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INFECTION PREVENTION CURRICULUM

A Training Course for Health Care Providers and Other Staff of Hospitals and Clinics

Trainer's Manual

AVSC International

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AVSC International works worldwide to improve the lives of individuals by making reproductive health services safe, available, and sustainable. We provide technical assistance, training, and information, with a focus on practical solutions that improve services where resources are scarce. We believe that individuals have the right to make informed decisions about their reproductive health and to receive care that meets their needs. We work in partnership with governments, institutions, and health care professionals to make this right a reality.

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Foreword

Infectious diseases are constantly in transition. New diseases develop, known diseases become widespread or re-emerge, and some diseases are eradicated. Over the past few decades, tuberculosis and cholera, diseases that were once better controlled or occurred rarely, have re-emerged. In addition, HIV and the hepatitis C virus have been newly identified and are a significant cause of illness and death in many parts of the world.

Health care personnel are on the front line of protecting themselves and their clients from infectious diseases. They perform clinical procedures or other activities that can expose themselves and clients to potentially infectious microorganisms. Many of their clients are sick and thus may be more susceptible to infections or have infections that can be transmitted to others.

Fortunately, health care staff can perform safe and simple procedures to minimize risk and the spread of infections. This curriculum presents those procedures and a variety of training activities for a range of health care staff, from cleaning personnel to surgeons. Many of the practices described here can be integrated at minimal cost into the routine workday at clinics and hospitals around the world.

This work represents AVSC's collaboration with health care organizations from around the globe. Working with our partners, we are committed to offering quality reproductive health services to the women and men of the world.

Amy E. Pollack, M.D., M.P.H.
President

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Introduction for the Trainer

Course Overview

Course Purpose

This infection prevention curriculum is designed to develop or strengthen the capacity of health care staff to protect themselves, their clients, and members of the surrounding community from infections. This course emphasizes the information needed to reduce the risk of infections in a service-delivery environment. This curriculum can be adapted for use with those who need only reinforcement or updating of previous trainings.

Course Participants

Infection prevention is an integral part of all health care services; everyone working at a health care facility is at risk of infections, and everyone plays a role in reducing that risk. Therefore, this course contains instructions for training all levels of staff—from service providers to ancillary staff—and can be used for training of mixed staff (service providers and ancillary staff) at the facility where the participants work (referred to as "on-site training"), training of service providers at a site other than where the participants work (referred to as "off-site training"), and independent self-study. (See "Training Site Selection: On-Site vs. Off-Site Training" on page 2.)

Some parts of this curriculum may also be appropriate for administrative or supervisory staff who do not actually work with clients but who supervise or make decisions affecting those who do. Such staff should be encouraged to attend both on-site and off-site training whenever possible. All course participants should bring to this training the desire to learn about or update their knowledge of infection prevention practices.

Throughout this curriculum, the term *service providers* will be used to refer to the staff who provide clinical services. Service providers may include doctors, medical officers, nurses, midwives, and medical or surgical assistants. The term *ancillary staff* will be used to refer to the staff who provide support services, such as handling specimens, housekeeping, processing of instruments and other items used in clinical procedures, and handling waste. Ancillary staff may include laboratory technicians and assistants, orderlies, nursing assistants, ward assistants, housekeepers, and cleaners. In some settings, service providers may also perform support-service tasks such as processing of instruments and other items.

Although it is useful to know each participant's level of knowledge before the beginning of the course, there are no minimum qualifications that must be met.

Trainers for This Course

This curriculum has been designed for use by skilled, experienced trainers. While this curriculum contains information to help the trainer enhance the learning experience, it is assumed that the

trainer understands adult learning concepts, employs a variety of training methods and techniques, and knows how to adapt the materials to meet the participants' needs.

Trainers for this course must be aware of the standards and guidelines regarding certification, training follow-up, and ongoing supervision of the facility or institution sponsoring the training. While reviewing the curriculum in preparation for conducting this course, trainers should be sure to keep these in mind.

Though the term *trainer* will be used throughout this curriculum, it is actually very useful to have two trainers for this course. The two trainers might split the responsibilities of training in a way that best meets the participants' needs and best utilizes the trainers' particular experience and areas of expertise.

Training Site Selection: On-Site vs. Off-Site Training

This curriculum is designed to be used during either an on- or off-site training course. *On-site training* occurs at the health care facility where the participants work and will use the new knowledge and skills gained during the training course. *Off-site training* is conducted at a centralized location (such as a training center or hotel) or health care facility (such as a hospital or clinic) where the participants do not normally work or use the new knowledge and skills gained during the course. It often involves participants from multiple facilities, cities, or even different countries.

