterility of the packs.
6. Distribute sterile and high-level disinfected items from this area.

Shelf Life

- The shelf life of an item (how long items can be considered sterile) after sterilization is event-related. An item remains sterile until something causes the package or

container to become contaminated; time elapsed since sterilization is not the determining factor.

- To make sure items remain sterile until you need them, prevent events that can contaminate sterile packs, and protect them by placing them in plastic covers (thick polyethylene bags). An event can be a tear or worn area in the wrapping, the package becoming wet, or anything else that would enable microorganism to enter the package or container.
- Before using any sterile item, look at the package to make sure the wrapper is intact and the seal unbroken and that it is clean and dry (as well as not having water stains).
- If the quality of the wrapping cloth is poor and plastic bags are not available, limiting the shelf life is a reasonable option to ensure the sterility of the instruments.

Handout 8.6: High-Level Disinfection and Storage

When sterilization equipment is either not available or not suitable, HLD is the only acceptable alternative method for the final processing of instruments. The HLD process destroys all microorganisms (including vegetative bacteria, tuberculosis, yeasts, and viruses) except some bacterial endospores.

HLD can be achieved by:

- a. Boiling in water
- b. Steaming (moist heat)
- c. Soaking instruments in chemical disinfectants (chemical disinfection)

Boiling

Boiling in water is an effective, practical way to high-level disinfect instruments and other items. Although boiling instruments in water for 20 minutes will kill all vegetative forms of bacteria, viruses (including HBV, HCV, and HIV), yeasts, and fungi, boiling will not reliably kill all endospores.

Steps for High-Level Disinfection by Steaming

Step 1: Decontaminate and clean all instruments and other items to be high-level disinfected.

Step 2: If possible, completely immerse items in water. Adjust the water level so that there is at least 2.5 cm (1 inch) of water above the instruments. In addition, make sure all bowls and containers to be boiled are full of water. For example, empty bowls that turn bottom side up and float to the surface contain air pockets.

Step 3: Close lid over pan and bring water to a gentle, rolling boil. (Boiling too vigorously wastes fuel, rapidly evaporates the water, and may damage delicate [or sharp] instruments or other items.) Hence, a gentle rolling boil is sufficient and will prevent instruments or other items from being bounced around and possibly damaged by striking other instruments or the side walls of the boiling pot.

Step 5: Boil all items for 20 minutes. Start timing when the water begins to boil.

Step 6: After boiling for 20 minutes, remove objects with previously high-level disinfected forceps. Never leave boiled instruments in water that has stopped boiling. As the water cools and steam condenses, air and dust particles are drawn down into the container and may contaminate those instruments.

Step 7: Use instruments and other items immediately, or with high-level disinfected forceps or gloves, place objects in a high-level disinfected container with a tight-fitting cover. Once the instruments are dry, if any pooled water remains in the bottom of the container, remove the dry items and place them in another high-level disinfected container that is dry and can be tightly covered.

Steaming

The best method for HLD of gloves and a useful method of HLD of cannulas used during MVA is to steam them in a steamer containing one to three tiers of gloves or cannulas.

Steps for High-Level Disinfection 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 MVA cannulas, 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.

- **Remember:** Be sure there is sufficient water in the bottom pan for the entire 20 minutes of steaming.

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 that was just removed onto the empty pan (see Step 3). 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 (one to two hours) before using.

Step 9: Using a high-level disinfected forceps, transfer the dry items to a dry, high-level disinfected container 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 (no holes) is used.

Soaking Instruments in Chemical Disinfectants

Although a number of disinfectants are commercially available in most countries, four disinfectants—chlorine, glutaraldehydes, formaldehyde, and peroxide—are routinely used as high-level disinfectants. A high-level disinfectant should be selected for use based on the characteristics of the items to be disinfected, the physical area (i.e., is it well ventilated?), and the skills of personnel available to do the procedure.

- **HLD by chlorine solutions**
 - Prepare 0.1 percent chlorine solution using boiled water that has been filtered if the tap water is cloudy.
 - Soak for 20 minutes.
- **Formaldehyde**
 - Use 8 percent formaldehyde, which is inexpensive and readily available.
 - Soak for 20 minutes.
- **Hydrogen peroxide**
 - Use a 6 percent solution. The 3 percent hydrogen peroxide solutions used as antiseptics should not be used as a disinfectant.
 - Soak for 20 minutes.
- **Glutaraldehydes**
 - Use a 2 to 4 percent solution.
 - Soak for 20 minutes at 25°C.

Key Steps in Chemical High-Level Disinfection

- Decontaminate instruments and other items that may have been contaminated with blood and bodily fluids, and thoroughly clean and dry them before placing them in the disinfectant solution.
- Completely immerse all items in the high-level disinfectant.
- Soak for 20 minutes.
- Remove items using high-level disinfected or sterile forceps or gloves.
- Rinse well with boiled and filtered (if necessary) water three times and air dry.

- Use promptly or store in a dry, high-level disinfected, covered container.

How to Prepare High-Level Disinfected Container

- For small containers, boil water in the covered container for 20 minutes, and then pour out the water (which can be used for other purposes), replace the cover, and allow container to dry.
- Alternatively, and for large containers, fill a plastic container with a 0.5 percent chlorine solution and immerse the cover in chlorine solution as well. Soak both for 20 minutes. Rinse the cover and the inside of the container three times with boiled water and allow to air dry. Large metal containers cannot be high-level disinfected using chemicals.

Module 9: Processing Linen and Laundry

Module Objective

- ❖ To equip participants with the required knowledge and skills for linen processing and laundry.

Learning Objectives

By the end of this module, participants will be able to:

- Explain why careful handling and processing of soiled linen is important.
- Describe key principles in handling linen.
- Explain how soiled linen should be collected, transported, sorted, washed, and dried.
- Explain how clean linen should be stored, transported, and distributed.
- State the minimum requirements for standard laundry services.
- List the PPE used in processing linen and laundry.

Module Content

Handout 9.1: Principles and Key Steps in Processing Linen

Handout 9.2: Collecting, Transporting, Sorting, and Laundering Linen

Handout 9.3: Storing, Transporting, and Distributing Clean Linen

Handout 9.4: Minimum Requirements and Periodic Monitoring for Standard Laundry Services

Handout 9.5: Personal Protective Equipment Used in Processing Linen and Laundry

Handout 9.1: Principles and Key Steps in Processing Linen

Processing Linen

Processing linen consists of all the steps required to collect, transport, and sort soiled linen as well as to launder (wash, dry, and fold or pack), store, and distribute it. Work-related infection in processing linen is most often due to negligence (not using gloves or washing

hands during/after collecting, transporting, or sorting linen). Staff responsible for washing soiled items should wear utility gloves, protective eyewear, and plastic or rubber aprons.

Principles and Key Steps in Processing Linen

- Housekeeping and laundry personnel should wear gloves and other PPE as indicated when collecting, handling, transporting, sorting, and washing soiled linen.
- When collecting and transporting soiled linen, handle it as little as possible and with minimum contact to avoid accidental injury and spreading of microorganisms.
- Consider all cloth items (e.g., surgical drapes, gowns, wrappers) used during a procedure as infectious. Even if there is no visible contamination, the item must be laundered.
- Carry soiled linen in covered containers or plastic bags to prevent spills and splashes, and confine the soiled linen to designated areas (interim storage area) until transported to the laundry.
- Carefully sort all linen in the laundry area before washing. Do not presort or wash linen at the point of use.

Handout 9.2: Collecting, Transporting, Sorting, and Laundering Linen

Collecting and Transporting

After invasive medical or surgical procedures or when changing linen in patient rooms:

- Collect used linen in cloth or plastic bags or containers 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 container with a lid.
- Cloth bags are adequate for the majority of the patient care linen. They require the same processing as their contents.
- Handle soiled linen as little as possible and do not shake it.
- Do not sort and wash soiled linens in patient care areas.
- Collect and remove soiled linen after each procedure on a daily basis or as needed, including from patient rooms.
- Transport collected soiled linen in closed leak-proof bags, in containers with lids, or in covered carts to the processing area daily or as needed.

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 areas, and food preparation areas.
- Ensure adequate ventilation and physical barriers between the clean and soiled linen areas.
- Always wear protective eyewear, utility gloves, appropriate footwear, and plastic or rubber apron while handling soiled linen.
- Be watchful for scalpels, sharp-tipped scissors, and hypodermic and suture needles when handling linen, in particular when initially collecting.
- Wash hands after removing the gloves.

Laundering Linen

All linen items, including bed sheets, surgical drapes, masks, and gowns, should be thoroughly washed before reuse. Decontamination of linen prior to washing is not necessary unless linen is heavily soiled, in which case it should be hand washed. Workers should not carry wet, soiled linen close to their body even if they are wearing a plastic or rubber apron.

Hand Washing Linen

- Wash heavily soiled linen separately from nonsoiled linen.
- Wash the entire item in water with soap.
- Presoak heavily soiled lined with soap and bleach (0.5 percent chlorine) for 10 minutes.
- Add a mild acid agent such as vinegar to prevent yellowing of linen, if desirable.
- Nonsoiled linen should not be presoaked in bleach and soap. It should be washed with soap and water until visibly clean.
- Check items for cleanliness. Rewash if they are dirty or stained.
- Rinse linen with clean water.

Machine Washing

- Do not overload the machine.
- A prewash rinse cycle of 15 minutes will remove remaining gross spillage.

- Adjust the temperature and time cycle of the machine according to manufacturer's instruction and the type of soap or other washing product being used. Both cold and hot water washing cycles that include bleach reduce bacterial counts in the linen.
- If using a cold water wash, chemicals such as bleach must be added (2 mL of household bleach for every liter of water) with detergent to facilitate disinfection.
- An agent should be added to the rinse cycle to reduce alkalinity and prevent yellowing.
- Heavily soiled linen may need two cycles if not found visibly clean at the end of the first cycle.

Drying, Checking, and Folding Linen

- Linen can be machine dried or air dried in direct sunlight, if possible, keeping the fabric off the ground and away from dust and moisture.
- After the linen is dry, check for holes and threadbare areas. If damaged, either discard or repair before reuse.
- The linen that is not going to be sterilized should be ironed and folded. Ironing, especially using a steam iron, will destroy pathogens.
- If surgical drapes are to be sterilized, do not iron. Ironing dries out the material, making autoclaving more difficult.

Handout 9.3: 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. Clean linen must be stored at least four to six inches off the floor.

Transporting Clean Linen

- Clean and soiled linen should be transported separately.
- Containers or carts used to transport soiled linen should be thoroughly cleaned before using the same for transporting clean linen.
- Clean linen must be wrapped or covered during transport to avoid contamination.

Distributing Clean Linen

- Protect clean linen until it is distributed.
- Do not leave extra linen in patient's area.
- Handle clean linen as little as possible.
- Avoid shaking clean linen. It releases dust and lint into the room.
- Clean soiled mattresses before putting clean linen on them.

Remember: Sterilization is a preferred end process for surgical gowns, linen drapes, and wrappers.

Handout 9.4: Minimum Requirements and Periodic Monitoring for Standard Laundry Services

Minimum Requirements

- Ensure that laundry areas have hand-washing facilities and products and appropriate PPE available for workers.
- Use and maintain laundry equipment according to manufacturers' instructions.
- Do not leave damp textiles or fabrics in machines overnight.
- Disinfection of washing and drying machines in residential care is not needed as long as gross soil is removed from items before washing and proper washing and drying procedures are used.

Periodic Monitoring

- Monitor/inspect the laundry unit on a weekly basis (cleanness, functionality, availability of all necessary detergent, water, and all activities including collection, storage, efficiency, and recording information of the unit).
- Include the laundry activity in weekly, monthly, quarterly, and yearly plan and report.
- Use microbiologic sampling during outbreak investigations.

Handout 9.5: Personal Protective Equipment Used in Processing Linen and Laundry

Utility gloves, plastic or rubber aprons, protective eyewear, and closed shoes should always be used when collecting, handling, transporting, sorting, and hand washing soiled linen or loading in automatic washers.

Module 10: Clinical Laboratory Services

Module Objective

- ❖ To increase the knowledge of participants on the exposure risks and the biosafety classifications in laboratories.

Learning Objectives

By the end of this module, participants will be able to:

- Identify the sources of laboratory hazards in the health care setting.
- List safe laboratory practices.
- Explain how exposures or accidental injuries occur in clinical laboratory settings.
- List biosafety and IP measures

Module Content

Handout 10.1: Exposure Risks for Laboratory Staff

Handout 10.2: Safe Laboratory Practices

Handout 10.3: Biosafety Levels

Handout 10.1: Exposure Risks for Laboratory Staff

Laboratory infections from pathogenic organisms occur by several means. The most common are the following:

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

Handout 10.2: Safe Laboratory Practices

Requirements for safe laboratory practice include:

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

General Biosafety and Infection Prevention Guidelines

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

Handout 10.3: Biosafety Levels

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

BSL-1 is the lowest level of containment and microbiologic safety guidelines and is entirely based on standard laboratory practices. These guidelines are recommended for those working with microorganisms, such as *Bacillus subtilis*, that are not known to cause infections in healthy adults.

Note: Gloves should be pulled over the cuffs of gowns to protect the wrists.

BSL-2 is generally applied in bacteriology laboratories working with agents (e.g., *Salmonella* spp.) associated with human diseases of varying severity. When standard microbiologic practices are applied, the agents may be handled on open benches, especially if primary barriers, such as facemasks, gowns, and examination gloves, are used when appropriate. The use of biologic safety cabinets (BSCs) and safety centrifuges may be necessary.

Note: Gloves should be pulled over the cuffs of gowns to protect the wrists.

BSL-3 is aimed at containing hazardous microorganisms primarily transmitted by the airborne route (aerosols and droplets), such as tuberculosis or varicella (chicken pox). Laboratory staff who work in these situations must be trained in the use of appropriate equipment, including suitable ventilation systems and the use of BSCs.

BSL-4 is designed for use where agents causing life-threatening or untreatable diseases (e.g., hemorrhagic fever viruses) that can affect the laboratory worker via the airborne route are present. Trained workers using level III BSCs or wearing full-body, air-supported, positive-pressure suits must perform all procedures in these laboratories. In addition, the facility itself must be totally isolated from other laboratories and have specialized ventilation and waste management systems.

Biological safety cabinets (BSCs): BSCs are devices that provide protection for personnel, the agent being processed, and the environment. They range in complexity from level I (general research cabinets for use with low- to moderate-risk microorganisms) to level III (totally enclosed cabinets with gas-tight construction that provide maximum protection to workers and the environment).

Module 11: Blood Safety

Module Objective

- ❖ To equip participants with the required knowledge about transfusion-transmissible infections (TTIs) and methods of minimizing them.

Learning Objectives

By the end of this module, participants will be able to:

- List TTIs of public health importance.
- List the blood donor selection criteria.
- Explain how to safely collect blood from donors.
- Describe methods to minimize TTIs.
- Describe recommended IP practices when handling blood transfusions.

Module Content

Handout 11.1: Transfusion-Transmissible Infections and Components of Blood Banks and Transfusion Services

Handout 11.2: Prevention of Transfusion-Transmissible Infections

Handout 11.1: Transfusion-Transmissible Infections and Components of Blood Banks and Transfusion Services

Transfusion-Transmissible Infections

Infectious diseases that may be transmitted through transfusion include viruses, bacteria, protozoa, and *Rickettsia*.

- **Viruses** include: hepatitis (hepatitis A virus, HBV, HCV, and hepatitis D virus), retroviruses (HIV-1 and HIV-2, as well as human T-lymphotropic virus I and II), herpes viruses (cytomegalovirus, Epstein-Barr virus, human herpes virus, and parvovirus), among others.
- **Bacteria** include those that can be classified as endogenous, such as *Treponema pallidum* (syphilis), *Borrelia burgdorferi* (Lyme disease), *Brucella melitensis*

(brucellosis), *Yersinia enterocolitica*, and *Salmonella* spp. These are present in the blood of a potential donor at the time of donation. Exogenous bacteria include *Staphylococcus* spp., *Pseudomonas* spp., and *Serratia* spp. These bacteria are introduced into the blood pack during collection if aseptic techniques are not closely adhered to, during storage, or at the time of phlebotomy for transfusions.

- **Protozoa** transmitted through blood transfusions include *Plasmodium* spp. (malaria), *Trypanosoma cruzi* (Chagas disease), *Toxoplasma gondii* (toxoplasmosis), and *Babesia microti* (babesiosis).
- **Rickettsia** includes *Rickettsia rickettsii*, causative agent for Rocky Mountain spotted fever, and *Coxiella burnetii*, which causes Q fever.

Blood safety refers to all the procedures that are undertaken to render blood safe for use on a patient.

Blood bank and transfusion services involve:

- Selecting donors and assuring that they have given informed consent
- Collecting blood from screened donors
- Testing for blood components, antibodies, and infectious diseases
- Storing and transporting blood
- Pretransfusion testing of patient's blood
- Transfusing patients

Handout 11.2: Prevention of Transfusion-Transmissible Infections

Blood Donor Selection Criteria, Informed Consent, and Blood Collection

Donor Selection and Informed Consent

Effective blood transfusion begins with collection of safe blood from healthy blood donors. In Ethiopia, 60 to 65 percent of blood donors are family and/or replacement donors (Ethiopia Red Cross Society 2008). Blood donation involves the following activities:

- Obtain complete medical history and physical examination for each donor (this should include any medical problems, behaviors, or events that put a person at risk of being infected and transmitting a serious disease to the person receiving the transfusion).

- General selection criteria:
 - At least 17 years of age
 - Good health
 - Not severely anemic (hemoglobin more than 11 g/dL)
 - Not infected with TTI such as HIV, HBV, HCV, etc.
- Prior to collection of blood, the elements of the donation process should be explained to the potential donor in simple, easy to understand language.
- Explain the risks of vein puncture and potential adverse responses to drawing 400 to 500 mL of blood.
- Explain the laboratory tests that will be performed and how exactly the donor will be informed about the test results, including any other medical abnormalities.
- Perform the routine laboratory tests, including hemoglobin or hematocrit and screening for HIV, HBV, HCV, syphilis, and malaria.
- A written informed consent form should be completed for each donor.

Blood Collection Procedures

1. Make sure all of the following items are available:
 - a. Blood collection set consisting of sterile plastic bag containing a sufficient amount of anticoagulant for the quantity of blood to be collected
 - b. Intravenous tubing and large-gauge hypodermic needles
 - c. Pair of sterile or surgical gloves
 - d. Clean tourniquet or blood pressure cuff
 - e. Antiseptic solution and sterile gauze squares or cotton swabs
 - f. Surgical tape
 - g. Towel to place under patient's hand or forearm
 - h. Basin of clean warm water
 - i. Soap
 - j. Clean dry towel to wash patient's arm if visibly soiled
 - k. Plastic bag or leak-proof, covered waste container for disposal of contaminated items
 - l. Puncture-resistant sharps container
2. Explain the procedure to the donor.