Whenever possible, infection prevention training should be conducted on-site. On-site training may be more beneficial than off-site training in improving infection prevention practices for a number of reasons, including:

- The trainer can assess the infection prevention practices at the facility before the training and tailor the training to the facility's needs.
- There is more opportunity during the training for hands-on practice of the skills being taught.
- Facility-specific problems and concerns, which have a significant effect on the quality and performance of infection prevention practices, can be addressed.
- Depending on the facility, many/most/all of the facility's staff can receive training, which is crucial to improving infection prevention practices. Off-site training generally includes only service providers and generally does not include ancillary staff, who are also at risk of infections during the course of their work and often perform crucial infection prevention tasks.
- The training is conducted in the setting in which the knowledge will be applied, thus increasing the likelihood that the participants will begin to use the skills immediately after the training.
- Staff do not have to leave their work sites, which allows the course schedule to be more flexible to accommodate work activities and eliminates travel costs and arrangements.
- Administrative or supervisory support, which is crucial to improving infection prevention practices, is more likely to be gained, and the facility's administators are more likely to attend the training.
- The trainer can observe the conditions and practices at many facilities, which can help tailor future trainings.

However, on-site training is not always possible, especially when a few staff members from a variety of institutions or locations need training. In addition, there are some reasons why off-site training may be more feasible than on-site training:

- There may be fewer interruptions, since the participants will be away from their daily work responsibilities.
- If limited trainers are available, more staff from different facilities can be trained at one time.
- Training equipment and materials that are not readily available or obtainable at a facility may be available or obtainable.

If training is conducted off-site, the trainer should find as many opportunities as possible to have the participants discuss how they will apply what they have learned at their own facility. The trainer should also arrange some visits to facilities near where the training is being conducted, if possible, to allow the participants to observe and discuss infection prevention practices.

Regardless of whether training is conducted on-site or off-site, it will be very useful for the trainer to observe the infection prevention practices at the participants' facility (if training is on-site) or at facilities typical of those at which the participants work (if training is off-site) *before the training*, if he or she is not already familiar with them. This will give the trainer an idea of what infection prevention practices are being used at the participants' facilities, what practices need to be changed or implemented, and what supplies are likely to be readily available, which will allow him or her to tailor the training accordingly.

Special Issues for On-Site Training

On-site training requires the most active participation of the trainer, because it allows for demonstration and practice of infection prevention procedures in the participants' clinical setting and affords the potential to address or solve problems that are identified during the training. Likewise, greater active participation of the participants is necessary for optimal skills-building. Appendix E of this curriculum includes a number of interactive training activities that can be most effectively used during on-site training.

For on-site training to be as effective as possible, the trainer should devote as much of the course as possible to demonstration/practice and other training activities and should limit the time spent in the classroom. Demonstrations and practice should take place in that part of the facility in which the skills will be used, and the trainer should work with those who will either use the skills or supervise those who do. Participants should be given an opportunity to practice the new skills with guidance from the trainer or co-workers who have mastered the skills to the greatest extent possible, given the time and availability. Trainers can use time during practice sessions to help the staff address facility-specific problems and concerns.

It is particularly useful during on-site training to have this training course taught by two different instructors—one of whom focuses primarily on working with the service providers and one who works primarily with the ancillary staff.

The trainer will need to use his or her judgment about which training approaches to use to be most effective with this curriculum, depending on the circumstances. For example:

- Some of the material can be covered during the practice sessions rather than in the classroom.
- The participants can be split into groups; for example, the service providers can read the material independently and complete some exercises on their own (followed by review/discussion with the trainer), while the trainer works with the ancillary staff.

The trainer may experience some resistance to the idea of training both service providers and ancillary staff together in the same classroom sessions; this may be due to the different levels of knowledge and experience of the members of the two groups, as well as the fact that members of one group may not feel comfortable discussing their beliefs and practices in front of members of the other. While it may be more difficult to train a mixed group of participants, in many instances it is preferable to do so for the following reasons:

- Training all staff together can help develop a feeling of team-building; this is important because infection prevention requires that all staff work together.
- Training all staff together allows the service providers to see that ancillary staff often know and understand more than was thought and may have good, practical ideas for improving the facility's infection prevention practices.
- Ancillary staff tend to be very receptive to such training, since they are often excluded from training altogether.

When training is conducted on-site, the trainer should arrive at the training site the day before the training, if possible, to set up for the training and see if the planned agenda will fit the working schedule and needs of the staff. In addition, there are basic supplies that a facility must have in order to conduct an on-site training course (see page 8). The trainer may choose to devote some time at the end of the first training day to take the participants to the local market to see what supplies are locally available.

The trainer could use the Infection Prevention Assessment Survey and accompanying User's Guide (which appear in Appendix C of this curriculum) as a way to gather baseline information at the facility and then again later to see if changes occurred (for example, for evaluation of the training). Staff could also use the survey as part of the process of "setting up" an infection prevention program at their facility. See Appendix C in this curriculum for more information on this topic.

When training is conducted on-site, the trainer should identify one or two participants who show particular interest in or knowledge about infection prevention to serve as an "infection prevention coordinator" at the facility. These staff members are responsible for following up with administrators and other key staff at the facility, helping to implement the practices identified in the implementation plans, and serving as resources for any staff who have questions about or problems related to infection prevention practices.

It is likely that some persons in positions of authority will be attending an on-site training. If this is not the case, the trainer should ensure that such staff are involved to the greatest extent possible—for example, by asking them to participate in Module 2: Importance and Purpose of Infec-

tion Prevention and the implementation plan sessions in Module 14: Implementation Plans and Closure, as well as by keeping them informed of progress and any problems encountered during the course.

Special Issues for Off-Site Training

AVSC recommends holding an off-site training at a health care facility that performs model infection prevention practices; this will allow the participants to observe the practices as they are being performed properly. If this is not possible, the trainer should try to organize visits to such a facility, and should schedule them for after a good portion of the curriculum has been covered so that the participants can observe practices that they have already learned. (During such a visit, trainers should be sure to tour the facility's waste-disposal site as well.)

If visits to a facility with model infection prevention practices cannot be arranged, it would still be useful to organize visits to nearby health care facilities. This would allow the participants to observe infection prevention practices, which may lead to fruitful discussion of appropriate and inappropriate practices and how similar inappropriate practices might be changed at their own facilities. The visits might also provide models of useful approaches that the participants could apply to their own facilities.

The Training Package

Training Curriculum

This curriculum consists of:

- Trainer's Manual
- Participant's Handbook
- Suggested text for transparencies and flipcharts (in Appendix G of this Trainer's Manual)

Other materials, supplies, and equipment needed to conduct the course are listed on pages 8–11.

Trainer's Manual

Format

For easy reference, the Trainer's Manual contains an exact reproduction of every page of the Participant's Handbook, as well as information for the trainer only.

The first page of each module contains general information for the trainer only. Thereafter, all the left-hand pages of modules in the Trainer's Manual present trainer information (these pages, referred to as "Notes for Trainers," have a stripe running down the side and are printed in blue), and all the right-hand pages show an exact reproduction of the material as printed in the Participant's Handbook.

Trainer's Notes, Options, Tips, and Activities

The first two pages of each module contain introductory information with essential details about:

- How to present the content of the module
- The intended audience of the module
- The estimated time needed for the module's training
- Training supplies needed to present the content of the module
- Advance preparation required
- The purpose and objectives of the module

The Notes for Trainers provide guidance and suggestions for teaching the content of each session within each module. These pages address the key points to be presented and call out content that the participants may have difficulty learning. They also include the following elements to help trainers customize the training and enhance the learning process:

- **Training Options.** These present alternative ways to present the content of the module. Training options in the curriculum are preceded by the symbol ➲.
- **Training Activities.** These are activities that AVSC recommends using as training tools. They allow the trainer to present material in a format other than lecture and provide opportunities for the participants to analyze concepts and apply information and skills presented in the modules. These include discussion topics, demonstration, skills practice, and other activities. Training activities in the curriculum are preceded by the symbol ⌖.
- **Optional Training Activities.** These are additional activities trainers can use if there is sufficient training time or if participants need additional practice in a topic area. While these are useful activities, they are not a required part of the course. Like the recommended training activities, these include discussion topics, demonstration, and skills practice, as well as case studies and video viewing. Optional training activities in the curriculum are preceded by the symbol ✚.
- **Training Tips.** These present information that can help make the training techniques more effective. Training tips in the curriculum are preceded by the symbol ☞.

Training Tools

The Trainer's Manual also includes the following tools the trainer can use to customize training:

Knowledge-Assessment Test

AVSC recommends that trainers use this test, which appears in Modules 1 and 14, at the beginning of the workshop (as a pretest) and again at the end of the workshop (as a posttest). The trainers can use the results of the pretest to customize the training to best suit the participants' level of knowledge and experience and to measure the change in the participants' knowledge after the training. Answers to the test appear in this Trainer's Manual, but these answers are not included in the Participant's Handbook.

The Participant's Handbook contains two copies of the test (one for the pretest and one for the posttest). The participants may tear out and use these copies or the trainer may make and distribute copies to the participants.

Summary/Self-Assessment Questions
A summary/self-assessment appears at the end of all modules in this curriculum except for Modules 1 and 14. These assessments can be used during training sessions, independent study, or group study. The trainer can use this instrument in several ways:

- At the beginning or end of the module, individual participants can write their responses to the questions. (If this exercise is used at the end of the module, the participants can complete it either during the training session or in the evening after the training session.)
- At the beginning or the end of the module, the group can respond verbally to each question as it is read aloud.
- Throughout the workshop, the trainer can note which questions the participants found difficult to answer. At the end of the last module that contains a summary/self-assessment exercise (Module 13: Waste Disposal), the participants can review these questions.
- The assessments can be used as part of a final group review.

Each question in this assessment is followed by a notation of the pages in the Participant's Handbook where the text discussion can be found. Answers appear in both the trainer's and the participant's books.

"At My Facility..."
The purpose of this section, which appears in Modules 2–13, is to help the participants use what they have learned in each module to evaluate the appropriateness and effectiveness of the infection prevention practices at their facility and identify problems that need to be addressed. The participants will use their responses to the questions to create implementation plans in Module 14: Implementation Plans and Closure.