3. Identify the best vein for inserting the intravenous needle (a prominent, large, and firm vein).
4. Put the tourniquet or blood pressure cuff on the upper arm about 9 cm above the antecubital space to confirm that the vein is visible and then release the tourniquet or cuff.
5. If the venipuncture site is visibly soiled, first wash it with soap and clean water, and then dry with a clean cloth or ask the donor to wash the forearm.
6. Wash hands and dry with a clean towel or air dry (alternatively, use alcohol hand rub [5 mL] and rub both hands vigorously until dry).
7. Place the donor's arm on a clean towel and cleanse an area about 3 cm in diameter with an antiseptic solution. Use a circular motion outward from the proposed needle insertion site over the vein. (If using povidone-iodine or other iodophors, allow 2 minutes for antiseptic to take full effect.)
8. Do not touch the area after applying the antiseptic solution.
9. Put the tourniquet or blood pressure cuff on the upper arm again; raise the pressure up to 40 to 60 mm Hg while collecting the blood.
10. Put sterile or HLD surgical gloves on both hands.
11. Insert the hypodermic needle into the vein without touching the hands, if possible; release the tourniquet or cuff, and then secure the needle by placing a short piece of tape across the blood collection tubing below the area cleansed with antiseptic.
12. When the required amount of blood has been obtained, remove the needle without touching the barrel or tip of the needle and immediately place it in a puncture-resistant sharps container.
13. Cover the insertion site with 2 × 2 cm gauze square, and apply pressure until bleeding stops. Secure the gauze square using one or two pieces of surgical tape.
14. Prior to removing gloves, place any blood-contaminated waste items into the appropriate yellow or infectious waste bin.
15. Wash hands or use an antiseptic hand rub, as in Step 6.
16. Have the donor remain resting on a bed or in the donor chair for several minutes.
17. Provide the donor with something to drink and eat.
18. Tell the donor to drink more fluid during the next 24 hours and avoid alcohol or smoking until more food has been eaten. Ask the donor to lie down if he or she is feeling dizzy or nauseous.

To Avoid Contamination of Collected Blood:

- Maintain appropriate storage conditions (stored at 1°C to 6°C and monitoring temperature every four hours).
- Test the blood unit without entering the closed collection system.
- Infuse or discard the blood unit within a short period once the closed system has been opened.

Blood Component and Infectious Disease Testing

- ABO blood group and Rh type
- Blood from donor with history of transfusions or pregnancy should be tested for unexpected red cell antibodies using methods that demonstrate clinically significant antibodies.
- Test for HIV by testing for antibodies to HIV-1 and HIV-2. As per the national policy on HIV for Ethiopia and the national blood transfusion services strategy, all donated blood shall be screened prior to transfusion. In remote areas where testing facilities are limited, simple and/or rapid HIV tests shall be made available. Blood donors shall be informed about the tests, which will be carried out on the donated blood. In case of a donor wanting to know his or her HIV serostatus, he or she shall be referred to the appropriate health facilities for counseling and testing (FMOH, HIV/AIDS Policy, May 2007).
- Syphilis by screening with rapid plasma reagent test; HBV and HCV by testing for hepatitis B surface antigen (Ethiopian Red Cross Society 2008)

Blood Storage and Short Distance Transport

- Blood units must be stored in a refrigerator at 1°C to 6°C.
- There must be a system to monitor temperatures continuously and record them at least every four hours.

While Discarding Blood That Has Been Exposed to Higher Temperatures:

- Wear examination or utility gloves and protective eyewear.
- Pour contents down a utility sink drain or into a flushable toilet or latrine.
- Place empty blood bags and tubing in a leak-proof container.

- Dispose by burning or burying.

Pretransfusion Testing and Cross-Matching

- Test a sample of recipient blood using the same methods and recommended IP practices used to test donor blood.
- Repeat testing of the donor blood to confirm the ABO group and Rh.
- Cross-match the red cells of the selected donor against the serum or plasma of the recipient to be sure there is no ABO and Rh incompatibility.

Transfusion of Blood or Blood Components

Indications for not selecting someone for blood transfusion are:

- Actively bleeding patients
- Patients with chronic or symptomatic anemia
 - The generally accepted hemoglobin level for transfusing patients with acute blood loss is 7 g percent, with patients having a level of 6 g percent almost always requiring transfusion but those with a level of ≥ 10 g percent rarely needing it.

Transfusing Patients

Before starting the transfusion:

- Explain the procedure to the patient if he or she is conscious.
- Correctly identify the blood product and the patient: confirm patient's name, check compatibility information attached to the blood bag and expiry date, check the ABO and Rh status of the patient on the patient chart, double check blood or type of blood product with the physician's order, and check blood for clots.
- Record baseline pulse and blood pressure.
- Ask patient or relatives to report chills, headaches, itching, or rashes immediately.

Once the transfusion has been started:

- Take patient's pulse and blood pressure every 5 minutes for the first 15 minutes and hourly thereafter.
- Observe the patient for flushing, itching, difficulty in breathing, hives (clear fluid-filled lesions on the skin), or other rash when checking for vital signs.

Preventing Complications and Transfusion-Transmissible Infections

To prevent complications and TTIs in patients:

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

Protecting Health Care Workers

Wear gloves while collecting, testing, and transfusing blood. Handle the sharps carefully and dispose immediately in puncture-resistant container. Wear PPE at all times. Improving performance and compliance with recommended policies and guidelines can be significantly enhanced if:

- Consistent support is provided by hospital administrators and the hospital transfusion committee to improve the quality of services.
- Supervisors regularly provide positive feedback, rewards, and suggestions to encourage and promote improvement.
- Physicians and other senior staff and faculty demonstrate using best practices and behaviors, thereby supporting the policies and guidelines.

Module 12: Traffic Flow and Activity Patterns

Module Objective

- ❖ To provide participants with an overview of traffic flow and activity patterns and the importance of regulating the flow of visitors, patients, and staff in preventing disease transmission in health care facilities.

Learning Objectives

By the end of this module, participants will be able to:

- Describe activity pattern and traffic flow in health care settings.
- Explain the importance of regulating traffic flow and activity patterns in health care settings.
- Describe how to design traffic flow and activity patterns in procedure areas, instrument processing areas, and surgical units.

Module Content

Handout 12.1: Overview and Importance of Activity Patterns and Traffic Flow in Health Care Settings

Handout 12.1: Overview and Importance of Activity Patterns and Traffic Flow in Health Care Settings

Regulating the flow of visitors, patients, and staff plays a central role in preventing disease transmission in health care facilities.

Microbial contamination is minimized by reducing the number of people permitted into an area and by defining the activities that take place there.

An important objective of IP is to minimize the levels of microbial contamination in areas where patient care and instrument processing take place. These include procedure areas, surgical units, and work areas (where instruments are processed).

Importance of Traffic Flow and Activity Patterns

It is important to direct activity patterns and traffic flow in these areas to keep contaminated areas separate from areas where procedures take place.

Activities such as waste disposal, instrument processing, and cleaning procedure areas should be carefully planned and organized to minimize the risk of infection to patients and health care workers.

Traffic Flow and Activity Patterns

- Have a yellow, leak-proof, covered waste container for disposal of contaminated waste items (cotton or gauze dressings) at point of use.
- Have a puncture-resistant container for safe disposal of sharps (e.g., used suture needles, hypodermic needles and syringes, and disposable scalpel blades) at point of use.
- Have storage space in procedure rooms for sterile or HLD supplies (storage shelves should be enclosed to minimize dust and debris collecting on stored items).

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

Note: Post signs in each surgical unit area to clearly indicate the appropriate environmental control and surgical attire required.

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

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

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

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

Restricted area: This area consists of the OR(s) and scrub sink areas.

- Limit traffic to authorized staff and patients at all times.
- Keep the door closed at all times, except during movement of staff, patients, supplies, and equipment.
- Scrubbed staff must wear full surgical attire and cover head and facial hair with a cap and mask.
- Staff should wear clean, closed shoes that will protect their feet from fluids and dropped items.
- Masks are required when sterile supplies are open and scrubbed staff are operating.
- Patients entering the surgical unit should wear 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).
- Never store instruments and other items in the OR.

Module 13: Transmission-Based Precautions for Health Care Facilities

Module Objective

- ❖ To enable participants to understand the concepts and components of transmission-based precaution and apply them in the health care settings.

Learning Objectives

By the end of this module, participants will be able to:

- ☞ Describe transmission-based precautions.
- ☞ Explain components of transmission-based precautions.
- ☞ Describe the challenges to implementing transmission-based precautions.

Module Content

Handout 13.1: Overview and Components of Transmission-Based Precautions

Handout 13.2: Challenges to Implementing Transmission-Based Precautions

Handout 13.1: Overview and Components of Transmission-Based Precautions

Definition

Transmission-based precautions: Guidelines designed to reduce the risk of transmitting infections that are spread wholly or partly by airborne, droplet, or contact routes between hospitalized patients and health care providers.

If there is any question of an infection in a patient without a known diagnosis, implementing transmission-based precautions should be considered based on the patient's symptoms until a definitive diagnosis is made (empiric use).

Components of Transmission-Based Precautions

Airborne precautions: Airborne precautions prevent the transmission of infectious agents that remain infectious over long distances (particles that are 5 µm or smaller in size and can remain in the air for several hours and be widely dispersed). Examples include TB, chicken pox, and measles.

Airborne precautions are effective in preventing infection with either known or suspected infections like TB, chicken pox, and measles. The precautions include the following components.

Patient placement:

- Patients should be placed in an airborne infection isolation room.
- If a private room is not available, place patients in a room with other patients with the same disease but with no other infection.
- The staff on duty should check all visitors for susceptibility before allowing them to visit, in accordance with established FMOH guidelines.

Respiratory protection:

- Wear a respirator (N95 or equivalent mask) or at least a surgical mask if a respirator is not available.

- If chicken pox or measles is present, no mask is needed for immune persons. Susceptible persons should not enter the room.
- Remove respirator or surgical mask after leaving the room and place it in a yellow or infectious plastic bag or waste container with tight-fitting lid.

Patient transport:

- Limit transport of patients for essential purposes only.
- During transport, patient must wear a surgical mask.
- Notify the area receiving the patient of the need for airborne precautions.
- In areas where TB is prevalent, it is important to have a mechanism to quickly assess patients with suspected TB and put them under airborne precautions.

Droplet precautions: These precautions reduce the risk of transmission of pathogens spread wholly or partly by droplets larger than 5 µm in size (e.g., *Haemophilus influenzae*, *Neisseria meningitides*, *Mycoplasma pneumoniae*, influenza, mumps, and rubella viruses).

Other conditions include diphtheria, pertussis, pneumonic plague, and streptococcal pharyngitis.

Patient placement:

- Place patient in a private room; the door may be left open.
- If a private room is not available, place patient in a room with other patients having active infection with the same disease but with no other infections.
- If neither option is available, maintain at least a space of one meter between patients.
- Drawing the curtain between patient beds is especially important for patients in multi-bed rooms. This is also important for privacy reasons.

Respiratory protection:

- Wear mask if within one meter of patient.
- Use during patient transport.
- Limit transport of patients for essential purposes only.
- During transport, patients must wear surgical mask.
- Notify area receiving patients of the need for droplet precautions.

Contact precautions: Contact precautions are indicated for patients infected or colonized with enteric pathogens, herpes simplex and hemorrhagic fever viruses, and multidrug-resistant bacteria. Chicken pox is spread both by the airborne and contact routes at different stages of illness.

Patient placement:

- A single-patient room is preferred for patients who require it; door may be left open.
- If a private room is not available, place patients only in rooms with other patients with active infection with the same microorganism.
- In multi-patient rooms, a space of at least one meter between beds is advised.

Gloving:

- Wear new examination gloves when entering room.
- Change gloves after contact with infectious materials (or when moving from one site to another).
- Remove gloves before leaving the patient's room.

Hand washing:

- Wash hands with an antimicrobial agent or use alcohol hand rub before entering room and after removing gloves (if patient has *Clostridium difficile* diarrhea, wash hands with soap and water after removing gloves).
- Do not touch potentially contaminated surfaces or items before leaving the room.

Gowns and protective aprons:

- Wear clean, nonsterile gowns when entering the patient's room if patient contact is anticipated or patient is incontinent or has diarrhea, an ileostomy, a colostomy, or wound drainage not contained by dressing.
- Remove gown after leaving room. Do not allow clothing to touch potentially contaminated surfaces or items before leaving the room.

Patient transport:

- Limit transport of patient to essential purposes only.

- During transport, ensure precautions are maintained to minimize risk of transmission of organisms (e.g., cover patient with clean linen and not with the linen that was used on the patient's bed).

Patient care equipment:

- Reserve noncritical patient care equipment for use with a single patient, if possible; otherwise, process as per guidelines.
- Clean and disinfect any equipment shared among infected and noninfected patients after each use.

Handout 13.2: Challenges to Implementing Transmission-Based Precautions

- Staff training is required to understand the rationale for using transmission-based precautions with patients who have infections transmitted by airborne, droplet, or contact routes.
- Additional personal protective equipment is required for implementing transmission-based precautions.
- Regular supervision is needed to assure compliance.
- Where resources are limited, recommendations will need to be modified according to what is possible, practical, and affordable.

Module 14: Tuberculosis Infection Prevention and Control in Health Care Settings

Module Objective

- ❖ To provide participants with appropriate knowledge on the risk of tuberculosis (TB) infection transmission in health care settings and appropriate TB infection prevention and control practices.

Learning Objectives

By the end of this module, participants will be able to:

- Describe how TB can spread in health care facilities.
- Explain how to reduce the risk of TB transmission in health care facilities.
- Discuss components of facility-level TB infection prevention and control.

Module Content

Handout 14.1: Transmission of Tuberculosis in Health Care Facilities

Handout 14.2: Reduction of Tuberculosis Transmission in Health Care Facilities

Handout 14.3: Facility-Level Tuberculosis Infection Prevention

Handout 14.1: Transmission of Tuberculosis in Health Care Facilities

How Does Tuberculosis Spread?

TB is caused by *Mycobacterium tuberculosis*. People who have TB in their lungs or larynx (throat) can release tiny particles containing *M. tuberculosis* into the air by coughing, talking, singing, or sneezing. These particles are called droplet nuclei. They are invisible to the naked eye because they are only about one-millionth of a meter long. Droplet nuclei can remain airborne in ambient air for many hours until they are removed by natural or mechanical ventilation.

For TB to spread, there must be a source that produces *M. tuberculosis* (e.g., person with TB) and others to inhale droplet nuclei containing *M. tuberculosis*. Anyone who shares air with a person with pulmonary or laryngeal TB in an infectious stage is at risk. When another person inhales one or more of the droplet nuclei, he or she can develop TB infection.

When Is Tuberculosis Infectious?

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

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

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

Handout 14.2: Reduction of Tuberculosis Transmission in Health Care Facilities

There are three ways to prevent TB transmission in health care facilities:

- **Preventing TB transmission through good patient management:** Rapidly identifying patients with a “suspicious” cough, suspected TB, or confirmed TB and managing them promptly prevents the transmission of TB in health care facilities.
- **Environmental control measures:** Maximizing natural ventilation and controlling the direction of air flow can reduce the concentration of droplet nuclei in the air. Such measures are used as second-line defense to prevent the spread of TB in high-risk settings and include ventilation (natural and mechanical), filtration, and germicidal irradiation. Although most measures are technologically complex and expensive, controlled natural ventilation (e.g., opening windows to increase natural ventilation and use of fans to control the direction of air flow) can be used to reduce the risk of spreading *M. tuberculosis* in resource-poor settings.
- **Screening health workers for TB and HIV and educating them on TB infection prevention and control:** Health care workers and other staff are also at particularly

high risk of TB infection because of frequent exposure to patients with infectious TB. Health care workers and staff may themselves be immunosuppressed due to HIV infection and be at higher risk of developing TB once infected. The facility-level infection control plan should include: identification of risk areas, assessment of TB among health care workers (where feasible), assessment of HIV prevalence in the patient population (where feasible), assessment of health care worker training needs, area-specific infection control recommendations, and time line and budget (e.g., material and personnel costs). It is essential that one individual be assigned responsibility and accorded authority to monitor the implementation of the infection control plan (FMOH, *Infection Prevention and Patient Safety Reference Manual for Service Providers and Managers in Health Care Facilities of Ethiopia*, February 2011).

Handout 14.3: Facility-Level Tuberculosis Infection Prevention

Administrative prevention:

- Promptly identify people with TB symptoms (triage), separate infectious patients, control the spread of pathogens (cough protocol and respiratory hygiene), and minimize time spent in health care facilities.
- Provide a package of prevention and care interventions for health workers, including HIV prevention, antiretroviral therapy, and isoniazid preventive therapy for HIV-positive health workers.

Environmental prevention:

- Use ventilation systems.
- Use ultraviolet germicidal irradiation fixtures, at least when adequate ventilation cannot be achieved.
- Use PPE.
- Use particulate respirators.

Tuberculosis Airborne Precautions

Within health care settings, TB airborne precautions should be initiated for any patient who has symptoms or signs of TB or who has documented infectious TB and has not completed anti-TB treatment.

Airborne precautions may be discontinued for patients placed in separate rooms because of suspected infectious TB of the lungs, airway, or larynx when infectious TB disease is considered unlikely, and when either:

- Another diagnosis is made that explains the clinical syndrome
- The patient has three consecutive, negative acid-fast bacillus sputum smear results
 - Each of the three sputum specimens should be collected in 8- to 24-hour intervals, and at least one specimen should be an early morning specimen because respiratory secretions pool overnight.

Five Steps for Patient Management to Prevent Transmission of Tuberculosis in HIV Care Setting

1. Screen for suspected or confirmed TB.
2. Educate on cough hygiene.
3. Separate patients suspected of having TB.
4. Provide HIV services.
5. Investigate for TB.

Module 15: Housekeeping

Module Objective

- ❖ To enable participants to acquire the required knowledge and skills on the recommended housekeeping practices in health care facilities.

Learning Objectives

By the end of this module, participants will be able to:

- Explain the importance of housekeeping.
- State the general principles of housekeeping in health care facilities.
- Demonstrate how to prepare disinfectant cleaning solutions.
- Identify cleaning methods.
- List the types of PPE used during cleaning.
- Explain how to clean low- and high-risk areas.

Module Content

Handout 15.1: Introduction to Housekeeping.

Handout 15.2: Cleaning Methods and the Use of Personal Protective Equipment

Handout 15.3: Schedules and Procedures for Cleaning

Handout 15.1: Introduction to Housekeeping

Importance of Housekeeping

Accumulation of dust, soil, and microbial contaminants on environmental surfaces is both aesthetically displeasing and a potential source of health care–acquired infections.

Housekeeping practices in health care facilities include the cleaning of floors, walls, certain types of equipment, tables, and other surfaces. The purpose of general housekeeping is to reduce the number of microorganisms that patients, visitors, staff, and the community may come in contact with and to provide a clean and pleasant atmosphere for patients and staff.

Most areas in hospitals and clinics are low risk, such as in waiting rooms and administrative offices, and can be cleaned using only soap and water. In high-risk areas where heavy contamination is expected, such as toilets and latrines, or with blood or body fluid spills, a disinfectant such as 0.5 percent chlorine or 1 percent phenol should be added to the cleaning solution (South-East Asia Regional Office and WHO 1988).

General Principles for 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 based on 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 dirtiest areas and debris that falls 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.
- Mixing (dilution) instructions 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 area's designated purpose.
- Routine cleaning is necessary to maintain a standard of cleanliness. Schedules and procedures should be consistent and posted.

Cleaning Solutions

Definitions:

- **Cleaning solution:** Any combination of soap (or detergent) and water, with or without a chemical disinfectant, used to wash or wipe down environmental surfaces such as floors, chairs, bench tops, walls, and ceilings.
- **Disinfectant cleaning solution:** Products that are a combination of a detergent (soap) and a chemical disinfectant.

- **Soaps and detergents** (terms used interchangeably): Cleaning products (bar, liquid, leaflet, 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.

Selection of disinfectants and other cleaning products is based on the following factors:

- Intended use of the product(s)
- Efficacy of the product(s)
- Acceptability of the product(s)
- Environmental friendliness of the product(s)
- Safety of the product(s)
- Cost-effectiveness of the product(s)

How to Prepare a Disinfectant Cleaning Solution

Disinfectant cleaning solutions contain both disinfectants for decontamination and detergents (soap) for cleaning. Chlorine-containing solutions should not be mixed with cleaning solutions containing an acid (e.g., phosphoric acid), ammonia, or ammonium chloride (NH₄Cl) (CDC 1991).

To prepare a disinfectant cleaning solution:

1. Prepare a 0.5 percent chlorine solution from liquid concentrates or from chlorine powder compounds. Alternative disinfectants that can be used include 1 to 2 percent phenols or 5 percent carbolic acid.
2. Add enough detergent to the 0.5 percent chlorine solution or other disinfectant to make a mild, soapy cleaning solution.

Handout 15.2: Cleaning Methods and the Use of Personal Protective Equipment

Cleaning Methods

The following are the common methods of cleaning:

- **Wet mopping method:** This is the most common and preferred method to clean floors.

- **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 and 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. This extends the life of the cleaning solution.
- **Triple-bucket technique:** The third bucket is used for wringing out the mop before rinsing, which extends the life of the rinse water.
- **Flooding followed by wet vacuuming method:**
 - Preferable for surgical suits
 - Eliminates mopping and minimizes the spread of microorganisms
 - Increases the contact time of the disinfectant and the area to be cleaned
 - Preferably done at night when the traffic flow of the facility is low
- **Dusting:** For cleaning walls, ceilings, doors, windows, furniture, and other environmental surfaces.
 - Clean cloths or mops are wetted 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 should not be shaken to avoid the spread of microorganisms.
 - Dusting should be performed in a systematic way, using a starting point as a reference point 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 ceilings provide a reservoir for fungal growth).
- **Dry vacuuming:** Only recommended for cleaning carpets.

Personal Protective Equipment for Housekeeping

The housekeeping staff in health facilities deal with dirt, soil, and other materials that expose them to risks of infections and other health hazards. To avoid this hazardous exposure, they have to have relevant PPE. Some PPE for housekeeping purposes include:

1. Gloves, preferably the household utility ones

2. Protective shoes
3. Plastic or rubber aprons
4. Masks
5. Protective eyewear

The housekeeping staff should use the above-mentioned PPE for:

- Handling disinfectant cleaning solutions
- Cleaning patient care areas
- Cleaning heavily contaminated areas
- Handling soiled linens
- Handling soiled items and instruments
- Handling or disposing of wastes
- When spills or splashes are expected

Handout 15.3: Schedules and Procedures for Cleaning

1. Schedules and Procedures for Specific Areas

In health facilities, housekeeping schedules should be planned, written, and closely followed. Cleaning schedules should be developed according to the needs of each area.

- **Walls, windows, ceilings, and doors, including door handles:** Spot clean when visibly dirty with a damp cloth, detergent, and water.
- **Chairs, lamps, tables, tabletops, beds, handrails, grab bars, lights, tops of doors, and counters:** Wipe daily and whenever visibly soiled with a damp cloth containing disinfectant cleaning solution. A disinfectant should be used when contamination is present, such as for blood or other body fluid spills as described below.
- **Noncritical equipment** (e.g., stethoscopes and blood pressure cuffs): Wipe daily and whenever visibly soiled with a damp cloth, detergent, and water. If the equipment is visibly soiled with blood or other body fluids or the patient is under contact precautions, this equipment should be cleaned and disinfected before it is reused.
- **Floors:** Clean floors frequently (daily and as needed) with a wet mop, detergent, and water. A disinfectant should be used when contamination is present, such as for blood or other body fluid spills as described below.

- **Sinks:** Scrub frequently (daily or more often as needed) with a separate mop, cloth, or brush and a disinfectant cleaning solution. Rinse with water.
- **Toilets and latrines:** Scrub frequently (daily and more often as needed) with a separate mop, cloth, or brush and a disinfectant cleaning solution.
- **Patient rooms:** Clean daily and after patient discharge, using the processes described earlier.
- **Procedure rooms:** Wipe horizontal surfaces, equipment, and furniture used for the procedures with a disinfectant cleaning solution after each procedure and whenever visibly soiled. Clean blood or other body fluid spills as described below.
- **Examination rooms:** Wipe horizontal surfaces with a disinfectant cleaning solution after each procedure and whenever visibly soiled.
- **Laboratory:** Wipe countertops with a disinfectant cleaning solution after each shift and whenever visibly soiled.
- **Curtains:** Change and clean curtains according to the routine schedule and when visibly soiled.
- **Carpets:** Vacuum carpets daily in patient rooms and weekly in offices or conference rooms.
- **Waste containers:** Clean contaminated waste containers after emptying each time. Clean noncontaminated waste containers when visibly soiled and at least once a week. Use a disinfectant cleaning solution and scrub to remove soil and organic materials.

2. Schedule and Procedures for the Operating Room

- At the beginning of each day, all flat (horizontal) surfaces (table, chairs, etc.) should be wiped down with a clean, lint-free moist cloth to remove dust and lint that may have collected overnight.
- Total cleaning or terminal cleaning (mopping floors and scrubbing all surfaces from top to bottom) of the OR should be done at the end of each day. Total cleaning is not necessary between surgical procedures.
- Do not dry mop or sweep the OR (this causes dust, debris, and microorganisms to become airborne and contaminate clean surfaces).

Total cleaning:

Step 1: Move covered decontamination buckets to the central supply or processing room. A clean bucket containing a fresh 0.5 percent chlorine solution, or other locally available and approved disinfectant, should be provided at the beginning of each day.

Step 2: Remove covered contaminated waste container and replace it with a clean container. Arrange for burning (incineration) or burial as soon as possible.

Step 3: Close and remove sharps containers when three-quarters full.

Step 4: Remove soiled linen in closed leak-proof containers.

Step 5: Soak a cloth in disinfectant cleaning solution and wipe down all surfaces, including counters, tabletops, sinks, lights, etc. Wash from top to bottom, so that any debris that falls on the floor can be cleaned up last.

- **Walls and ceilings:** Wipe with a damp cloth, detergent, and water as needed for visible soil.
- **Chairs, lamps, sink tabletops, and counters:** Wipe with a damp cloth and disinfectant cleaning solution.
- **OR lamp:** Wipe with a damp cloth and disinfectant cleaning solution.
- **OR table:** Wipe with a 0.5 percent chlorine solution (or other approved disinfectant) to decontaminate. Then clean top, sides, base, legs, and any accessories (e.g., leg stirrups) with a damp cloth and disinfectant cleaning solution.
- **Floors:** Clean with a wet mop using a disinfectant cleaning solution.
- **Vents** (heating or air conditioning): Wipe with a damp cloth, soap, and water.

Between each case, do the following:

- **Spills:** Clean spills with a 0.5 percent chlorine solution.
- **OR bed:** Wipe all surfaces and mattress pads with a disinfectant cleaning solution.

- **Instrument tables (trolley and Mayo stand) and other flat surfaces:** Wipe all flat surfaces that have come in immediate contact with a patient or body fluids with a disinfectant cleaning solution.
- **Center of OR surrounding the OR bed:** Mop with a disinfectant cleaning solution (if visibly soiled).
- **Waste:** Collect and remove all waste from the OR in closed leak-proof containers.
- **Sharps containers:** Close and remove containers from the OR when they are three-quarters full.
- **Containers with a 0.5 percent chlorine solution for decontamination:** Remove covered containers with instruments from the OR and replace them with clean containers with a fresh 0.5 percent chlorine solution.
- **Soiled linen:** Remove soiled linen in leak-proof, covered waste containers.

3. How to clean spillage of blood and other bodily fluids:

- Clean spillage of blood, body fluids, and other potentially infectious fluids immediately.
- **For small spills:** While wearing utility or examination gloves, remove visible material using a cloth soaked in a 0.5 percent chlorine solution, and then wipe clean with a disinfectant cleaning solution.
- **For large spills:** While wearing gloves, flood the area with a 0.5 percent chlorine solution, mop up the solution, and then clean as usual with detergent and water.

4. How to clean soiled and contaminated cleaning equipment:

- Step 1:** Decontaminate cleaning equipment that has been contaminated with blood or body fluids by soaking it for 10 minutes in a 0.5 percent chlorine solution or another locally available and approved disinfectant.
- Step 2:** Wash cleaning buckets, cloths, brushes, and mops with detergent and water daily, or sooner if visibly dirty.
- Step 3:** Rinse in clean water.
- Step 4:** Dry completely before reuse (wet cloths and mop heads are heavily contaminated with microorganisms).

Fumigation and the Use of Ultraviolet Light

Fumigation of rooms with formaldehyde gas is an ineffective method in reducing risk of infection (Schmidt 1899). Moreover, formaldehyde vapors are irritating to the skin, eyes, and respiratory tract. Formaldehyde also has a pungent odor and is classified as a potential carcinogen; therefore, the use of formaldehyde in this form is not recommended.

Although in theory intense ultraviolet (UV) light can be both bactericidal and viricidal, in practice, only limited disinfection of instruments can be achieved. This is because the UV rays can kill only those microorganisms that are struck directly by UV light beams.

Other disadvantages of UV light:

- It requires a reliable source of electricity.
- It is not effective in areas of high relative humidity.
- UV bulbs require frequent cleaning to remain effective.
- Exposure to UV rays can burn the skin and eyes.

Module 16: Health Care Waste Management

Module Objectives

- ❖ To equip participants with the required knowledge and skills on the proper health care waste management systems in health care facilities.

Learning Objectives

By the end of this module, participants will be able to:

- Identify the various types of health care waste.
- Identify the risks related to health care waste.
- Describe the methods and steps in health care waste management.

Module Content

Handout 16.1: Introduction to Health Care Waste

Handout 16.2: Management of Health Care Waste

Handout 16.1: Introduction to Health Care Waste

Health care waste is a byproduct of health care that includes potential risk and nonrisk wastes. It includes all the waste generated by health care establishments, research facilities, and laboratories. Health care waste can be classified as high-risk and low-risk wastes depending on the level of the risk they pose to the health provider, patient, and community.

High-Risk Waste

High-risk waste includes the following:

- **Infectious waste:**
 - Blood, blood products, and other bodily fluids or items contaminated with similar fluids

- Cultures and stocks of infectious agents from the laboratory and items contaminated with such agents
- Isolation waste from highly infectious patients (including food residue)
- Discarded live and attenuated vaccines
- Waste, bedding, bandages, surgical dressings, and other contaminated material infected with human pathogens
- **Anatomical waste:**
 - Human tissues, body parts, and fetuses
 - Biopsies, carcasses, organs, and tissues infected with human pathogens
- **Sharps waste (used or unused):**
 - Syringes, needles, scalpel blades, suture needles, razors, and intravenous set needles
- **Chemical waste:**
 - Formaldehyde, photographic chemicals, solvents, organic and inorganic chemicals
- **Pharmaceutical waste:**
 - Outdated medications and residuals of drugs used in chemotherapy
 - Items contaminated by or containing pharmaceutical bottles/boxes
- **Radioactive waste:**
 - Contamination with radioactive isotopes
- **Genotoxic waste:**
 - Cytostatic drugs
 - Vomit, urine, or feces from patients treated with cytotoxic drugs, chemicals, and radioactive material
- **Pressurized containers:**
 - Explosion of cylinders containing gases or aerosols
- **Waste with high content of heavy metals:**
 - Batteries, broken thermometers, blood pressure gauges, etc.

Low-Risk Waste

Noninfectious waste:

Commercial waste is noncontaminated waste and poses no infectious risk to persons who handle it. Examples include paper, trash, boxes, bottles, plastic containers, leftover foods, and food products.

Not all health care waste is risky; most waste (80 to 85 percent) generated from health care facilities is believed to be noninfectious and nonrisky (FMOH, *Infection Prevention and Patient Safety Reference Manual for Service Providers and Managers in Health Care Facilities of Ethiopia*, February 2011). The proportion of waste generated from health care is as follows:

- Noninfectious waste: 80 percent
- Pathological waste and infectious waste: 15 percent
- Sharps waste: 1 percent
- Chemical or pharmaceutical waste: 3 percent
- Pressurized cylinders, thermometers: less than 1 percent

Risks of Health Care Waste

Inadequate and inappropriate handling of health care waste may have serious public health consequences and a significant impact on the environment. Injuries, transmission of infections, environmental pollution, fire hazards, and public nuisance (offensive smells, unsightly debris, etc.) are the major risks and hazards of poorly managed health care waste.

Improper health care waste management can expose health workers, patients, and the community to the risk of being exposed and potentially infected by blood-borne pathogens. Studies revealed that 33 percent of HBV and 42 percent of HCV infections occur due to direct or indirect exposure to infectious waste (WHO 2005a). Improper health care waste management can also expose people to gastroenteric and respiratory infections.

In addition to health risks from direct contact, health care waste can impact human health by contaminating bodies of water and polluting the air. Emission of persistent organic pollutants/toxic gases like dioxins, furans, and polychlorinated biphenyls is dangerous to human health.

Handout 16.2: Management of Health Care Waste

Key Steps in Health Care Waste Management

The key steps in the management of health care waste are as follows.

Waste Minimization/Containment

Waste minimization is the first and best way to reduce health care waste quantities and costs, environmental impact, and exposure to health care workers, patients, and communities. Effective waste minimization practices require that the purchases of all materials and supplies be made with waste reduction in mind.

Segregation

Waste segregation is separating waste by type at the place where it is generated. Waste should immediately be separated by the person generating the waste, according to its type, and placed in a bin with an appropriate colored bin liner or into a sharps container. Waste handlers should never sort through waste after it has been placed in the bin. The color-coding system aims at ensuring immediate and nonequivocal identification and segregation of the hazards associated with the type of health care waste that is handled or treated. It is very important that both providers and waste handlers understand the color-coding system and handle waste accordingly. The following table shows the recommended color coding for categories of health care waste.

Category	Example	Color of Bin Liner
Noninfectious	Paper, packing materials, plastic bottles, food, cartons	Black
Infectious	Gloves, dressings, blood, body fluids, used specimen containers	Yellow with biohazard symbol
Highly infectious	Anatomical waste, pathological waste	Red with biohazard symbol
Chemical	Formaldehyde, pathological chemicals, solvents, organic and inorganic chemicals	Brown
Radioactive	Any solid, liquid, or pathological waste contaminated with radioactive isotopes of any kind	Yellow with radioactive label
Sharps	Needles, needles from intravenous sets, scalpels, blades, lancets, broken glass, syringes, and needles	Yellow box marked "SHARPS" with biohazard symbol

Waste Handling, Collection, and Storage

Waste handling refers to activities involving the handling of waste at the health care facility as well as its collection and storage.

- **Waste collection** is the process of removing waste bags from the service point and taking to storage or disposal area. It also includes quantifying waste by volume, labeling as to its source, and recording.
- **Waste storing** is the process of placing waste in a secure place until it can be disposed of. The ideal storage area should be designated (for waste only), secure (only authorized persons should have access), and kept clean, dry, and pest free. The designated central storage facility should be located within the premises of the health facility, close to the treatment unit but away from food storage or food preparation areas. Health care waste should be stored for no longer than two to three days, depending on weather conditions. However, in the case of safety boxes, the filled box can be stored in a locked room for up to one week at lower-

level health care facilities where there is no incinerator. Organic waste should be disposed of daily. Segregation must be maintained throughout until final disposal.

Waste Transportation

Waste transportation is movement of waste from one place to another. Waste transportation can be either on-site or off-site and should also maintain waste segregation.

- **On-site:** Moving waste from one point to another within the health care facility
- **Off-site:** Transporting waste outside the health facility

Treatment and Disposal

Health care waste is treated to render it nonhazardous. Noninfectious waste does not need to be treated. Disposal is a process of eliminating health care waste without posing any risk to health facility workers or the general public.

The following are health care waste treatment and disposal options at the health care facility level:

- **Sharps waste:**
 - Incineration using properly built and maintained medium- or high-temperature incinerator on-site
 - Transport to off-site incinerators, if there is centralized treatment service
 - On-site burial in a protected pit
- **Infectious waste:**
 - On-site burial in a protected pit
 - On-site incineration in a medium- or high-temperature incinerator provided that the incinerator is standard and capable of destroying such wastes
 - Transport to off-site treatment/disposal site, if the service is available
- **Nonrisk waste:**
 - Collection by municipal truck or other private trash collection firm for landfill disposal

Recommended Disposal Methods of Health Care Waste

1. Burial in a protected pit:

- Waste is placed into a pit (1 to 2 meters wide, 2 to 5 meters deep, and at least 1.5 meters above the water table) and covered with soil.
- Protected burial pits are an acceptable, and perhaps the most appropriate, disposal option for infectious wastes in rural health care facilities.
- Pits should be at least 50 meters away from any waste source, be fenced to restrict unauthorized access, and be located away from public areas.
- Keep waste covered with a 10- to 30-cm layer of soil every time waste is added to the pit.
- Only contaminated and hazardous waste needs to be buried.
- Expired vaccines and drugs should be encapsulated and buried. Place the expired drugs and vaccines in a hard container such as a metal drum. When the container is mostly full (3/4) add a mixture of 1 part cement, 1 part lime, 4 parts sand, and 1/3 to 1/2 part water. Lime works as a disinfectant, and it also helps the cement flow into empty spaces to completely surround the waste. Seal the container and bury it in a pit. Expired vaccines and drugs should not be burned unless there is appropriate incineration technology.
- When the level of waste reaches to within 30 to 50 cm to the surface of the ground, completely fill the pit in with soil and dig another pit.
- **Advantages:** Simple and inexpensive
- **Disadvantages:** Can handle only a small volume of waste in areas where there is shortage of space and presents a danger to the community if not buried or covered properly

2. Burn (FMOH, *Infection Prevention and Patient Safety Reference Manual for Service Providers and Managers in Health Care Facilities of Ethiopia*, February 2011):

- Waste is placed into a pit and burned on a regular basis (at least once a week, according to volume of waste and size of pit). Waste must be burned thoroughly, and ashes must be covered with soil.
- Pits should be dug 1 to 2 meters wide and to a depth of 2 to 5 meters, but also at least 1.5 meters above water table.