The participants can complete the exercise at the end of each module. If time is limited, the participants can complete the exercise in the evening after each day's training and then discuss their responses with the trainer the following morning. (*Note:* On the last day of training, the participants will need to have completed the exercises for all modules covered during the course before they can create implementation plans.) Participants who are studying the material independently are instructed to complete the "At My Facility..." exercise after studying each module.

Independent Study
Independent study can be used as an alternative to taking group time to cover some of the knowledge-based course content. Directions for independent study are given for all modules. The purpose of independent study is to allow participants to prepare in advance for the training sessions. This curriculum is not designed to be self-instructional, and independent study is not meant as a substitute for attending training sessions.

Suggested Text for Transparencies and Flipcharts
Throughout this course, trainers may find it useful to use transparencies or flipcharts to present the content of the modules or review exercises. Appendix G of this curriculum contains sample trans-

parencies and flipcharts for each module that can be reproduced or adapted and used during training sessions.

Implementing and Managing an Infection Prevention Program

Appendix C of this curriculum focuses on supporting the management capacity needed to establish and maintain appropriate infection prevention practices at a service-delivery site. It provides information on how to:

- Assess current infection prevention practices at a facility and make appropriate recommendations for improvement
- Design a plan and implement activities to improve practices at the facility
- Develop some key strategies for gaining staff support, transferring knowledge and skills, and influencing attitudes necessary to make change
- Develop a broad plan for periodic monitoring of infection prevention practices at a facility and develop ways to address problems identified
- Develop a plan to evaluate whether or not a program is successful

Success in establishing and maintaining appropriate infection prevention practices requires effective management skills, knowledge, creativity, and contributions from all staff at a facility. Limited resources make it very important to have an organized supply system to ensure an adequate and reliable stock of essential materials and equipment.

Participant's Handbook

Each participant will receive a Participant's Handbook, which includes all essential course information. This minimizes the need for the participants to take notes during sessions and allows them to give their full attention to the course. Ideally, the participants should receive their copy of the handbook in advance of the course so that they can become familiar with the information before the course begins. The handbook also provides directions for independent study (see page 7). After reviewing the material in each module, participants who are studying independently can answer the summary/self-assessment questions (see page 7) to test their knowledge. The handbook can also be used as a reference resource after the training course is over.

Training Materials, Supplies, and Equipment

Along with the materials provided as part of this curriculum (one copy of the Trainer's Manual and one copy of the Participant's Handbook), the following materials, equipment, and supplies will help the trainer successfully conduct an infection prevention training course. (See the Trainer's Checklist, which appears on the next two pages, for information on ordering texts and other materials.)

- ***Infection Prevention for Family Planning Service Programs video*** (AVSC International and JHPIEGO Corporation). This video is an important component of this training course and is strongly recommended for use. However, if a television monitor and videocassette recorder are not available, video viewing is not mandatory. The video segment appropriate to each session

Materials, Equipment, and Supplies

Before beginning any training, make sure that everything needed to conduct the training is available and in working order. For on-site training, review the list of on-site training activities (see Appendix E of this curriculum) and determine the facility's needs for supplies (such as buckets and utility gloves) in advance so that they can be purchased before the training, used during training, and then left at the facility to allow participants to begin instituting the infection prevention practices immediately after the training.

The following list contains the supplies needed to conduct the training activities for an off-site training course. Additional supplies may also be needed, depending on which optional activities are used.

For the course

- *Infection Prevention for Family Planning Service Programs* video*
- Audiovisual equipment (for videos and transparencies)
- Flipchart paper, masking tape, and colored markers
- Transparencies

For individual modules

Module 3

- Samples of locally available soap
- Samples of locally available alcohols and emollients
- Containers for storing alcohol handrub solution
- Gloves (surgical, exam, and utility)
- Soap dishes that allow for drainage

Module 4

- Samples of locally available antiseptics
- Samples of locally available disinfectants
- Small bottles
- Iodine bowl, gallipot, or other small bowl
- Gauze, cotton wool, or cotton balls

Module 5

- Surgical handscrub supplies (soap/antiseptic, brush/sponge/stick, running water, towels)
- Samples of locally available alcohols and emollients
- Containers for storing alcohol handrub solution
- Surgical attire (surgical gloves, cap, mask, gown, or waterproof apron, protective eyewear)

continued

Trainer's Checklist continued

Module 6

- Supplies for making a sharps-disposal container (a small, heavy cardboard box, empty plastic jug, and/or metal container, scissors, tape)
- Hypodermic needles and syringes
- Multidose vial
- Kidney basin

Module 7

- Supplies for drawing floor plans (paper, colored pencils or pens)

Module 8

- Samples of locally available bleach (liquid, powder, or tablets)
- Supplies for preparing a chlorine solution (bleach, water, a bucket or other container for mixing the solution, a container for measuring)

Module 9

- Brushes (e.g., toothbrushes)

Module 10

- Supplies needed for wrapping (wrappers [paper, newsprint, muslin or cotton fabric], instruments or other items, gloves, tape)

Module 11

- Steamer

For each participant

- Participant's Handbook*
- Infection prevention wall charts*

* To obtain these items, contact AVSC International, 79 Madison Avenue, New York, NY 10016, USA (telephone: 212-561-8000; fax: 212-779-9489; e-mail: info@avsc.org) or use AVSC's publications order form on the World Wide Web (www.avsc.org/pubs.html).

may be shown at the beginning of the session to introduce the content or at the end of the session as a review.

- **Training aids.** The trainer should also obtain training aids, such as flipchart paper, masking tape, and colored markers, for use during the course. The trainer must obtain audiovisual equipment in order to make use of the video or transparencies. If the resources to develop and use transparencies are not available, the trainer should create flipcharts for posting critical material during training sessions.
- **Other supplies.** In addition to the above-mentioned materials, a variety of supplies may be useful for conducting the activities and demonstrations in this training course. A list of supplies needed for all training activities are listed in the Trainer's Checklist, which appears on pages 9 and 10. Especially if training is conducted on-site, locally available brands of supplies for demonstrations and skills training (like the soaps used for handwashing or the chlorine used for instrument processing) should be obtained to ensure that participants will be able to obtain the materials demonstrated after the training course.

In an on-site training, some of the needed supplies may actually be available at the facility itself (e.g., in the pharmacy or the central supply). If not, there are several options for getting these supplies, including:

- Purchasing the supplies locally before the workshop begins or during the course of the workshop
- Taking some of the participants to the market to purchase the supplies during the workshop (such as at the end of training day 1)
- Asking administrators at the facility to purchase the necessary supplies before the workshop

How to Use These Materials

Training Design

Because infection prevention encompasses a wide range of practices—from proper technique during provision of clinical services to adequate disposal of waste—and involves varying levels of staff playing different roles, this course tends to be more knowledge-based than competency-based. This means that the training focuses on teaching the facts and attitudes needed to perform infection prevention practices correctly and that the participants' progress will be measured, to a great extent, by assessing changes in their knowledge of infection prevention rather than by assessing actual changes in their practice. In general, on-site training provides more opportunity than off-site training for participants to practice and for trainers to observe the participants using new knowledge and skills. However, several skills will be taught and observed during this course, regardless of the training setting.

This course has been designed to be flexible to accommodate different types of participants (service providers and ancillary staff), different levels of participant experience, an on-site or off-site training location, and differing amounts of training time. The training package includes most of the essential training materials to facilitate this course (including sample agendas), but the trainer should prepare his or her own workshop agenda (see sample agendas on pages 18–22) and lesson plans.

The trainer should thoroughly review the training package and consider these key factors when preparing the course:

- The course design will be affected by the types of participants (service providers and/or ancillary staff) and their prior experience and training (see page 13). While time may be a limiting factor for on-site training in which both service providers and ancillary staff are participants, it is preferable that all are present so they gain an understanding and appreciation of the critical roles they each play in infection prevention.
- The Knowledge-Assessment Test, which is given during the introductory session of the workshop, can help the trainer identify the participants' training needs to adapt the workshop accordingly.
- The trainer can provide the participants with the Participant's Handbook in advance of the course. Instructions for independent study are included in the Participant's Handbook. If the participants read the course material before attending the course, lecture time in some areas can be reduced, and more time will be available for discussion of problem areas, issues of particular interest or importance to the participants, training activities, or (in on-site courses) practice exercises.
- The trainer should use training techniques with which he or she feels comfortable. Training techniques have been suggested in each module, but the trainer should feel free to use any other techniques that will be useful.

Use of Training Methods

The content of this curriculum may be presented through a combination of training methods: trainer presentation, training activities (which are provided in the Notes for Trainers for each module), and independent study. Although it will be necessary to present some of the material through lecture, more participatory methods, such as questioning, group exercises, observation, and discussion, can be used. The trainer should never lecture for more than 15–20 minutes at a time. Even while lecturing, the trainer should show examples, whenever possible, of items that are being discussed. For example, the trainer might hold up samples of supplies that are needed for a particular process, especially if the process is new to the participants or the supplies may not be available at the particpants' facilities.

Usually a choice of activities is presented to teach the same content. Often one activity is recommended and then several optional or alternate activities are presented. For some activities, options for conducting the activity are included. The trainer may choose activities that best suit the particular training workshop, taking into consideration the audience, available time, training location, and trainer's teaching style. In many cases, a discussion may be used to lead into the presentation of a particular topic or a case study may be used to introduce the content of an entire module.

Participatory methods, such as brainstorming or group skills demonstration, have been shown to be a critical feature of successful adult learning. While it is desirable to have as much interactivity as possible, both to reduce the amount of lecture time and to more fully engage the participants, the content of this training course does not always lend itself to such activities. Activities should not be used purely for the purpose of variety, but rather, should be used only if they help illuminate a difficult teaching point or facilitate potentially otherwise unexplored areas. Principles of

adult learning can be employed by relying heavily on the participants to discuss issues and generate solutions based on their own experiences.