- The pit should be fenced off 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.
- Open burning (outside of a pit, on the ground) should not be practiced.
- Medical waste may not burn easily, especially if it is wet. Add kerosene to make the fire hot enough to burn all wastes.

3. Medium- or high-temperature incineration:

- Incineration is medium- or high-temperature burning. It reduces the volume of the waste and, if high enough temperatures are reached, eliminates pathogens.
- Proper incineration produces fewer pollutants than open-air burning and is preferred if a good-quality incinerator is available with a well-trained operator. Proper incineration includes:
 - Clear operation procedures
 - Trained operator
 - Reliable segregation system
 - Reliable transport system
 - Ash pit
 - Maintenance performed on schedule
 - Adequate supply of fuel
 - Secured incinerator

When using incinerator:

- Keep incinerator clean. Remove ash from ash chamber and grate and dispose the ash into ash pit. Do not store waste in incinerator.
- Some incinerators need to be preheated by burning general or nonmedical waste (e.g., paper) until the incinerator reaches the recommended temperature for incinerating health care waste (800°C in the burning chamber).
 - Polyvinyl chloride plastics (like blood bags and intravenous lines), large amounts of reactive chemical waste, silver salts and photographic or radiographic waste (x-ray materials), waste with high mercury (such as broken mercury thermometers) or cadmium content, batteries, aerosol cans or pressurized gas containers, and glass vials must never be incinerated. **N.B. Syringes are not made of polyvinyl chloride plastic and are therefore safe to burn.**

- **Advantages:** Treats and greatly reduces waste volume
- **Disadvantages:** Overfilling the combustion chamber and wastes with high moisture content can produce smoke, and also may produce emission and hazardous ash that contain dioxins and metals. It may require pollution control equipment to meet local environmental regulation.

Module 17: Medication Safety

Module Objective

- ❖ To enable participants to understand the basic concepts and importance of medication safety.

Learning Objectives

By the end of this module, participants will be able to:

- Define medication safety.
- Explain the importance of medication safety.
- Describe the standards of medication safety.
- Identify common causes of medication errors.
- Explain the possible measures to prevent medication errors.

Module Content

Handout 17.1: Medication Safety

Handout 17.2: Medication Reconciliation and Medication Management

Handout 17.1: Medication Safety

Background

- Errors are common when medications are procured, prescribed, dispensed, administered, and monitored, but they occur most frequently during the prescribing and administering processes.
- In some countries, up to 67 percent of patient prescription medication histories have one or more errors and up to 46 percent of medication errors occur when new orders are written at time of patient admission or discharge (FMOH, *Infection Prevention and Patient Safety Reference Manual for Service Providers and Managers in Health Care Facilities of Ethiopia*, February 2011).

- **Medication reconciliation** is a process of preventing medication errors at patient transition points.

Causes of Medication Errors

- The existence of confusing drug names
- Nonproprietary names and proprietary (brand or trademarked) names
- Drug names that look or sound like other drug names
- Medicines, although marketed under the same or similar-sounding brand names, that contain different active ingredients in different countries
- The same drug marketed by more than one company and that has more than one brand name
- Illegible handwriting
- Incomplete knowledge of drug names
- Newly available products
- Similar packaging or labeling
- Similar clinical use
- Similar strengths
- Dosage instructions
- Frequency of administration
- The failure of manufacturers and regulatory authorities to recognize the potential for error and to conduct rigorous risk assessments, both for nonproprietary and brand names, prior to approving new product names

Practical Guidance on Giving Medications

Precautions in giving medication:

- DO NOT use a single-loaded syringe to administer medication to several patients (i.e., ensure one needle, one syringe, one patient!).
- DO NOT change the needle in order to reuse the syringe.
- DO NOT use the same mixing syringe to reconstitute several vials.
- DO NOT combine leftover medications for later use.

Single-dose vials: Whenever possible, use a single-dose vial for each patient to reduce cross-contamination between patients.

Multi-dose vials: Only use multi-dose vials if there is no alternative.

- Open only one vial of a particular medication at a time in each patient care area.
- If possible, keep one multi-dose vial for each patient, and store it with the patient's name on the vial in a separate treatment or medication room.
- DO NOT store multi-dose vials in the open ward, where they could be inadvertently contaminated with spray or spatter.
- Discard a multi-dose vial if sterility or content is compromised:
 - If the expiry date has passed (even if the vial contains antimicrobial preservatives)
 - If it was not properly stored after opening
 - If it is found to be undated, improperly stored, inadvertently contaminated, or perceived to be contaminated, regardless of expiration date.
- Pop-open ampoules: Whenever possible, use pop-open ampoules rather than ampoules that require use of a metal file to open. If using an ampoule that requires a metal file to open, protect your fingers with a clean barrier (e.g., a small gauze pad) when opening the ampoule.

Handout 17.2: Medication Reconciliation and Medication Management

Medication Reconciliation

Medication reconciliation is a process designed to prevent medication errors at patient transition points. Another critical factor upon which medication reconciliation depends is the appropriateness of the medications prescribed in relation to the patient's illness and underlying conditions. The medication reconciliation process provides opportunities to reconsider the appropriateness of a patient's medications over time if the patient's condition changes or if other prescribers become involved.

The following factors are important for medication reconciliation:

- Creating an accurate list of medications that the patient is currently taking
- Comparing the list against the admission, transfer, and/or discharge orders when writing medication orders; identifying and bringing any discrepancies to the attention of the prescribing health professional; and, if appropriate, making changes to the orders while ensuring that all changes are well documented

- Updating the list as new orders are created to reflect all of the patient's current medications
- Communicating the list to the next provider of care whenever the patient is transferred
- Providing the list to the patient at the time of discharge
- Effectively engaging the patient and family in medication reconciliation by:
 - Providing patients and their caregivers with written medication information
 - Instructing patients and families to alert a health care professional whenever a medicine appears to be different
 - Avoiding confusion by reminding them about the five rights:
 - Right person
 - Right drug
 - Right dosage
 - Right route
 - Right time and frequency
- Educating patients about safe medication use and providing access to reliable, relevant, and understandable information about their medications
- Encourage patients, families, and caregivers to keep and maintain an accurate list of all medications, including prescription and nonprescription medications
- Teaching patients about the risks of medications, paying particular attention to patients on multiple medications prescribed by multiple caregivers

Medication Management

Ensure that health care organizations have clear policies and procedures in place, such that:

1. The patient's current medication list is displayed in a consistent and highly visible location (e.g., in the patient's chart), so that it is easily accessible to clinicians who are writing drug orders or prescriptions.
2. The home medication list is used as a reference when ordering medications at the time of treatment in a clinic or emergency unit or upon admission to an inpatient service.
3. The current medication list is provided to the receiving caregiver(s) at each care transition point (admission, transfer, discharge, outpatient visit).

4. Training on procedures for reconciling medications is integrated into the educational curricula, orientation, and continuing professional development for health care professionals.

Whenever possible:

1. Validate the home medication list with the patient.
2. Determine the patient's actual level of compliance with prescribed dosing.
3. Determine the source(s) of the patient's medications.

Procedural Standards of Medications

Medication orders are not to be carried out unless all of the elements listed below are present. If an element is missing, the physician who issued the order should be called upon to complete the order.

- Date and time: Note when the order was written.
- Full name of the medication: Either the chemical or generic name can be used without abbreviations.
- Dosage: Specify the amount of medicine to be given. Abbreviations are discouraged.
- Concentration: If the medication is to be diluted in intravenous fluid, state the amount and type of diluents(s) ordered.
- Duration: If the medication is to be given over a period of time, such as via intravenous administration, the duration of the infusion ordered should be recorded by the physician. Nurses should then convert and document the duration of infusion into number of (micro-) drops per minute.
- Time and frequency: The time of day and how often a medication is to be given, as ordered by the physician.

The nurse who transcribes the order will identify the specific time that the medication is to be given by following a standardized schedule.

- Route: For medications that can be given in several ways, the route of administration needs to be clearly stated.
- Physician signature: This should be clearly written immediately following the order.
- Once medications are received by the dispensing nurse, there should be a confirmation at every dispensing of the following:

- Patient identification
- Name on medication container dosage and timing
- Any adverse effects

Management of Look-Alike, Sound-Alike Medications

To reduce one of the most common causes of medication errors, facilities should actively identify and manage the risks associated with look-alike, sound-alike medications by:

- Annually reviewing the look-alike, sound-alike medications used in their facility
- Implementing clinical protocols that:
 - Minimize the use of verbal and telephone orders
 - Emphasize the need to carefully read the label each time a medication is accessed and again prior to administration, rather than relying on visual recognition, location, or other less specific cues
 - Emphasize the need to check the purpose of the medication on the prescription/order and, prior to administering the medication, check for an active diagnosis that matches the purpose/indication
 - Include both the nonproprietary name and the brand name of the medication on medication orders and labels, with the nonproprietary name in proximity to and in larger font size than the brand/proprietary name
- Developing strategies to avoid confusion or misinterpretation caused by illegible prescribing or medication orders
- Storing problem medications (narcotic and psychotropic medications) in separate locations or in nonalphabetical order, such as by bin number or on shelves
- Developing strategies to involve patients and their caregivers in reducing risks through ensuring that all steps in the medication management process are carried out by qualified and competent individuals

Module 18: Post-Exposure Prophylaxis

Module Objective

- ❖ To enable participants to understand the role of post-exposure prophylaxis (PEP) in the prevention of HIV, HBV, and HCV infections in health care settings.

Learning Objectives

By the end of this module, participants will be able to:

- Define PEP.
- Describe HIV occupational exposure and indications for PEP.
- Identify steps in the management of clients with exposure to HIV.
- Identify the recommended PEP drugs and discuss their efficacy.
- Explain the management of occupational exposure to HIV, HBV, and HCV.
- Practice documentation and reporting of PEP treatment.

Module Content

Handout 18.1: Definition of Terms Used in Post-Exposure Prophylaxis Treatment Delivery

Handout 18.2: Risk of Acquiring HIV, Hepatitis B Virus, and Hepatitis C Virus Infections

Handout 18.3: Benefits of Administering Post-Exposure Prophylaxis Treatment

Handout 18.4: Recommended Steps in Administering Post-Exposure Prophylaxis Treatment

Handout 18.5: Management of Post-Exposure Prophylaxis in Nonoccupational Exposures

Handout 18.6: Follow-Up of People Receiving Post-Exposure Prophylaxis Treatment and Documenting, Monitoring, and Evaluating Post-Exposure Prophylaxis Treatment in Health Care Facilities

Handout 18.1: Definition of Terms Used in Post-Exposure Prophylaxis Treatment Delivery

Definitions

- **PEP** is generally understood to mean the medical measures taken to prevent the transmission of blood-borne pathogens following a potential exposure to these pathogens. In the context of HIV, PEP refers to the set of services that are provided to manage the specific aspects of exposure to HIV to help prevent HIV infection in a person exposed to the risk of getting infected by HIV. These services comprise first aid, counseling (including the assessment of risk of exposure to the infection), HIV testing, and, depending on the outcome of the exposure assessment, the prescription of a 28-day course of antiretroviral (ARV) drugs, with appropriate support and follow-up.
- **Occupational exposure** is exposure of individuals to HIV and other blood-borne pathogens in the course of their work. This should not be assumed to be solely related to health care workers; other workers, such as emergency rescue staff, waste disposal workers, law enforcement personnel, and firefighters, among others, may be exposed to blood and other potentially infectious bodily fluids while performing their work duties.
- **Nonoccupational exposure** is exposure to HIV and other blood-borne pathogens outside the work setting; this term predominantly refers to potential exposure through sexual assault. Other forms of potential nonoccupational exposure include those arising from needle sharing among injection drug users, potential exposure through consensual sex, needle-sticks in the community, fights, playground incidents resulting in bleeding by an HIV-positive child, and mass casualties, such as road traffic accidents.
- **Exposed person:** This is the person who is potentially at risk of acquiring HIV (and/or an infection from other pathogens) through exposure to blood or bodily fluids in his or her occupation or in another nonoccupational situation.
- **Source person:** This is the person who is either identified or not identified as the possible source of contamination through potentially infectious blood or bodily fluid. If the serostatus of the source person is unknown, he or she may be asked to provide informed consent to HIV testing. The source person may be a patient if a health care

worker is exposed (in occupational exposures) or the perpetrator in the case of sexual assault.

Handout 18.2: Risk of Acquiring HIV, Hepatitis B Virus, and Hepatitis C Virus Infections

The risk of acquiring HIV after a mucous membrane exposure to blood is approximately 0.09 percent, and the risk of acquiring HIV through a percutaneous exposure is approximately 0.3 percent (Cardo et al. 1997). The risk of acquiring HIV percutaneously is higher with deeper injuries, visibly bloody devices, and more advanced disease (likely due to a higher viral load) in the source patient. Hollow-bore needle exposures have higher risk of transmission than solid-bore needle exposures.

Evidence supports the recommendation that PEP drugs be started for exposed persons (based on the indication) as early as possible, preferably within 2 hours of exposure, but giving PEP drugs after 72 hours of exposure is not generally recommended.

HBV infection is a well-recognized occupational risk for health care providers (Mast and Alter 1993). The risk of HBV infection is primarily related to the degree of contact with blood in the work place and also to the hepatitis B e antigen (HBeAg) status of the source person. The risk of developing clinical hepatitis, if the blood is both hepatitis B surface antigen (HBsAg) and HBeAg positive, is 22 to 31 percent. The risk of developing serologic evidence of HBV infection is 37 to 62 percent. By comparison, the risk of developing clinical hepatitis from a needle contaminated with HBsAg-positive, HBeAg-negative blood is 1 to 6 percent, and the risk of developing serologic evidence of HBV infection is 23 to 37 percent (Werner and Grady 1982).

The risk of HCV transmission from a percutaneous exposure is approximately 1.8 percent (Alter 1997; Lanphear et al. 1994; Mitsui et al. 1992; Puro, Petrohilos, and Ippolito 1995). HCV is rarely transmitted from mucous membrane exposure to blood (in two documented cases, the source patient was HIV/HCV co-infected), and HCV transmission has never been documented following a blood exposure to intact or nonintact skin

Handout 18.3: Benefits of Administering Post-Exposure Prophylaxis Treatment

- Both direct and indirect evidence suggests that treatment with ARVs soon after exposure to HIV decreases the risk of transmission.
- Evidence also shows significant reduction in mother-to-child HIV transmissions as a result of ARV therapy of varying composition and duration given to the mother and the newborn.
- PEP is effective when initiated within 72 hours of exposure.
- ARV treatment immediately after exposure to HIV can reduce the risk of infection by about 80 percent (FMOH, *Infection Prevention and Patient Safety Reference Manual for Service Providers and Managers in Health Care Facilities of Ethiopia*, February 2011).

Handout 18.4: Recommended Steps in Administering Post-Exposure Prophylaxis Treatment

Steps in clinical management of HIV PEP are as follows:

1. Person reports exposure:
 - a. Provide first aid, assess the type and severity of exposure, use decision-making tools to assess the exposure, and decide eligibility for PEP.
2. Eligibility: eligible if the following four criteria are fulfilled:
 - a. Exposure within last 72 hours
 - b. Exposed individual not known to be infected with HIV
 - c. Significant exposure
 - d. Person who was the source of exposure is HIV infected or has unknown HIV status.
3. Informed consent for PEP:
 - a. Provide information about risks and benefits of PEP.
 - b. Provide health education and counseling on adherence, side effects, risk reduction, etc.
 - c. Consent may be given verbally.
 - d. Perform baseline HIV test in the exposed person.
 - e. Give information, education, and communication materials on HIV prevention.

4. Additional laboratory evaluations:
 - a. Rapid HIV test of the source person; if feasible and based on informed consent and standard operating procedures, also consider testing the source patient for HBV and HCV (if available)
 - b. Pregnancy testing of exposed person if the person is female in reproductive age group
 - c. Hemoglobin (especially if zidovudine-containing PEP regimens are to be used)
 - d. HBV and HCV screening if available
5. ARVs:
 - a. Two nucleoside analogue reverse transcriptase inhibitors \pm boosted protease inhibitor
 - b. Give doses of ARVs for three to five days (starter packs)
6. Time to initiation:
 - a. The initial dose of ARV treatment should be given as soon as possible but no later than 72 hours after exposure. Duration of therapy is 28 days.
7. Link to ARV treatment clinic and subsequent follow-up:
 - a. The person started on PEP needs to report to the ARV treatment clinic in the next working day for further follow-up. The exposed person should have a minimum of six visits to the ARV treatment clinic up to the sixth-month HIV test.
 - b. In the ARV treatment clinic, assess and manage side effects and assess and support adherence.
 - c. Give continued health education and counseling on side effects, the importance of treatment completion with good adherence, risk reduction, social support, and safety (occupational and nonoccupational) at the first ARV treatment clinic visit, at the second week, and at the fourth week.
 - d. Conduct follow-up HIV testing at six weeks, three months, and six months after exposure.
8. Referral: Provide intrafacility and interfacility referrals as appropriate.
9. Record keeping: Maintain accurate and confidential records.

Assessment of Exposure Risk

Low-risk exposure:

- Exposure to a small volume of blood or blood-contaminated fluids from asymptomatic HIV-positive patients
- Following injury with a solid needle
- Asymptomatic source patient

High-risk exposure:

- Exposure to a large volume of blood or potentially infectious fluids
- Exposure to blood or potentially infectious fluids from a patient with clinical AIDS or acute HIV infection
- Injury with a hollow needle
- Needle used in source patient artery or vein
- Visible blood on device
- Deep and extensive injury

Table 18.1. Recommendations for post-exposure prophylaxis after occupational exposure

Site of Exposure	HIV Status of Source Person		
	Unknown	Positive	
		Low Risk	High Risk
Mucosal splash/nonintact skin	Consider two-drug regimen	Recommend two-drug regimen	Recommend three-drug regimen
Percutaneous (sharps)	Recommend two-drug regimen	Recommend two-drug regimen	Recommend three-drug regimen

Table 18.2. Recommended antiretroviral drug regimens for post-exposure prophylaxis

Antiretroviral Drug Regimen	Dose	Frequency	Duration
Two-drug regimen: zidovudine (AZT) + lamivudine (3TC)	AZT 300 mg 3TC 150 mg	Every 12 hours	28 days
Three-drug regimen: AZT + 3TC + efavirenz (EFZ) <i>Lopinavir/ritonavir (LPV/r) can be used as alternative if available.</i>	AZT 300 mg 3TC 150 mg EFZ 600 mg (daily) LPV/r 400 mg/100 mg	Every 12 hours	28 days

Post-Exposure Management of HBV

- First dose of HBV immunoglobulin (0.06 mL/kg intramuscular) should be given within seven days of exposure, and second dose should be given approximately one month later.
- Those previously infected with HBV are immune to reinfection and do not require PEP.

Post-Exposure Management of HCV

- At this time, there is no effective post-exposure vaccine or drug prophylaxis for HCV.
- Prevention of exposure, therefore, is the only effective strategy.

Handout 18.5: Management of Post-Exposure Prophylaxis in Nonoccupational Exposures

The per-contact risk of HIV transmission from sexual exposure varies according to the nature of the exposure. The estimated risks are 1 to 30 percent with receptive anal intercourse, 0.1 to 10.0 percent with insertive anal intercourse and receptive vaginal intercourse, and 0.1 to 1.0 percent with insertive vaginal intercourse. Compared with other forms of intercourse, oral sex is considered to pose a lower risk of HIV transmission.

The risks of sexual transmission are difficult to quantify and are influenced by many factors, including the presence or absence of concomitant genital ulcer disease, other concurrent diseases and cervical or anal dysplasia, circumcision status, the viral load in the genital tract, and the degree of viral virulence. The estimated risk of transmission associated with sharing needles for injection drug use is approximately 0.67 percent per needle-sharing contact.

The 2007 HIV/AIDS policy of the Federal Democratic Republic of Ethiopia states that PEP service should be made accessible to people who have experienced occupational exposures as well as to rape survivors.

Evaluation of Persons Seeking Care after Potential Nonoccupational Exposure to HIV

Evaluation of survivors of sexual assault includes:

- Detailed medical history including details of sexual assault, and complete physical examination with a focus on genital examination: examine and document any change noticed on the external and internal genital exam in a stepwise fashion.
- Vaginal examination (speculum and digital) is rarely indicated in cases of sexual assault. The indications include:
 - Active bleeding that is not localized on external evaluation
 - Vaginal discharge that is copious and needs to be localized and other similar conditions
 - For forensic evidence and lab investigations to take vaginal swab for spermatozoa. This should be obtained with cotton-tipped applicator from the interior of the vaginal wall.

Also assess:

- The HIV status of the potentially exposed person
- The timing and characteristics of the most recent exposure
- The frequency of exposures to HIV
- The HIV status of the source
- The likelihood of concomitant infection with other pathogens
- Negative health consequences of the exposure event

Nonoccupational PEP is less likely to be effective if initiated after 72 hours after exposure to HIV. If initiation of nonoccupational PEP is delayed, the likelihood of any benefit might not outweigh the risks inherent in taking ARV medication. However, in the case of ongoing sexual assault that occurs over a number of hours or days, the 72-hour time limit should be applied to the most recent potential exposure.

HIV Status of Source

If possible, source persons should be tested for HIV. If the risk associated with the exposure is considered substantial, nonoccupational PEP can be started pending determination of the HIV status of the source and then stopped if the source is determined to be not infected.

Recommendations after sexual assault:

1. All women 14 years and older presenting to a health facility after potential exposure to HIV during sexual assault should be counseled by the examining health care worker about the potential risk of HIV infection.
2. Parents/guardians of traumatized children should be counseled and informed on the risk of HIV infection after sexual assault.
3. The following points should be covered in the counseling:
 - a. The exact risk of transmission is not known, but it exists.
 - b. It is important to know the victim's HIV status prior to any ARV treatment.
 - c. It is the patient's choice to have immediate HIV testing, or if he or she prefers, this can be delayed until 72 hours after the examination visit (management guidelines on sexual assault provide for a three-day starter pack for those who prefer not to test immediately or those who are not ready to receive results immediately). However, encourage the patient to be tested.
 - d. PEP is not recommended after 72 hours following sexual assault. Patients should be counseled about risk of infection and the possibility of transmitting infection during seroconversion. They should be instructed to return at six weeks and three months after the sexual assault for voluntary counseling and HIV testing.
4. It is strongly recommended that the implementation of post-rape prophylaxis should be carefully monitored and evaluated for:
 - Psychosocial and legal support
 - Screening for conventional sexually transmitted infections and follow-up management
 - Drug side effects
 - Seroconversion

Recommendations for Post-Exposure Prophylaxis after Sexual Assault

PEP is not recommended:

1. If the victim presents more than 72 hours after exposure
2. Following condom leak or tear

Recommended regimen:

- Zidovudine/lamivudine/efavirenz or stavudine/lamivudine/efavirenz should be given for 28 days.
- Alternatively, lopinavir/ritonavir can substitute efavirenz.

Handout 18.6: Follow-Up of People Receiving Post-Exposure Prophylaxis Treatment and Documenting, Monitoring, and Evaluating Post-Exposure Prophylaxis Treatment in Health Care Facilities

Follow-Up of People Taking Post-Exposure Prophylaxis

Dispense three to five days' worth of PEP drugs to people receiving PEP treatment immediately after the eligibility for the patient has been confirmed.

The person receiving PEP treatment should report to the ARV therapy clinic on the next working day for follow-up, continued health education, counseling, and support. In the ARV therapy clinic, the PEP client is expected to have a minimum of six scheduled visits to complete the follow-up on PEP.

- In the first ARV therapy clinic visit, which should be conducted in the first two to three days of exposure, enough additional PEP drugs should be prescribed to the patient to take for the next two weeks. A follow-up appointment should be made for the two-week mark. The client should be told to come to the ARV therapy clinic if he or she needs further counseling or if he or she cannot tolerate the drugs in the meantime.
- The second follow-up visit to the ARV therapy clinic will be after two weeks. The ARV therapy clinician assesses adherence to treatment and drug side effects, prescribes additional PEP drugs for two weeks, and makes a follow-up appointment for two weeks later.
- The third follow-up visit will be at four weeks after the patient has started PEP treatment. During this visit, the ARV therapy clinician will verify the PEP drug treatment completion and will give the patient additional counseling on preventing further exposures and on the importance of having follow-up visits.
- The patient also needs to be scheduled for HIV testing at six weeks (fourth visit), three months (fifth visit), and six months (sixth visit). The testing procedure and counseling should be performed according to the national provider-initiated testing

and counseling protocol. The testing should be done in the ARV therapy clinic (point-of-care testing) to address issues related to confidentiality.

Each person with occupational HIV exposure should report the incident to his or her immediate supervisor. Initial PEP management should be given by the health worker, and the exposed person is linked to the ARV therapy clinic for further follow-up.

Documentation and reporting of PEP service given for both professional and nonoccupational exposures will be similar.

Monitoring and Evaluation of Post-Exposure Prophylaxis Treatment in Health Facilities:

Inputs Required for Post-Exposure Prophylaxis Treatment

Monitoring the process of PEP treatment should be completed as follows:

The health facility management will monitor the process of the PEP program implementation by following:

- Availability of all input materials for giving comprehensive PEP treatment
- Continuous availability of PEP services during both regular and nonregular working hours
- Adherence by health care workers to the national PEP guidelines or implementation guidelines
- Presence of regular (at least monthly) health facility meetings
- Reporting system for the health facility management
- The implementation of operational (action) plans developed for PEP

Output of PEP treatment should be completed as follows:

The health facility management will also be responsible for following PEP program outputs (for the PEP registration and follow-up card, please see Appendices 3 and 4):

- The number of occupational and nonoccupational exposures reported in the health facility
- From nonoccupational exposures, the number of cases of sexual violence and other nonoccupational cases disaggregated
- The age, sex, and occupation (including case team) of workers reporting an exposure

- The number of people who started PEP treatment
- The number of people who completed PEP treatment
- The number of people who received six-week, three-month, or six-month follow-up

Module 19: Food and Water Safety

Module Objective

- ❖ To equip participants with the basic knowledge of food and water safety rules.

Learning Objectives

By the end of this module, participants will be able to:

- Describe food- and water-associated infections.
- Describe how to make water safe in health facilities.
- Explain food safety rules.

Module Content

Handout 19.1: Food and Water Safety

Handout 19.1: Food and Water Safety

Nosocomial diarrhea is a common problem in hospitals (Lynch and Jakson 1997). The main factors associated with nosocomial diarrhea include poorly trained food handling staff and the use of unsafe practices involving the storage, preparation, and handling of raw meat, chicken, fish, and fresh eggs as well as some vegetables and the use of unsafe drinking water. Nosocomial transmission of fecal organisms by contaminated food or water can be reduced considerably by improving sanitation, food handling, and staff hygiene. To reduce the risk of nosocomial diarrhea from contaminated food and water in hospitals, the following safety standards should be followed.

Food Safety

- Food handlers:
 - Hand hygiene is a crucial safety measure. Food handlers should wash their hands or use waterless, alcohol-based hand rubs at critical times (before cooking/serving food, after blowing nose/covering a sneeze, and after visiting the toilet).
 - The health and hygiene of food service staff should be supervised by a knowledgeable person who is certified in food safety.
 - Food handlers should undergo quarterly medical checkups.
 - Food handlers should report any gastrointestinal problems or skin lesions, especially on hands. Food handlers with diarrhea should be immediately removed from handling foods. They should not return to food handling or work with immunocompromised patients or intensive care or transplant patients until all symptoms are over for 24 to 48 hours.
 - Food handlers need to know how to properly inspect, prepare, and store the foods they handle; how to properly deal with waste management; and how to clean and operate equipment they are using, such as slicers, blenders, and dishwashers, if they are available. Kitchen staff should have access to face masks, hair covers, and plastic aprons at a minimum. Other PPE should be supplied as necessary.
- Holding temperatures:
 - Food should be hold above 60°C/140°F or below 7°C/45°F.
 - Thermometers for food storage should be checked periodically.
 - Warm, perishable foods should be cooled before being stored.
- Cooking:
 - Food should be cooked thoroughly.
 - Frozen food items should be thawed before cooking to avoid the presence of cold spots in the interior.
- Cleanliness of kitchen and equipment:
 - Cleanliness of the kitchen has to be monitored and verified on a daily basis. The kitchen should be cleaned at the end of each day.
 - It is important to ensure equipment is being cleaned and disinfected, especially cutting boards used for preparing raw meat, fish, or poultry.

- Utensils used to cater food and cups for drinking have to be properly washed/sanitized using proper dish washing methods.
- Purchasing, transporting, and storing food:
 - Only purchase raw food from known vendors that meet local inspection standards, if possible. Food prepared at home should not be shared with other hospitalized patients.
 - Purchased raw food has to be transported to health care facilities in transportation free from biological and chemical contaminants.
 - Storage of raw and cooked food should be separate and with recommended temperatures based on the type of food to be stored (e.g., easily perishable cereals). It has to be monitored on a daily basis, including food handling.
- Educate or assist the hospitalized patients and caretakers to wash their hands during critical times (before preparing food, before eating, and after using the toilet).

Water Safety

- Monitoring the quality of the water supply:
 - Know the biological quality of the source.
 - Monitoring/inspection of the water quality used by health care facilities, including the sources, collection, and storage, should be done on a regular basis.
 - The microbial water quality (total coliform and *Escherichia coli* count based on WHO guidelines or country water quality standards, if available) of the source should also be monitored on a quarterly basis.
 - If it is feasible, also verify the chemical quality.
- The collection, transportation, storage, and handling of water should be done so as to avoid risk of contamination (e.g., use properly washed/sanitized containers to collect and store water, and separate containers for drinking and other purposes by clearly writing on the container which is for which).
- If the water supply for the health facility is from an unsafe source, it is possible to make it safe using the following methods:
 - Water boiled for 1 to 5 minutes is considered safe to drink, whereas water boiled for 20 minutes is considered high-level disinfected.

- Alternatively, water can be disinfected and made safe for drinking by using sodium hypochlorite.

Module 20: Client Education on Infection Prevention and Patient Safety

Module Objective

- ❖ To introduce participants to the basic concepts of effective client education programs on IPPS.

Learning Objectives

By the end of this module, participants will be able to:

- Explain why clients are educated on IPPS and its importance.
- Describe the components of effective client education programs.
- List key principles of IPPS for patient and client educators.
- Identify what considerations should be provided for effective implementation of client education on IPPS.

Module Content

Handout 20.1: Client Education on Infection Prevention and Patient Safety

Handout 20.1: Client Education on Infection Prevention and Patient Safety

What Is Patient Education?

Patient education is defined as the transmission to the patient, family caregiver, and community of the knowledge, skills, and attitude that empower them to actively participate in the promotion and maintenance of a safe health care facility environment.

Patient participation is increasingly recognized as a key component in the redesign of health care processes and is advocated as a means to improve and maintain patient safety.

In Ethiopia, as in most developing countries, the issue of patient rights for information and knowledge is becoming an essential part of policy consideration. An emphasis on patient

education is an essential component, in addition to infrastructure, supplies, and improvement of skills and knowledge of health service providers.

Four components have been reported as being fundamental to the process of patient/client empowerment:

1. Understanding by the patient of his or her role
2. Acquisition by patients of sufficient knowledge to be able to engage with their health care provider
3. Patient skills
4. The presence of a facilitating environment

Based on these four components, empowerment can be defined as a process in which patients understand their role and are given the knowledge and skills by their health care provider to perform a task in an environment that recognizes community and cultural differences and encourages patient participation.

The first and most important step is to enlist the full and enthusiastic support of health care workers. The objective is to help health care workers recognize the contribution of patients and their families to the healing process and to be receptive to patient input. This campaign must be designed to take into account the numerous health care provider–related obstacles to patient participation (e.g., perception of lack of time and their level of training in the patient-caregiver relationship). Once health care workers are “on board,” educational programs for patients must be offered so that they have the knowledge required to participate. Health care providers must understand the legitimacy and relevance of the interventions and must be convinced of their effectiveness.

Components of Effective Patient Education Programs

1. Have clear policies and procedures in place that guide the proper implementation of patient education and empowerment.
2. Clearly assign roles and responsibilities for all steps in the patient education process to qualified individuals, within the context of shared accountability. These individuals may include the patient’s primary care provider, other physicians, nurses, pharmacists, and other clinicians.

3. Incorporate training on procedures and basic principles for patient education into the educational curricula, orientation, and continuing professional development activities for health care professionals.
4. Develop and include an evaluation component that includes the use of both qualitative and quantitative measures to determine not only what works, but under what conditions and within which organizational context the program works best.

A program in which there is some evidence of empowering patients and health care workers is usually part of a multifaceted approach and includes one or all of the following:

- Educational tools
- Motivation tools (visual reminders for both the health care workers and the patient, like small badges, stickers, and posters)
- Role modeling (e.g., peers and supervisors)

The Six Key Principles That Allow Patients to Be More Actively Involved in Their Own Care

For all patients:

1. Share vital information with all caregivers, including all medicines, all allergies, and all ailments.
2. Ask questions about health problems and care.
3. Ask for help from family and friends.
4. Express your concerns.
5. Alert caregivers if your symptoms change.
6. Pay close attention to instructions.

For patient educators (health care workers or community workers providing education):

1. **Slow down.** Communication can be improved by speaking slowly and by spending just a small amount of additional time with each patient. This will help foster a patient-centered approach to the health worker–patient interaction.
2. **Use plain, nonmedical language.** Explain things to patients like you would explain them to your grandmother.
3. **Show or draw pictures.** Visual images can improve the patient’s recall of ideas.

4. **Limit the amount of information provided—and repeat it.** Information is best remembered when it is given in small pieces that are pertinent to the tasks at hand.
5. **Use the “teach-back” technique.** Confirm that patients understand by asking them to repeat back your instructions.
6. **Foster a learning environment.** Encourage questions. Make patients feel comfortable asking questions.

Module 21: Health Care Risk Management

Module Objective

- ❖ To provide participants with the basic knowledge and skills on how to assess hazards and risks in health care settings and devise appropriate measures to prevent risks.

Learning Objectives

By the end of this module, participants will be able to:

- Describe health risks that might cause harm to patients, visitors, students, and health care facility workers.
- Devise (design) possible interventions to prevent risks in health care settings.

Module Content

Handout 21.1: Health Care Risk Management

Handout 21.1: Health Care Risk Management

Background

Although each institution has specific risk factors, some risks are universal. These risks have been assessed internationally and should be addressed by each facility. These include:

- Informed consent
- Fall prevention (prevention of falling accidents)
- Credentialing
- Event reporting
- Environmental safety
- Government regulations and standards
- Infection prevention and control
- Staff occupational safety and health
- Security
- Medication safety

- Fire safety
- Medical device–related incidents

Health care risk management focuses on:

1. Event reporting
2. Informed consent
3. Environmental safety
4. Staff occupational safety and health

Assessment

Assessment of hazards and possible errors that might cause harm to patients, visitors, students and health care facility workers includes the following.

Event Reporting

In the WHO adverse event reporting guidelines, an event is defined as any deviation from usual medical care that causes an injury to the patient or poses a risk of harm. It could include errors, preventable adverse events, and hazards. An adverse event is defined as an injury related to medical management, in contrast to complications of disease medical management, which includes all aspects of care (diagnosis and treatment, failure to diagnose or treat, and the systems and equipment used to deliver care) (WHO 2005b).

Informed Consent

Often, health care workers are tempted to perform procedures on patients for their benefit without fully explaining the procedure or its intended benefits or possible risks. It is sometimes assumed that the patient will not understand a medical explanation or will just trust an expert's judgment. This assumption eliminates the possibility for input from the patient regarding important personal or family medical history or concerns and questions. The resulting patient's stress and probable family anxiety can put any adverse event in a very bad light and raise questions that engender distrust. Every patient has the right to receive an understandable explanation of and answers to questions about health care activities concerning the patient.

Environmental Safety

The hospital environment should be designed in such a way so as to be as hazard free as possible. Hazardous materials and activities are required for various reasons in hospitals. These must be handled as safely as possible.

Occupational Health

Hospital employees by occupation are at risk for physical and emotional injury as well as exposure to diseases. It is a legal requirement that the health facility provide treatment for injuries experienced at work. As in most programs, the training to prevent injuries is much more effective in ensuring a healthy work force than the process of treating an injury.

Interventions

Providing possible interventions to prevent or minimize the known risks include the following.

Reporting

Establish effective methods to provide regular reporting of all adverse events and other patient safety issues occurring in all health care facilities.

Event Reporting

One solution to this problem is event reporting by the doctor, nurse, or other provider within the hospital or health care organization and by the organization to a broader audience through a system-wide, regional, or national reporting system. Some believe that an effective reporting system is the cornerstone of safe practice and, within a hospital or other health care organization, a measure of progress toward achieving a culture of safety. At a minimum, reporting can help identify hazards and risks and can provide information as to where the system is breaking down. This can help target improvement efforts and system changes to reduce the likelihood of injury to future patients.