If most or all of the participants are service providers rather than ancillary staff, the trainer can ask them to cover the didactic material in advance through independent study. Though this is not a participatory technique, it is a fast, efficient way to introduce new material.

Audience

Some of the content of this training course is geared specifically toward service providers. These staff, who also often have supervisory roles, should have a good understanding of all aspects of infection prevention, even if they do not themselves perform some specific tasks (such as those related to processing instruments, housekeeping, or waste disposal). Therefore, as a general rule, all of the content of this course should be taught to service providers.

Likewise, some of the content of the course is not necessary for ancillary staff to perform their jobs adequately and safely. This content may vary from facility to facility, since these staff may perform different duties at different facilities. For example, at some facilities ancillary staff may be responsible for preparing decontamination solutions, wrapping instrument packs, or running the autoclave, whereas at other facilities they may only be responsible for housekeeping and waste-disposal activities. When the participants include mixed groups (as in on-site training), it may be difficult or impractical to exempt the ancillary staff from classroom sessions in which the material being covered does not apply to their responsibilities. Although there are a few exceptions, generally there is some information in every module that is important for ancillary staff to learn and understand. Thus, in most cases it is probably best to have these staff stay with the group and participate in the activities, even if some of the information is not critical for them to understand. In the Notes for Trainers introducing each module, the trainer is provided with guidance on which content is generally applicable to different levels of participants.

If all of the participants are ancillary staff, the trainer will need to adapt the materials to focus on the information that is most applicable; again, this will vary, depending on the participants' specific duties. Therefore, before conducting an on-site training, the trainer should determine exactly which tasks the ancillary staff are responsible for and make every effort to ensure that these participants understand and are able to adequately perform them. This is particularly important with low-literate/illiterate staff, who may be unable to easily use the Participant's Handbook and other materials, such as wall charts, for reference. When training is conducted on-site, the trainer should be sure to allocate enough time for demonstration and practice of the procedures presented in the handbook, as well as for assistance in resolving any problems that may exist. The trainer should also be sure to work closely with the ancillary staff to ensure that they understand those practices that are most appropriate for them, based on their specific duties.

Supervisory Involvement

When training is conducted off-site, it is crucial that the trainer keep in mind that, in some cases, participants will not be able to make significant changes in infection prevention practices when

they return to their facilities or may not be in an appropriate position or have the authority to make the necessary changes in policy or practice. Ideally, it is best to include supervisors in some portion, if not all, of the training. Therefore, it is important to visit the participants' facilities, if possible, before the training course to orient senior-level staff to the need for appropriate infection prevention practices.

Some of the material in this introduction and in Module 2: Importance and Purpose of Infection Prevention can be used during these discussions. If facility visits are not possible, it is critical that the participants brief their supervisors and others in positions of authority when they return to their facilities in order to gain support for changing current practices or implementing new ones. Ideally, participants in the training should include supervisors or others in positions of authority who can make the necessary changes in policy or practice.

If supervisors are not supportive of implementing the new infection prevention practices and supporting the prospective participants in transferring infection prevention skills to the rest of the staff, then the prospective participants may not be appropriate for the training. Remember: the success of a training is not how well the participants perform on a posttest, but whether newly learned knowledge and skills are successfully implemented at the facility.

Clients' Rights

The participants may or may not have direct client contact during the infection prevention training course. However, they may observe some client-care activities during the training, either at their facility (if the training is conducted on-site) or during a facility visit (if the training is conducted off-site). As with any medical service, the rights of the client are paramount and should be considered at all times throughout the training course. Each client's permission must be obtained before participants in the training observe or assist with any aspect of client care. A client who refuses to grant permission about having participants present when a procedure is performed should not be denied services, nor should the procedure be postponed.

Evaluation

Evaluation is an important part of the training. Evaluation gives the trainer an indication of what the participants have learned, provides feedback to the participants about what they have learned, and helps the trainer determine whether training strategies used were effective.

The true test of how successful infection prevention training has been is whether or not appropriate practices have been instituted or current practices improved. This emphasizes the importance of good follow-up of all training workshops. There is, however, a need for more immediate evaluation—including an evaluation of the trainer and the course itself. Because this course tends to be more knowledge-based than competency-based, participants' progress will be measured in large part by assessing changes in knowledge. Each module contains several tools and activities for evaluation.