Informed Consent

Patients' participation in their health care process is improved by their level of understanding and approval of specific interventions. This enhances their cooperation and collaboration with their care, decreases their stress, and often promotes an improved healing process. An

explanation to the patient or qualified representative of the process risks and benefits for all planned procedures and surgeries is mandatory. Documentation by way of a consent form signed by the patient or qualified representative as well as the person giving the explanation will be a part of the permanent medical record and should be confirmed prior to the beginning of the procedure or surgery.

Environmental Safety

The following are some safety precautions that reduce risk.

Hazardous materials:

- Material safety data sheets should be available for all chemicals found at the hospital.
- The hospital should ensure that reasonable stocks of PPE are held at all times (gloves, masks, eye protection, protective clothing, etc.)

Fire risk:

- Hospitals should have a fire safety plan that addresses both the prevention of and response to fires.

Injury hazards:

- Wet floors, spills, broken glass, and other hazards should be clearly labeled.
- All public areas should be kept clean and free of large objects.
- Stairwells and corridors should be kept clear and should not be used as storage areas.
- When cleaning is conducted, only half of the area of corridors and stairwells should be wet cleaned at a time to always have a dry and safe path available for use.
- Major incident planning and management: When the numbers or types of casualties overwhelm or threaten to overwhelm normal services, an incident poses a serious threat to the health of the community, or there is the potential for the hospital itself to suffer serious internal disruption, special arrangements are needed to deal with these situations.
- Ensure that the hospital is capable of responding to major incidents of any scale in a way that:
 - Delivers optimum care and assistance to victims
 - Minimizes the consequential disruption to health care services

- Brings about a speedy return to normal levels of activity
 - Ensures a set of expertise available at all times at short notice
 - Provides a set of core processes to handle the uncertainty and unpredictability of whatever happens
- Each hospital should assign an occupational health and safety officer who is accountable to the human resource case team leader.
 - All employees should undergo a health screening prior to employment at the hospital (with regard to the national policy).
 - Voluntary counseling and testing for HIV should be encouraged and made available to all workers.
 - Maintenance of immunity from risk for exposure to and possible transmission of vaccine-preventable diseases such as TB, HBV, influenza, measles, mumps, rubella, and varicella should be performed through immunizations.
 - The 2007 HIV/AIDS policy of the Federal Democratic Republic of Ethiopia states that PEP service should be made accessible to people who have experienced occupational exposures as well as to rape survivors (FMOH 2007).
 - Training should be provided regarding information and implementation of educational activities. It should be aimed at raising the awareness and strengthening the decision-making skills of workers related to exposures to infections and other hazards.

Occupational Health

- Each hospital should assign an Occupational Health and Safety Officer (OHSO) who is accountable to the human resource case team leader.
- All employees should undergo a health screening prior to employment at the hospital. (with regard to the national policy).
- Voluntary counseling and testing for HIV should be encouraged and made available to all workers.
- Maintenance of immunity from risk for exposure to and possible transmission of vaccine-preventable diseases such as TB, HBV, influenza, measles, mumps, rubella, and varicella should be performed through immunizations
- Any worker who incurs accident, injury, or disease as a direct result of their employment is entitled to receive free general and special medical treatment.

- Training should be provided regarding information and implementation of educational activities, aimed at raising the awareness and strengthening the decision-making skills of workers related to infectious exposures and other hazards.

Professional competence is a standardized requirement for an individual to properly perform a specific job. It encompasses a combination of knowledge, skills, and behavior used to improve performance. More generally, competence is the state or quality of being adequately or well qualified and having the ability to perform a specific role with the given reasonable time.

Module 22: Managing Infection Prevention and Patient Safety Programs

Module Objective

- ❖ To provide participants with the required knowledge on how to properly manage IPPS programs.

Learning Objectives

By the end of this module, participants will be able to:

- Describe the organizing principles of IPPS program management.
- Identify the responsible entities and working groups involved in managing IPPS programs and their roles.
- Describe how to manage change in introducing recommended IPPS practices and processes.
- Explain the basics of IPPS supportive supervision.
- Identify the supportive supervision tools used in Ethiopia.

Module Content

Handout 22.1: Managing Infection Prevention and Patient Safety Programs

Handout 22.2: Supportive Supervision and Mentoring

Handout 22.1: Managing Infection Prevention and Patient Safety Programs

Background

The proper management of IPPS programs at various levels of implementation involves careful planning, implementing, and monitoring of important activities on a regular basis. IPPS programs in health care facilities should also be based on a clear understanding of the scope of the IPPS problem, prioritizing activities, and effectively using available resources and scientific standards. Proper supportive supervision for performance improvement and change management is also critical in IPPS program management. To realize an effective

IPPS program, health facility managers, health care administrators, and staff at all levels of the health care system must be committed to supporting and using recommended infection prevention guidelines and practices. It is also essential that health care managers take a leading role in managing IPPS programs.

Organizing Principles for Managing Infection Prevention and Patient Safety Programs

Following are the recommended three organizing principles for managing IPPS programs.

1. Establishing the relative importance of problems using their level of significance. The following are the categories of potential infection risk:
 - Critical
 - Semi-critical
 - Noncritical

Such categorization of potential risk provides a good basis for determining relative importance and setting priorities (e.g., the most serious and frequent problems and infections involve management in the critical area and, therefore, deserve the most attention and resources).

2. Identify and analyze the reasons for poor or incorrect implementation performance. The second principle is correctly identifying why performance is not up to standard. The following three possible reasons are common.
 - The staff does not know how to do the task correctly or why they need to do it (knowledge gap).
 - The staff does not have the correct (adequate) protective and patient safety equipment (resource gap).
 - The staff lacks motivation.

In most cases, more than one reason is involved. Understanding how these reasons contribute to performance deficits increases the potential for corrective action to be successful.

3. Costing the issues: The third and final principle is estimating the cost versus benefit of various IPPS intervention activities or corrective actions. In many settings, this is the most difficult of the three principles to implement because data on which to base estimates are often lacking. However, it is highly recommended to use national and locally available data sources for decision making.

Responsible Entities in the Management of Infection Prevention and Patient Safety Programs

Appropriate structures at different levels for the management of IPPS programs need to be established and strengthened.

Because health care facilities are the ultimate point of service delivery, establishing and strengthening facility-based IPPS committees is vital. Guiding and supporting the use of recommended practices and reviewing and resolving related problems that may arise are key responsibilities of the committee. The working group or committee should include representatives from a variety of patient care areas (e.g., surgery, central services, housekeeping, laboratory, purchasing, and administration) as well as one or more health professionals. In small health facilities where these functions often overlap, however, the group may consist of only two or three individuals or a focal person.

The basic guidance and activities that help managers implement successful IPPS program roll-out include:

- Having written policies, guidelines, and procedures to handle situations in which patients or staff are exposed to the risks of infection and clinical malpractices
- Conducting staff orientation before new policies, recommendations, or procedures are implemented and providing follow-up training when management reinforcement is needed
- Ensuring that adequate supplies, equipment, and facilities are available before start-up to meet the desired set of standards. Conduct regular reviews to ensure the adequacy of the recommended changes or practices, to solve emerging problems, and to address

staff concerns. Finally, effective and regular communication at all levels is the key to developing the support needed for a successful program.

Potential Scope of Work for Infection Prevention and Patient Safety Committee or Focal Person

The IPPS committee/group or focal person is responsible for coordinating the health facility's overall IPPS activities as well as developing an operational plan for IPPS activities. If there is a person selected to work on IP activities full time, his or her responsibilities should be clearly delineated in a job description. The committee should also have terms of reference that outline the roles and responsibilities of all members. The terms of reference should include the frequency of meetings and the process for recording and reporting information. It is recommended that the committee meet regularly, at least once a month. The team should select a chairperson who will be responsible for coordinating the IPPS committee's activities (e.g., calling meetings, disseminating minutes) and a secretary to record meeting minutes. The IPPS committee's main responsibilities include:

1. Defining the health facility's annual IPPS plan
2. Monitoring and evaluating the performance of the IPPS program by assessing implementation of the plan and adherence to practice
3. Reviewing surveillance data (for hospitals)
4. Reporting findings on surveillance (for hospitals) and performance of the IPPS program to management and other staff and identifying intervention areas
5. Ensuring, in collaboration with relevant staff, appropriate staff training in infection IPPS guidelines
6. Ensuring, in collaboration with relevant staff, the consistent and adequate supply of PPE and other IP supplies and equipment
7. Creating a sense of individual responsibility for IPPS among all staff

Training and Staff Development

Preventing infections and providing safe services to patients primarily involve education linked to behavior change interventions. Staff not only need to have correct information regarding risks and how to avoid risks, but they also need to demonstrate appropriate risk-averting behavior and sound patient management behavior.

All levels of health care workers (e.g., lab technicians, nurses, physicians, housekeepers, cleaners) need to know why IPPS is important. Standardized training in terms of content, modality, and time should be given to health care providers.

Supportive Supervision and Review Meeting

Regular supportive supervision and periodic evaluation of IPPS program implementation at various levels are critical elements of IPPS program management. Supportive supervision at the hospital level can use the minimum operational standards for IPPS as well as hospital reform initiative standards. These include the following:

1. Health facility management supports improvement efforts in IPPS by ensuring that operational and technical capacity, financial, and human resources guidelines are available for adherence to IPPS programs.
2. A designated group and/or individual(s) is in place to effectively implement and monitor IPPS activities.
3. The health facility has an operational plan for the implementation of IPPS activities. The plan follows national guidelines and includes guidance on infection prevention practices, procedures, and materials.
4. Standard practices to prevent, control, and reduce risk of health care–acquired infections are in place.
5. The health facility has an adequate plan to address transmission-based precautions for staff, patients, caregivers, and visitors.
6. The health facility ensures that equipment, supplies, and facilities/infrastructure necessary for IPPS are available.
7. All health facility staff are trained using standard IP training materials.
8. The health facility provides health education to patients, caregivers, and visitors, as appropriate, on IP practices.

Monitoring Infection Prevention and Patient Safety Practices

Regular monitoring of IPPS practices and processes is important, not only to assess their effectiveness but also to determine areas about which staff may need more training or review. Keeping records about infections and patient mismanagement that occur in facilities is a proven way of monitoring the effectiveness of IPPS practices. Supervisors and managers at all levels should use standardized monitoring and evaluation tools to guide all monitoring and evaluation activities.

Handout 22.2: Supportive Supervision and Mentoring

Supportive supervision is the process of guiding, helping, and encouraging staff to improve their performance so that they meet the defined standards of performance.

Integrated supportive supervision is the periodic assessment of all the activities for which a particular facility is responsible. It is most effectively carried out by multidisciplinary teams that have expertise in clinical medicine, public health, administration, and finance. It allows for the sharing of scarce resources (e.g., vehicles) to support a wide range of activities.

Purpose of supportive supervision:

- It is a process that promotes sustainable and efficient program management by encouraging effective two-way communication, as well as performance planning and monitoring.
- It creates an opportunity to recognize good practices and help health workers to maintain their high level of performance
- Health professionals at the service delivery point often receive little guidance or mentoring on how to improve their performance:
 - They are frequently left undirected, with few or no targets or objectives to help assess their performance.
 - Thus, when supervisors offer their support, health professionals feel what they are doing is important.

Traditional versus supportive supervision:

- While supervision should be a very participatory process, traditional supervisory visits focus more on inspection and fault finding rather than on problem solving to improve performance.
- Traditional supervision is often geared more toward the needs of higher-level supervisors to monitor service delivery point activities, rather than meeting the support and guidance needs of service delivery point staff.

Table 22.1. The difference between traditional and supportive supervision

Action	Traditional Supervision	Supportive Supervision
Who does the supervision?	External supervisors designated by the management structure	External supervisors designated by the management structure
		Staff from other facilities (peer reviews)
		Colleagues from the same facility
		Staff through self-assessment
		Community health committee
When does supervision happen?	During periodic visits by external supervisors	Continuously: during routine work
		During team meetings
		Confirmation visits by external supervisor
How do supervisors prepare?	Little or no preparation	Supervisors review previous supervisory reports
		Supervisors review reported achievements
		Supervisors decide before the supervision visit on what they need to focus
What happens during supervision?	Inspection of facility	Observation of performance and comparison to standards
	Review of records and supplies	Immediate feedback from supervisor
	Focus on fault finding	Joint problem solving on possible solutions to performance problems
	Little feedback or discussion of supervisor observations	Provision of technical updates and guidance
	Supervisors make most decisions	On-the-job training where necessary
		Use of data to help identify opportunities for improvement
		Follow-up on the previously identified problems

What happens after supervision?	No or irregular follow-up	Actions and discussions are recorded
		Ongoing monitoring of weak areas and improvements
		Follow-up on prior visits and problems

Components of Supportive Supervision

1. Commitment by management: Managers must be committed to supervision.
2. Standards of performance: There must be documented and well-known standards of performance (the standards are the baseline against which to measure actual performance).
3. Planning for supervision: There should be advance planning to allow for proper preparation and to ensure that everyone is present and ready.
4. Preparation for supervision: There should be careful preparation by the supervision team before their field visits, covering:
 - Health management information system data and health indicators
 - Previous data and health indicators
 - Discussion with all departments to identify the issues they wish to have followed up on
5. Stakeholder involvement: There should be supervision involving as many key members of staff at the facility or office as possible.
6. Appropriate behavior during the meeting to promote cooperation:
 - Treat problems as “our” problems (the supervisor is also responsible).
 - Each side should show respect for the other; neither side knows everything.
 - The supervisor needs to be firm but not “accusatory” so that those being supervised are more likely to want to get actively involved.
7. Supervisory tools:
 - Use of supervisory tools, such as a checklist, helps to ensure that all key areas are covered.
 - They also provide a record of the findings (for both sides).
8. Preparation of an action plan:
 - The follow-up action plan ensures that for each problem identified, there is an agreement on steps to be taken to improve the problem.
 - The action plan also ensures that a record is provided so that everyone knows what they are meant to do.

- The signing of the action plan ensures that no one can say that they did not agree to something.
- 9. Documentation of supervisory findings: The results of the supervision and the agreements reached on next steps should be documented.
- 10. Sharing of supervision findings: Reporting back to the management committee ensures that all departments are aware of the results of the supervision and know what actions they are expected to take.
- 11. The management committee should review the action plan until all necessary action items have been taken care of to ensure that supervision is being taken seriously by everyone.
- 12. Self-assessment: Self-assessment is the most cost-effective way of promoting good performance, although it still needs periodic “outside assessment” or supervision to confirm that standards are being met.

Appendix 1. Infection Prevention and Patient Safety Needs Matrix: Operational Action Plan Sheet

Region: _____ Woreda: _____ Name of health facility: _____

Name of focal person: _____ Contact information: _____

SN	Infection Prevention and Patient Safety Needs Gaps and Possible Causes	Activity/ Intervention	Quantity	Responsible Person	Support Needed	Timeline						Remarks
						Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	
1												
2												
3												
4												
5												
6												

Prepared by: 1: _____ 2: _____ 3: _____ 4: _____

Appendix 2. How to Use the Infection Prevention and Patient Safety Stations

Instructions for Participants

The IPPS station checklists are designed to help the participants learn the steps/tasks in the following five areas:

- Selecting antiseptics and preparing skin/mucous membranes prior to procedures
- Preparing clean water and chlorine solutions
- Cleaning instruments and other items
- Disposing of needles and syringes
- Reprocessing instruments and disposing of medical waste after a vaginal childbirth

Each checklist contains the tasks/steps performed when following IPPS practices for selected procedures. These tasks/steps correspond to the information presented in the *IPPS Reference Manual*.

The checklists are the same as the checklists that the trainer will use to assess each participant's performance for qualification. It is the goal of this training that every participant will practice at all five stations and will be qualified on one randomly selected station by the end of the training.

The participant is not expected to perform all the tasks/steps correctly the first time he or she practices them. Instead, the checklists are intended to:

- Assist the participant in learning the correct steps and the sequence in which they should be performed (skill acquisition)
- Measure progressive learning in small steps as the participant gains confidence and skill (skill competency)

Prior to using the stations and checklists, the trainer will demonstrate the steps for each station. By the time the group breaks up into pairs or trios to begin practicing and rating each other's performance, each participant will be familiar with the various IP practices covered in each station.

When used consistently, the checklists will enable each participant to chart his or her progress and to identify areas for improvement. Furthermore, the checklists are designed to make communication (coaching and feedback) between the participant and trainer easier and more helpful. When using the checklists, it is important that the participant and trainer work together as a team. After the scenario (tasks) has been completed by the participant, the trainer (or participant acting as a trainer) should provide positive feedback regarding the learning progress and to define the areas where improvement is needed in subsequent practice sessions.

Using the Stations

The station checklists should be used initially during practice to follow the steps. During qualification, however, the participant will not be allowed to use the checklists.

For practice purposes, participants may work in groups of two or three. One participant should demonstrate the skills/tasks in the station checklist, while another participant takes on the role of the trainer. If there is a third participant in the group, he or she should take on the role of the observer.

Using the station checklist, the participant playing the trainer should assess the participant's ability to demonstrate the skills/tasks in the checklist for that station. Participants may use the participant matrix to monitor their progress in using the stations for practice and qualification. For learning and practice purposes, the participants should practice all scenarios and skills/tasks. For qualification, however, the trainer will choose *one* scenario for the participant to perform.

Once the participant becomes confident in performing the tasks/steps in the station, he or she should notify the trainer that he or she is ready to be observed for qualification. The trainer will observe and assess the participant's performance on each step of the skill/task for the selected station. For some stations, the trainer will choose one of several scenarios.

For other stations, there is only one scenario. For practice purposes, participants will practice at all five stations. For qualification purposes, the trainer will randomly select one station for the participant.

The participant must be rated “competent” in each step/task covered in the checklist in order to be evaluated as qualified. If the participant is not rated “competent,” the trainer will work with him or her on the steps missed. The participant can be reassessed by the trainer after practicing the steps individually or with another participant.

Selecting Antiseptics and Preparing Skin/Mucous Membranes prior to Procedures						
Skin Preparation prior to a Cesarean Section						
Trainer: Read the following information to the participant. Mrs. X is scheduled to have a cesarean section. You are assisting the surgical team. The surgeon has asked you to prepare her skin for the procedure, and the anesthesiologist has asked you to first start an intravenous line. The surgery will probably last one hour.						
Question	Answer	Observation				
Given the type and length of the procedure, what are the antiseptic options for skin preparation for intravenous insertion?		1	2	3	4	5
	Alcohol (60 to 90 percent ethyl or isopropyl)					
	Chlorhexidine (2 to 4 percent): Hibitane, Hibiscrub, Hibiclens					
	Chlorhexidine gluconate and cetrimide (at least 2 percent)					
	Iodine preparations (3 percent)					
	Iodophors (7.5 to 10 percent): Betadine					
	PCMX (0.5 to 4 percent): Dettol					
Which option is preferable?	Chlorhexidine (2 to 4 percent): Hibitane, Hibiscrub, Hibiclens					
Given the type and length of the procedures, what are the antiseptic options for skin preparation for a cesarean section?	Chlorhexidine (2 to 4 percent): Hibitane, Hibiscrub, Hibiclens					
	Iodophors (7.5 to 10 percent): Betadine					
	Explain the procedure to the patient.					
	Ask the patient about any known allergies or allergic reactions before selecting an antiseptic solution.					
	If the skin is visibly soiled, gently wash it with soap and water and dry the area before applying the antiseptic.					
	Select the antiseptic.					
Which options are preferable?	Chlorhexidine (2 to 4 percent): Hibitane, Hibiscrub, Hibiclens					
	Iodophors (7.5 to 10 percent): Betadine					
Task	Step	Observation				
		1	2	3	4	5
Skin preparation for intravenous insertion	Explain the procedure to the patient.					
	Ask the patient about any known allergies or allergic reactions before selecting an antiseptic solution.					
	If the skin is visibly soiled, gently wash it with soap and water, and dry the area before applying the antiseptic.					
	Select the antiseptic.					
	Put examination gloves on both hands.					
	Clean the insertion site with new cotton or gauze squares soaked in the antiseptic solution using a circular motion outward from the insertion site.					

	Wait long enough for the antiseptic to become effective before beginning the procedure.					
Skin preparation for cesarean section Note: Give the participant the following additional information: Mrs. X was not shaved before coming to the operation room.	Explain the procedure to the patient.					
	Do not shave hair around operative site. If necessary, hair may be cut close to the skin surface with scissors immediately before surgery in the preoperative area.					
	Ask the patient about allergic reactions before selecting an antiseptic solution.					
	If the skin is visibly soiled, gently wash it with soap and water, and dry the area before applying the antiseptic.					
	Select the antiseptic.					
	Put sterile gloves on both hands.					
	Using dry sterile or HLD forceps and new cotton or gauze squares soaked in antiseptic, thoroughly cleanse the skin.					
	Work from the operative site outward for several centimeters in a circular motion.					
	Wait long enough for the antiseptic to become effective before beginning the procedure.					
Cervical and Vaginal Preparation Before Intrauterine Device Insertion						
Trainer: Read the following information to the participant. Mrs. Y will have an IUD inserted. You should demonstrate preparation prior to the insertion.						
Question	Answer	Observation				
		1	2	3	4	5
Given the type and length of the procedure, what are the antiseptic options?	Chlorhexidine (2 to 4 percent): Hibitane, Hibiscrub, Hibiclens					
	Chlorhexidine gluconate and cetrimide (at least 2 percent)					
	Iodophors (7.5 to 10 percent): Betadine					
	Alcohol and any antiseptics containing alcohol should be avoided for cervical and vaginal preparation. Alcohol burns, and it also dries and irritates mucous membranes, thus promoting the growth of microorganisms.					
Task	Step	Observation				

		1	2	3	4	5
Cervical and vaginal preparation for IUD insertion	Explain the procedure to the patient.					
	Ask the patient about any known allergies or allergic reactions before selecting an antiseptic solution.					
	If the external genital area is visibly soiled, wash the area with soap and water, and dry the area before applying the antiseptic.					
	Put examination gloves on both hands.					
	Select the antiseptic.					
	After inserting the speculum, apply antiseptic solution liberally to the cervix and vagina (twice). It is not necessary to prepare the external genital area with antiseptic solution.					
	If an iodophor is used, wait two minutes before proceeding.					

Preparing Clean Water and Chlorine Solutions							
Scenario 1							
Trainer: Read the following information to the participant. The water in your hospital/clinic is contaminated. You are assigned to train one person in each unit/department to prepare clean water that is safe to drink and can also be used for other purposes (e.g., hand washing and medical instrument cleaning).							
Question	Answer		Observations				
			1	2	3	4	5
What are the options/methods to prepare clean water?	The two methods for preparing clean water are:	Boiling for five minutes					
		Treating with liquid or powder bleach					
Task	Step		Observations				
			1	2	3	4	5
Boiling	Pour the water into a pot or kettle.						
	Place the lid on the pot/kettle and bring the water to a gentle, rolling boil using the hot plate.						
	Start timing when the rolling boil begins.						
	Keep the water at a rolling boil for five minutes.						
	Pour the water into a clean container and keep covered with a lid.						
Treating with liquid	Identify the concentration of the bleach available (select one container and check the concentration).						
	Select the appropriate formula (consulting Figure 10.1 of the <i>IPPS Reference Manual</i>) and choose the						

bleach Note: For qualification, the trainer may select different amounts of water to be prepared (e.g., 10, 20, or 50 liters).	correct value: percent concentrate; percent dilute (0.001 percent).					
	Using the formula, correctly calculate the total parts of water for one part of liquid bleach.					
	Use appropriate PPE: plastic apron and utility gloves.					
	Select the appropriate measuring container with which to prepare 10 liters of clean water.					
	Mix the necessary parts of water with parts of liquid bleach in a plastic bucket or container to prepare 10 liters of 0.001 percent chlorine solution.					
	Keep the water in a clean plastic bucket or container with a lid.					
Treating with powder bleach Note: For qualification, the trainer may select different amounts of water to be prepared (e.g., 10, 20, or 50 liters).	Identify the concentration of the bleach available (select one container and check the concentration).					
	Select the appropriate formula (consulting Figure 10.2 of the <i>IPPS Reference Manual</i>) and choose the correct value: percent concentrate; percent dilute (0.001 percent).					
	Using the formula, correctly calculate the grams of powder bleach per liter of water.					
	Using the scale, measure and weigh the correct amount of powder bleach per liter of water, and then calculate the amount needed for 10 liters.					
	Use appropriate PPE: plastic apron and utility gloves.					
	Select the appropriate measuring container with which to prepare 10 liters of clean water.					
	Mix the measured amount of powder bleach with the necessary liters of water in a plastic container to prepare 10 liters of 0.001 percent chlorine solution.					
	Allow the calcium particulates to settle to the bottom of the container prior to use.					
	Keep the water in a clean plastic container with a lid.					
Question	Answer	Observations				
		1	2	3	4	5
What can be done if the water is cloudy?	The water can be filtered through four layers of woven cloth, such as cheesecloth or old sari material. Filtering will remove most particulates before boiling or treating					

	with chlorine.					
--	----------------	--	--	--	--	--

Decontamination						
Scenario 2						
Trainer: Read the following information to the participant. You work in a reproductive health clinic with a high volume of clients for family planning, counseling and testing for HIV, and antenatal care. You have to prepare a chlorine solution for the decontamination of instruments. How do you prepare this solution?						
Task	Step	Observations				
		1	2	3	4	5
Using liquid bleach Note: For qualification, the trainer may select different amounts of chlorine solution to be prepared (e.g., 10, 20, or 50 liters).	Identify the concentration of the bleach available (select one container and check the concentration).					
	Select the appropriate formula (consulting Figure 10.1 of the <i>IPPS Reference Manual</i>) and choose the correct value: percent concentrate; percent dilute (0.5 percent).					
	Using the formula, correctly calculate the total parts of water for one part of liquid bleach.					
	Use appropriate PPE: plastic apron and utility gloves.					
	Select the appropriate measuring container with which to prepare 10 liters of 0.5 percent chlorine solution.					
	Mix the necessary parts of water with parts of liquid bleach in a plastic container to prepare 10 liters of 0.5 percent chlorine solution.					
	Pour the chlorine solution into smaller plastic containers or keep the chlorine solution in the plastic container with a lid.					
Task	Step	Observations				
		1	2	3	4	5
Using powder bleach Note: For qualification, the trainer may select different amounts of chlorine solution to be prepared (e.g., 10, 20, or 50 liters).	Identify the concentration of the bleach available (select one container and check the concentration).					
	Select the appropriate formula (consulting Figure 10.2 of the <i>IPPS Reference Manual</i>) and choose the correct value: percent concentrate; percent dilute (0.5 percent).					
	Using the formula, correctly calculate the grams of powder bleach per liter of water.					
	Using the scale, measure and weigh the correct amount of powder bleach per liter of water, and then calculate the amount needed for 10 liters.					
	Use the appropriate PPE: plastic apron and utility gloves.					
	Select the appropriate measuring					

	container to prepare 10 liters of 0.5 percent chlorine solution.					
	Mix the measured amount of powder bleach with the necessary liters of water in a plastic container to prepare 10 liters of 0.5 percent chlorine solution.					
	Allow the calcium particulates to settle to the bottom of the container prior to use.					
	Pour the chlorine solution into smaller plastic containers or keep the solution in the plastic container with a lid.					
Question	Answer	Observations				
		1	2	3	4	5
Where should the containers be placed for decontamination?	The containers should be placed at point of use in the room where procedures occur and instruments and other items are used.					
How long should the instruments be kept in the 0.5 percent chlorine solution?	The instruments should be kept in the 0.5 percent chlorine solution for a minimum of 10 minutes. They should then be removed as soon as possible for cleaning.					
How often should you change the solution when in use?	The solution should be changed at the end of each day or clinic session or, depending on the procedure, when the solution becomes cloudy or bloody.					

High-Level Disinfection						
Scenario 3						
Trainer: Read the following information to the participant.						
You work in the central supply department in your clinic, and you need to process some instruments through HLD with chlorine solution. How do you prepare this solution?						
Task	Step	Observations				
		1	2	3	4	5
Using liquid bleach Note: For qualification, the trainer may select different amounts of chlorine solution to be prepared (e.g., 10, 20, or 50 liters).	Identify the concentration of the bleach available (select one container and check the concentration).					
	Select the appropriate formula (consulting Figure 10.1 of the <i>IPPS Reference Manual</i>) and choose the correct value: percent concentrate; percent dilute (0.1 percent).					
	Prepare and use HLD water (water boiled for 20 minutes).					
	Using the formula, correctly calculate the total parts of water for one part of liquid bleach.					
	Use the appropriate PPE: plastic apron and utility gloves.					
	Select the appropriate measuring container with which to prepare 10 liters of 0.1 percent chlorine solution.					
	Mix the necessary parts of HLD water					

	with parts of liquid bleach in a plastic container to prepare 10 liters of 0.1 percent chlorine solution.					
	Pour the chlorine solution into smaller plastic containers or keep the solution in the plastic container with a lid.					
Task	Step	Observations				
		1	2	3	4	5
Using powder bleach Note: For qualification, the trainer may select different amounts of chlorine solution to be prepared (e.g., 10, 20, or 50 liters).	Identify the concentration of the bleach available (select one container and check the concentration).					
	Select the appropriate formula (consulting Figure 10.2 of the <i>IPPS Reference Manual</i>) and choose the correct value: percent concentrate; percent dilute (0.1 percent).					
	Prepare and use HLD water (water boiled for 20 minutes).					
	Using the formula, correctly calculate the grams of powder bleach per liter of water, and then calculate the amount needed for 10 liters					
	Using the scale, measure and weigh the correct amount of powder bleach per liter of water.					
	Use the appropriate PPE: plastic apron and utility gloves					
	Select the appropriate measuring container with which to prepare 10 liters of 0.1 percent chlorine solution.					
	Mix the measured amount of powder bleach with the necessary liters of HLD water in a plastic container to prepare 10 liters of 0.1 percent chlorine solution.					
	Allow the calcium particulates to settle to the bottom of the container prior to use.					
	Pour the chlorine solution into smaller plastic containers or keep the solution in the plastic container with a lid.					
Question	Answer	Observations				
		1	2	3	4	5
Where should the containers be placed for HLD?	The containers should be placed in the instrument processing area (clean area) of the clinic or central supply department as appropriate.					
How long should the instruments be kept in the 0.1 percent chlorine solution?	The instruments should be kept in the 0.1 percent chlorine solution for a minimum of 20 minutes.					
What should be done with the instruments after	The instruments should be removed and rinsed with HLD water (water boiled for 20 minutes). They should be stored in an					

they have been soaked in 0.1 percent chlorine solution?	HLD container with a cover.					
--	-----------------------------	--	--	--	--	--

Cleaning Instruments and Other Items

Questions

Write **Y** if the question is answered correctly; write **N** if the question is answered incorrectly.

Steps

Write **C** if the step is performed **competently**; write **N** if the step is **not** performed competently or is omitted.

Competent: Performs the step according to the standard procedures or guidelines.

Not Competent: Unable to perform the step according to the standard procedures or guidelines, or does not perform the step at all.

Cleaning Instruments and Other Items

Scenario

Trainer: Read the following information to the participant.

You work in a hospital. You have just collected the decontamination buckets containing used instruments and surgical gloves. You need to clean them. The instruments have already been soaked in 0.5 percent chlorine solution for 10 minutes.

Task	Step	Observations				
		1	2	3	4	5
Preparing for the procedure	Put on the proper PPE.					
	Utility gloves					
	Face shield or mask and protective eyewear					
	Plastic apron					
Cleaning instruments	Closed shoes					
	Fill a plastic container (or utility sink) with clean water.					
	Using a brush and liquid or powder detergent, scrub instruments and other items under the surface of the water, removing all blood and other foreign matter.					
	Disassemble instruments and other items with multiple parts and clean the grooves, teeth, and joints with a brush.					
Cleaning surgical gloves	Thoroughly rinse the instruments and other items with clean water.					
	Wash the inside and outside of the gloves in soapy water.					
	Rinse in clean water until no soap remains.					
	Test gloves for holes by inflating them by hand and holding them under water. (Air bubbles will appear if there are holes.)					
Drying cleaned instruments and other items	Air dry instruments and other items, or dry them with a clean towel.					
Hand hygiene after	Remove all PPE.					

cleaning	<p>Wash hands for 10 to 15 seconds with soap and running (or poured) water. Dry with a clean, individual towel or paper towel, or allow hands to air dry.</p> <p>OR</p> <p>Rub hands with 3 to 5 mL of an alcohol-based solution until the hands are dry (if hands are not visibly soiled).</p>					
----------	---	--	--	--	--	--

Disposing of Needles and Syringes

Questions

Write **Y** if the question is answered correctly; write **N** if the question is answered incorrectly.

Steps

Write **C** if the steps are performed **competently**; write **N** if the steps are **not** performed competently or are omitted.

Competent: Performs the steps according to the standard procedures or guidelines

Not Competent: Unable to perform the steps according to the standard procedures or guidelines, or does not perform the steps at all

Disposing of Needles and Syringes						
Scenario						
<p>Trainer: Read the following information to the participant.</p> <p>You are the head nurse at an immunization clinic. Because you have a variety of needles and syringes (regular disposable needles and syringes, auto-disable syringes), your staff is confused about how to dispose of them properly. The policy at your clinic is the following:</p> <ul style="list-style-type: none"> • Disposable syringes are not reused. • Needles are never reused. <p>You have decided to set up a station to demonstrate the proper disposal of the different types of needles and syringes.</p>						
Task	Step	Observations				
		1	2	3	4	5
Selecting supplies and setting up the station for a regular disposable needle and syringe	Regular disposable syringe assembled with needle and no cap					
	Puncture-resistant sharps container at “point of use”					
Disposal of a disposable needle and syringe	Do not recap, bend, or break the needle prior to disposal.					
	Do not disassemble needle and syringe.					
	Immediately after use, place the assembled needle and syringe directly into a puncture-resistant sharps container at point of use.					
Auto-Disable Syringe						
Task	Step	Observations				
		1	2	3	4	5
Selecting supplies and setting up the station for an auto-disable syringe	Auto-disable syringe without a cap					
	Puncture-resistant sharps container at “point of use”					
Disposal of an auto-disable syringe	Do not recap, bend, or break the needle prior to disposal.					
	Immediately after use, place the assembled needle and syringe directly into a puncture-resistant sharps container at point of use.					
Question	Answer	Observations				
		1	2	3	4	5
When and how should you dispose of the puncture-resistant sharps container?	When the puncture-resistant sharps container is three-quarters full, it should be sealed and either burned, encapsulated, or buried. The best practice is to incinerate.					

Reprocessing Instruments and Disposing of Medical Waste After a Vaginal Childbirth						
Questions						
Write Y if the question is answered correctly; write N if the question is answered incorrectly.						
Steps						
Write C if the steps are performed competently ; write N if the steps are not performed competently or are omitted.						
Competent: Performs the steps according to the standard procedures or guidelines.						
Not Competent: Unable to perform the steps according to the standard procedures or guidelines, or does not perform the steps at all.						
Reprocessing Instruments and Disposing of Medical Waste After a Vaginal Childbirth						
Scenario						
Trainer: Read the following information to the participant. You are a nurse-midwife and work in the labor and delivery ward. With your assistance, Mrs. D gave birth to a baby girl. She is resting on the delivery bed with her baby. Before you take off your gloves, you need to dispose of the medical waste and decontaminate all of the instruments.						
Task	Step	Observations				
		1	2	3	4	5
Medical waste disposal and instrument decontamination	Place the placenta in a leak-proof container.					
	Dispose of all waste (e.g., gauze, cotton, dressings, etc.) in a leak-proof container.					
	Place instruments in a container with 0.5 percent chlorine solution for 10 minutes to decontaminate.					
	Immediately dispose of used needles and syringes in a puncture-resistant sharps container, without removing, recapping, or breaking the needle.					
	Dispose of all other disposable sharps in a puncture-resistant container.					
	Place soiled linen in a leak-proof container.					
Disposal of PPE	Immerse both gloved hands in a 0.5 percent chlorine solution.					
	Remove gloves by turning them inside out.					
	Dispose of gloves; place them in a leak-proof container. OR If reusing surgical gloves, place in a 0.5 percent chlorine solution for 10 minutes to decontaminate.					
	Remove all other PPE, and place the items in a 0.5 percent chlorine solution for 10 minutes to decontaminate.					
Hand hygiene after cleaning	Wash hands for 10 to 15 seconds with soap and running (or poured) water. Dry with a clean, individual towel or paper towel, or allow hands to air dry. OR Rub hands with 3 to 5 mL of an alcohol-based solution until the hands are dry (if hands are not visibly soiled).					