The trainer should include appropriate evaluation options to:

- Assess the participants' needs and abilities *before the training* to adapt the course to meet the participants' needs and to gather baseline information for comparison with responses after the training in order to document change. For example, the trainer might:
  - Use the Knowledge-Assessment Test as a written or verbal pretest.
  - Observe the participants at work and note the current status of infection prevention practices at the facility.
  - Ask all the participants about their experience with infection prevention, and ask specific questions related to their level of knowledge and skill.
- Assess the participants' progress *during the training*. For example, the trainer might:
  - Use the module's summary/self-assessment exercise as described on page 7.
  - Ask questions of individual or groups of participants to test their knowledge and comprehension.
  - Present case studies for discussion and assess participants' solution of cases.
- Assess the participants' cumulative knowledge and skills at the *end of the training*. For example, the trainer might:
  - Use the Knowledge-Assessment Test as a written or verbal posttest.
  - Observe the participants during practice sessions and ask them to demonstrate learned skills.
  - Ask questions to test the participants' knowledge and comprehension.
- Assess the outcome or results of the course *after the training*. For example, the trainer should follow up with the participants to learn how they have applied the knowledge and skills taught during the training (see "After the Training Course" on page 24). If the supervisor performs follow-up, the trainer should contact the supervisor to see how infection prevention practices are going at the facility.

For evaluation during and at the end of the training for participants whose literacy skills are good, the written material in the handbook, such as the summary/self-assessment exercises or case studies, may be used. If some participants have poor literacy skills, observation of them performing specific practices is likely to be a better assessment tool than written exercises from the handbook.

It is also important to have an end-of-training evaluation, in which the participants evaluate the overall process and results of the training course. Evaluation should also include an assessment of the trainer's performance, since ineffective trainers can negate the potentially positive impact of a training course. The trainer should check with the institution with which he or she is working to see if there is a form the institution prefers to use. Alternatively, the trainer may have a form that he or she has used before or may prefer to design one specifically for this course. A sample form appears in Appendix B of this curriculum.

Certification

Certification indicates that the participant has demonstrated the competency needed to perform an activity independently. Because infection prevention encompasses such varied types of activities, and because different levels of staff are responsible for different infection prevention tasks, certification is generally not practical. The fact that this training is primarily knowledge-based and not

competency-based also makes certification of competency in infection prevention impractical. AVSC does not recommend that participants receive certificates of competency following the training.

The institution that provides the training should determine whether it wants to provide the participants with some other type of certification. For example, institutions can choose to provide participants who complete the course with a certificate of attendance.

Advance Preparation

Developing a Training Agenda

The modules are organized in a logical order, but the trainer may change the order to suit the participants' training needs or the facility's schedule—especially in on-site training. However, Module 1: Introduction to the Infection Prevention Course and Module 2: Importance and Purpose of Infection Prevention should always be first, and the modules on processing instruments and other items should be covered in order, so that Module 7: Introduction to Processing of Instruments and Other Items always precedes Module 8: Decontamination and Preparation of Chlorine Solutions; Module 8: Decontamination and Preparation of Chlorine Solutions always precedes Module 9: Cleaning Instruments and Other Items; and all three modules always precede Module 10: Sterilization and Storage and/or Module 11: High-Level Disinfection and Storage. In addition, Module 14: Implementation Plans and Closure should always be last.

When preparing a course for *any* audience, the trainer should be sure to include all essential content and activities required to give the participants a strong base of knowledge in infection prevention. The trainer should discuss possible adaptations with other experienced trainers; even the most experienced trainers have found it useful to review their ideas for adapting materials with others.

The Notes for Trainers contained in each module are designed to help the trainer organize a lesson plan for that module. By selecting from the training options and training activities, the trainer can adapt the training course for different workshop lengths, types of participants, and levels of experience. The training activities are designed to serve various purposes—some can be used as a way to present material, others to reinforce certain concepts or technical content, and still others as a review of a session or module. AVSC recommends using a mix of lecture/presentation and participatory training activities to cover the didactic material in this curriculum, as time allows.

For either on-site or off-site training, four to five days would be the ideal length of time for this training course. This would allow time for presentation of all the material and use of most of the training activities, as well as time for discussion, practice, or site visits, as appropriate. Sample five-day agendas for both on-site and off-site training appear on pages 18–22. Sample three-day agendas for on-site and off-site training are also provided in case only three days are available for training. Note, however, that a three-day on-site training course will not allow enough time to cover all of the content, do all of the training activities, and spend time in the facility working with the staff. While the curriculum is designed for use as a three- to five-day course, it could easily be adapted to other time periods, such as separate, sequential weekly sessions.

The trainer will need to use his or her discretion about which specific aspects of the curriculum to include in the training. For example, if time is limited, the trainer may:

- Use the independent-study option, which allows each participant to study the material at his or her own pace and prepare for class discussion. This can save time during the training workshop.
- Ask the participants to do some of the training activities, answer the "At My Facility..." exercises, answer the summary/self-assessment questions, or read the Participant's Handbook at home for review in the morning as appropriate and as time allows.
- Omit any material that is not relevant for the training course, based on the participants' job duties and experience with infection prevention.
- During on-site training, present some of the technical content during the practice sessions rather than during the classroom sessions.

Special Issues for On-Site Agendas

When developing an agenda for on-site training, the trainer should consider the following factors:

- The times that staff arrive at and leave work
- The time period during which clients are seen
- The client load during the days of the training
- The participants' need to see clients and do their other work during the course of the training

For this reason, the trainer should be as flexible as possible when developing the agenda to cause the least disruption possible to the staff's work schedule; after all, if the participants are unhappy and inconvenienced by the training, they are less likely to be enthusiastic, active participants and to learn the information. On the first day of training, the trainer should discuss the schedule with the participants and make adjustments, as necessary. For example, if the staff need to leave work at a certain time, the trainer should try to rearrange the agenda to suit their needs.