Appendix 3: Post-Exposure Prophylaxis Follow-Up Card

Potential HIV exposure Documetation and Post Exposure Prophylaxis Follow up Card:					
Facility Name			Date		
Patient Name:		Age:	Sex: <input type="checkbox"/> M <input type="checkbox"/> F	Occupation :	
Address: Region:		Sub-city/Woreda:	Kebelle:	House #	Tel:
For Occupational Exposure		Exposure status:(a-i)	Other specify:	Circumstance of Injury: (a-e)	other (specify):
Number of hours elapsed after exposure:		Hrs	Service outlet on which the client is exposed :		
HIV status of source case: <input type="checkbox"/> Reactive <input type="checkbox"/> Non-Reactive <input type="checkbox"/> Unknown, If Reactive, Source code <input type="checkbox"/> 1 <input type="checkbox"/> 2 Exposure code: <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3					
Baseline HIV status of exposed person: <input type="checkbox"/> Reactive <input type="checkbox"/> Non-Reactive <input type="checkbox"/> Not done If female, pregnancy test: <input type="checkbox"/> Positive <input type="checkbox"/> Negative <input type="checkbox"/> Not done					
For Non-occupational exposure: <input type="checkbox"/> Sexual violence/rape <input type="checkbox"/> Other(specify): (2-7) Baseline Hemoglobine(Hb):					
PEP Eligibility: <input type="checkbox"/> Eligible <input type="checkbox"/> Not Eligible General counselling on PEP given <input type="checkbox"/> Type of PEP reglemen provided :					
Visits		Follow up Information		Next Apointement date	Remark(tracking of clients lost to follow up, etc)
		Fill the pt and service status as indicated	Measures taken eg. in cases of poor adherence and drug side effect,additional PEP drugs prescribed for 2 weeks, linkages to other services etc..		
Visits In the ART clinic	First Visit(2-3 days)	Baseline info complete (Y/N)			
		General counseling on PEP(Y/N)			
		Adherence (G/F/P)			
		Drug side effects (1-12)			
		Lab Investigations done (if any)			
		Prescribe ARVs for 2 weeks			
	2nd visit(2 weeks)	Adherence (G/F/P)			
		Drug side effects (1-12)			
		Lab Investigations done (if any)			
		Prescribe ARVs for 2 weeks			
		General counseling on PEP			
	3rd visit(4 weeks)	Adherence (G/F/P)			
		Drug side effects (1-12)			
		Lab Investigations done (if any)			
		Treatment completed(Yes/No)			
	4th visit(6 weeks)	Reinforce counseling on PEP			
		General counseling on PEP			
	5th visit(3 month)	HIV test result(R/NR)			
		General counseling on PEP			
	6th visit(6 month)	HIV test result(R/NR)			
		General counseling on PEP			

Potential HIV exposure Documentation and Post Exposure prophylaxis Follow up Card Legend															
<p>Facility Name: Write the name of the hospital or health center. Date: Date clients exposure reported in Ethiopian calendar (dd/mm/yyyy). Medical Record Number/Card Number: A number given by the facility main chart room. For HMIS sites, this number is medical record number and for the other sites it is card number. Patient Name: Write patient full name. Age: Write age of the client in years. Sex: Put a check mark on F for female and on M for Male. Occupation: Occupation of the exposed client (e.g. Nurse, physician, teacher, etc). Address: This information is helpful for tracking patients. Write the full address of the client in the spaces provided.</p> <p>Visits: A follow up visits in the ART clinic. First the baseline information on the heading portion will be completed by the health worker who first encountered the exposed cases. The visits days/weeks are estimated from the first date the exposed person appears to the health facility. E.g. first visit is 1-3 days after initial presentation of the exposed case to the health facility. Write the number of hours elapsed between time of exposure and time of reporting in hours. Service outlet: Write the service outlet giving the PEP starting service (the service out let on which the client is exposed) like Emergency OPD, OPD etc....</p>															
Do base Hb especially if AZT based regimens are used also do pregnancy test for female with child bearing potential															
<p>Date of Visit</p> <p>Enter date of visit in Ethiopian Calendar in dd/mm/yy format</p>		<p>HIV status of source case</p> <p>Put a check mark on Reactive or Non-Reactive if the HIV status of the source case is known. If Unknown select Unknown</p> <p>Source code</p> <p>SC negative: HIV Negative SC1: HIV positive; Asymptomatic/High CD4 SC2: HIV positive: Advanced disease/ patient on antiretroviral therapy/primary infection/low CD4 SC unknown: HIV status unknown or source unknown</p>													
<p>Circumstance of injury:</p> <p>a) Trying to secure intravenous line b) Needle stick injury during surgery c) Needle stick while disposing of waste d) Amniotic fluid splash during delivery e) Splash with body cavity fluids during procedure f) Other (specify): Cut injury with a surgical blade while doing a surgical procedure</p>		<p>Exposure type: Occupational</p> <p>a) Hollow needle deep prick b) Hollow needle superficial prick c) Solid needle deep prick d) Solid needle scratch e) Splash to the conjunctivae f) Splash to the oral cavity g) Splash to intact skin h) Splash to broken skin i) other (specify) cut injury with surgical blades etc....</p> <p>Exposure type: Non-Occupational</p> <p>1. Sexual assault 2. Pediatric exposures : needle prick, community fight etc.. 3. Non HCW care givers 4. Unanticipated high risk exposure (consensual sexual activity) 5. condom tear 6. Road traffic accident 7. Other (specify) eg. Community fight, bite</p>													
<p>Exposure code: Occupational</p> <p>Occupational Exposure Code</p> <p>Mucous Membrane EC1= Few drops and short duration EC2= Several drops/ long duration/ major blood splash Percutaneous EC2= Solid and Superficial scratch EC3= Hollow needle deep puncture</p>		<p>General counselling on PEP includes:</p> <p>Counseling on :</p> <ul style="list-style-type: none"> the risk of acquiring HIV infection due exposure the efficacy of PEP the importance of having a base line and follow up HIV test the importance of adherence to PEP drugs; the duration of the course of medicine (four weeks); the common side effects of PEP drugs advice to avoid secondary transmission to other people in case 													
		<p>Adherence grading</p> <table border="1"> <thead> <tr> <th>Adherence</th> <th># of missed dose per month</th> </tr> </thead> <tbody> <tr> <td>G(good)</td> <td>>95%</td> </tr> <tr> <td>F(fair)</td> <td>85-94%</td> </tr> <tr> <td>P(poor)</td> <td><85%</td> </tr> </tbody> </table>		Adherence	# of missed dose per month	G(good)	>95%	F(fair)	85-94%	P(poor)	<85%				
Adherence	# of missed dose per month														
G(good)	>95%														
F(fair)	85-94%														
P(poor)	<85%														
		<p>Types of regimen given:</p> <p>Pa2: d4T/3TC or Pz2:AZT/3TC (CBV) or Pz2: TDF/3TC Pa3:d4T/3TC/LPV/r Pz3:AZT/3TC/LPV/r Pz3:TDF/3TC/LPV/r Pd3:AZT/3TC/EFV</p>													
		<p>Drug side effects</p> <table border="1"> <tbody> <tr> <td>1. Nausea</td> <td>5. Numbness/tingling</td> <td>9. fat changes</td> </tr> <tr> <td>2. Diarrhea</td> <td>6. Anemia</td> <td>10. dizzy, anxiety, night mare</td> </tr> <tr> <td>3. fatigue</td> <td>7. Abdominal pain</td> <td>11. Rash</td> </tr> <tr> <td>4. headache</td> <td>8. Jaundice</td> <td>12. Other(specify)</td> </tr> </tbody> </table> <p>Lab investigations done: order the relevant lab investigations to do lab monitoring of ARV drug toxicities in clients taking PEP and record this in the lab investigations done row of the follow up form</p>		1. Nausea	5. Numbness/tingling	9. fat changes	2. Diarrhea	6. Anemia	10. dizzy, anxiety, night mare	3. fatigue	7. Abdominal pain	11. Rash	4. headache	8. Jaundice	12. Other(specify)
1. Nausea	5. Numbness/tingling	9. fat changes													
2. Diarrhea	6. Anemia	10. dizzy, anxiety, night mare													
3. fatigue	7. Abdominal pain	11. Rash													
4. headache	8. Jaundice	12. Other(specify)													
<p>Remark: use to show any other additional information (e.g linkage to HIV care or other support, tracking, lost dead etc)</p>															

Appendix 4: Post-Exposure Prophylaxis Register

Occupational and Nonoccupational HIV Post Exposure Prophylaxis Register

[illegible]

References

- AIDSTAR-One Ethiopia. 2009. *Injection Safety Trainer's Manual*. Arlington, VA: AIDSTAR-One.
- Alter, M. J. 1997. "The Epidemiology of Acute and Chronic Hepatitis C." *Clinical Liver Disease* 1:559–68.
- Alvarado, C. J. 2000. "The Science of Hand Hygiene: A Self-Study Monograph." Madison, WI: University of Wisconsin Medical School and Science Health Communications.
- Bessinger, C. D. Jr. 1988. "Preventing Transmission of Human Immunodeficiency Virus During Operations." *Surgical Gynecology and Obstetrics* 167:287–9.
- Boyce, J. M. and D. Pittel. 2002. "Guidelines for Hand Hygiene in Health Care Settings: Recommendations of the Health Care Infection Control Practices Advisory Committee and the HICPAC/SHSA/APIC/IDSA Hand Hygiene Task Force. *Infection Control in Hospital Epidemiology* 23(Suppl):S3–40. Available at <http://www.cdc.gov/handhygiene>
- Cardo, D. M., D. H. Culver, C. A. Ciesielski, P. U. Srivastava, R. Marcus, D. Abiteboul, J. Heptonstall, G Ippolito, F Lot, P. S. McKibben, and D. M. Bell. (1997). "A Case Control Study of HIV Seroconversion in Health Care Workers after Percutaneous Exposure." *New England Journal of Medicine* 337:1485–90.
- Centers for Disease Control and Prevention (CDC). 1989. "Guidelines for Prevention of Transmission of Human Immunodeficiency Virus and Hepatitis B Virus to Health Care and Public Safety Workers." *Morbidity and Mortality Weekly Report* 38(S-6):1–37.

Centers for Disease Control and Prevention (CDC). 1991. “Chlorine gas toxicity from mixture of bleach with other cleaning products.” *Morbidity and Mortality Weekly Report* 40(36): 619–621.

Centers for Disease Control and Prevention (CDC). 1997. “Evaluation of Blunt Suture Needles in Preventing Percutaneous Injuries Among Health Care Workers During Gynecological Surgical Procedures.” *Morbidity and Mortality Weekly Report* 46(2):25–9.

Centers for Disease Control and Prevention (CDC). 1998. “CDC Guidelines for Infection Control in Hospital Personnel.” *American Journal of Infection Control* 26:289–354.

Dauleh, M. I., A. D. Irving, and N. H. Townell NH. 1994. “Needle Prick Injury to the Surgeon: Do We Need Sharp Needles?” *Journal of the Royal College of Surgeons of Edinburgh* 39:310–1.

EngenderHealth. 1999. *Infection Prevention Curriculum: A Training Course for Health Care Providers and Other Staff at Hospitals and Clinics*. New York: EngenderHealth.

Ethiopian Red Cross Society. 2008. “National Blood Bank Service.” Available at: http://www.redcrosseth.org/cp_health_care_blood_bank.php

Favero, M. S. 1985. “Sterilization, Disinfection, and Antisepsis in the Hospital.” In *Manual of Clinical Microbiology*, 4th ed., ed. E. H. Lennette, et al., 129–37. Washington, DC: American Society of Microbiology.

Federal Democratic Republic of Ethiopia, Ministry of Health. 2007. *National HIV/AIDS Policy*. Addis Ababa, Ethiopia: Federal Ministry of Health.

Federal Ministry of Health, Ethiopia. 2004. *Infection Prevention Guidelines for Health Care Facilities in Ethiopia*. Addis Ababa, Ethiopia: Federal Ministry of Health.

Federal Ministry of Health, Ethiopia. 2010. *Ethiopian Hospital Reform Implementation Guidelines: Ethiopian Hospital Management Initiative, Volume 1*. Addis Ababa, Ethiopia: Federal Ministry of Health.

Garner, J. S., and Hospital Infection Control Practices Advisory Committee (HICPAC). 1996. “Guideline for Isolation Precautions in Hospitals.” *American Journal of Infection Control* 24:24–31.

Girou, E., S. Loyeau, P. Legrand, F. Oppein, and C. Brun-Buisson. 2002. “Efficacy of Hand Rubbing with Alcohol-Based Solution Versus Standard Hand Washing with Antiseptic Soap: Randomized Clinical Trial.” *British Medical Journal* 325:362–6.

Hutin, Y., A. Hauri, L. Chiarello, M. Catlin, B. Stilwell, T. Ghebrehiwet, J. Garner, and Injection Safety Best Practices Development Group. 2001. *Best Infection Control Practices for Intra-Dermal, Subcutaneous and Intramuscular Needle Injections*. Geneva, Switzerland: World Health Organization (WHO), Safe Injection Global Network.

JHPIEGO. 2003. *Infection Prevention Guidelines for Health Care Facilities with Limited Resources*. Baltimore, MD: JHPIEGO.

JHPIEGO. 2004. *Infection Prevention Learning Resource Package: Guide for the Trainer*. Baltimore, MD: JHPIEGO.

JSI/Making Medical Injections Safer. 2005. *Norms and Standards for Injection Safety*. Boston: JSI, Inc.

Korniewicz, D. M., B. E. Laughon, W. H. Cyr, C. D. Lytle, and E. Larson. 1990. “Leakage of Virus Through Used Vinyl and Latex Examination Gloves.” *Journal of Clinical Microbiology* 28:787–8.

Lanphear, B. 1994. “Trends and Patterns in the Transmission of Blood-Borne Pathogens to Health Care Workers.” *Epidemiological Review* 16:437–50.

- Lanphear, B. P., C. C. Linnemann Jr., C. G. Cannon, M. M. DeRonde, L. Pendy, and L. M. Kerley. 1994. "Hepatitis C Virus Infection in Health Care Workers: Risk of Exposure and Infection." *Infection Control of Hospital Epidemiology* 15:745–50.
- Larson, E. L. 1988. "Guideline for Use of Topical Antimicrobial Agents." *American Journal of Infection Control* 16:253–66.
- Larson, E. L. 1995. "APIC Guidelines for Hand-Washing and Hand Antisepsis in Health Care Settings." *American Journal of Infection Control* 23:251–69.
- Larson, E. 1999. "Skin Hygiene and Infection Prevention: More of the Same or Different Approaches?" *Clinical Infectious Diseases* 29:1287–94.
- Lynch, P., and Jakson M. 1997. *Infection Prevention with Limited Resources*. Chicago: ETNA Communications.
- Making Medical Injections Safer (MMIS). 2006. *Training of Trainers Facilitation Guide*. Boston: Ministry of Health and John Snow, Inc. Research and Training (MMIS – Kenya Program).
- Mast, E. E., and Alter M. J. 1993. "Prevention of Hepatitis B Virus Infection Among Health Care Workers." In *Hepatitis B Vaccines in Clinical Practice*, ed. R. W. Ellis, 295–307. New York: Marcel Dekker.
- Mitsui, T., K. Iwano, K. Masuko, C. Yamazaki, H. Okamoto, F. Tsuda, T. Tanaka, and S. Mishiro. 1992. "Hepatitis C Virus Infection in Medical Personnel After Needle Stick Accident." *Hepatology* 16:1109–14.
- Nichols, R. L. 1991. "Surgical Wound Infection." *American Journal of Medicine* 91(Suppl 3B):54S–64S.

Nyström, B. 1981. "Disinfection of Surgical Instruments." *Journal of Hospital Infection* 2:363–8.

Patterson, J. E., J. Vecchio, E. L. Pantelick, P. Farrel, D. Mazon, M. J. Zervos, and W. J. Hierholzer, Jr. 1991. "Association of Contaminated Gloves with Transmission of *Acinetobacter calcoaceticus* var. *antitratus* in an Intensive Care Unit." *American Journal of Medicine* 91:479–83.

Pereira, L. J., G. M. Lee, and K. J. Wade. 1997. "An Evaluation of Five Protocols for Surgical Hand-Washing in Relation to Skin Condition and Microbial Counts." *Journal of Hospital Infection* 36:49–65.

Porter, C. W. 1987. "Infection Prevention in Voluntary Surgical Contraception." *Biomedical Bulletin* 6:1–7.

Puro, V., N. Petrohilos, and G. Ippolito. 1995. "Italian Study Group on Occupational Risk of HIV and Other Blood Borne Infections. Risk of Hepatitis C Seroconversion After Occupational Exposure in Health Care Workers." *American Journal of Medicine* 293:1063–7.

Schmidt, A. 1899. *U.S. Patent 630,782: Disinfecting by Means of Formaldehyde*.

Seropian, R., and B. M. Reynolds. 1971. "Wound Infections After Preoperative Depilatory Versus Razor Preparation." *American Journal of Surgery* 121:251–4.

Sheena, A. Z., and M. E. Stiles. 1982. "Efficacy of Germicidal Hand-Washing Agents in Hygienic Hand Disinfection." *Britain's Journal of Medicine* 65:855–8.

Siegel, J. D., E. Rhinehart, M. Jackson, L. Chiarello, and the Health Care Infection Control Practices Advisory Committee. 2007. "Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Health Care Settings." *American Journal of Infection Control* 35(Suppl 2):S65–164.

South-East Asia Regional Office (SEARO), World Health Organization. 1988. *A Manual on Infection Control in Health Facilities*. New Delhi, India: SEARO.

Spaulding, E. H. 1968. Chemical Disinfection of Medical and Surgical Materials.” In *Disinfection, Sterilization and Preservation*, ed. C. A. Lawrence, 437–46. Philadelphia: Lea & Febiger.

Werner, B. G., and G. F. Grady. 1982. “Accidental Hepatitis B Surface Antigen Positive Inoculations: Use of Antigen to Estimate Infectivity.” *Annals of Internal Medicine* 97:367–9.

WHO/AFRO/PEPFAR/JSI. 2005. *Do No Harm: Injection Safety in the Context of Infection Prevention and Control. Facilitators’ Guide*. Geneva, Switzerland: WHO.

World Health Organization, Regional Office for South-East Asia and Regional Office for Western Pacific. 2004. *Practical Guidelines for Infection Control in Health Care Facilities*. Geneva, Switzerland: World Health Organization, Regional Office for South-East Asia and Regional Office for Western Pacific.

World Health Organization. 2005a. *Management of Solid Health Care Waste at Primary Health Centers: A Decision-Making Guide*. Geneva, Switzerland: World Health Organization.

World Health Organization. 2005b. *WHO Draft Guideline for Adverse Event Reporting and Learning System: From Information to Action*. Geneva, Switzerland: World Health Organization.

World Health Organization. 2006. *Safety of Injections. Global Facts and Figures*. Geneva, Switzerland: World Health Organization.

World Health Organization. 2009a. *WHO Guidelines in Hand Hygiene in Health Care*. Geneva, Switzerland: World Health Organization.

World Health Organization. 2009b. *WHO Guidelines for Safe Surgery: Safe Surgery Saves Lives*. Geneva, Switzerland: World Health Organization.

World Health Organization. 2010. *WHO Best Practices for Injections and Related Procedures Toolkit*. Geneva, Switzerland: World Health Organization.