The times in the on-site agendas are approximate. The actual length of time needed to teach the content will depend on a number of factors, including the participants' level of knowledge and experience and their work responsibilities. Therefore, the trainer will need to adapt the curriculum carefully, review the lesson plan after the first training day to see if the time allowed for each module still seems sufficient, and modify it, if needed.

Agenda Samples

Five sample agendas (three for on-site training and two for off-site training) are provided on the next few pages, as follows:

- A three-day on-site agenda with practice sessions in the morning, since this is when clients are often seen
- A three-day on-site agenda with alternating classroom and practice sessions
- A five-day on-site agenda.
- A three-day off-site agenda
- A five-day off-site agenda

SAMPLE COURSE AGENDA #1
Three-Day On-Site Infection Prevention Course with Practice Sessions in the Morning

DAY 1	DAY 2	DAY 3
Meet and greet supervisory staff at the facility (30 minutes)	Practice session** (3 hours 20 minutes)	Practice session** (3 hours 30 minutes)
Trainer's assessment of infection prevention practices (1 hour 5 minutes)		
Classroom session (2 hours) • Module 1: Introduction to the Infection Prevention Course (45 minutes) • Module 2: Importance and Purpose of Infection Prevention (45 minutes) • Module 3: Handwashing and Use of Gloves (30 minutes)		
Lunch (30 minutes)	Lunch (30 minutes)	Lunch (30 minutes)
Practice session* (2 hours 45 minutes)	Classroom session (3 hours) • Module 4: Antiseptics and Disinfectants (15 minutes) • Module 5: Aseptic Technique (20 minutes) • Module 7: Introduction to Processing of Instruments and Other Items (25 minutes) • Module 8: Decontamination and Preparation of Chlorine Solutions (40 minutes) • Module 9: Cleaning Instruments and Other Items (20 minutes) • Module 10: Sterilization and Storage (30 minutes) • Module 11: High-Level Disinfection and Storage (30 minutes)	Classroom session (3 hours) • Module 6: Use and Disposal of Needles and Other Sharps (20 minutes) • Module 12: Housekeeping (20 minutes) • Module 13: Waste Disposal (20 minutes) • Module 14: Implementation Plans and Closure (2 hours)
Wrap-up (10 minutes)	Wrap-up (10 minutes)	
Total time = 7 hours	Total time = 7 hours	Total time = 7 hours

* On the first training day, it is difficult to conduct the practice session before the classroom session; however, the order of these sessions may be switched to best accommodate the facility's needs and schedule.

** If the facility sees clients in the morning.

SAMPLE COURSE AGENDA #2
Three-Day On-Site Infection Prevention Course with Split Classroom Sessions

DAY 1	DAY 2	DAY 3
Meet and greet supervisory staff at the facility (30 minutes)	Classroom session (1 hour) • Module 4: Antiseptics and Disinfectants (15 minutes) • Module 5: Aseptic Technique (20 minutes) • Module 7: Introduction to Processing of Instruments and Other Items (25 minutes)	Classroom session (1 hour) • Module 6: Use and Disposal of Needles and Other Sharps (20 minutes) • Module 12: Housekeeping (20 minutes) • Module 13: Waste Disposal (20 minutes)
Classroom session (45 minutes) • Module 1: Introduction to the Infection Prevention Course	Practice session (2 hours 30 minutes)	Practice session (2 hours 30 minutes)
Trainer's assessment of infection prevention practices at the facility (1 hour 15 minutes)	Lunch (30 minutes)	Lunch (30 minutes)
Practice session (2 hours 30 minutes)	Classroom session (2 hours) • Module 8: Decontamination and Preparation of Chlorine Solutions (40 minutes) • Module 9: Cleaning Instruments and Other Items (20 minutes) • Module 10: Sterilization and Storage (30 minutes) • Module 11: High-Level Disinfection and Storage (30 minutes)	Classroom session (2 hours) • Module 14: Implementation Plans and Closure
Lunch (30 minutes)		
Classroom session (1 hour 15 minutes) • Module 2: Importance and Purpose of Infection Prevention (45 minutes) • Module 3: Handwashing and Use of Gloves (30 minutes)	Wrap-up (10 minutes)	
Wrap-up (10 minutes)		
Total time = 6 hours 55 minutes	Total time = 6 hours 10 minutes	Total time = 6 hours

SAMPLE COURSE AGENDA #3
Five-Day On-Site Infection Prevention Course

DAY 1	DAY 2	DAY 3	DAY 4	DAY 5
Meet and greet supervisory staff at the facility (30 minutes) Trainer's assessment of infection prevention practices at the facility (2 hours) Practice session (1 hour)	Practice session (3 hours 30 minutes)	Practice session (3 hours 30 minutes)	Practice session (3 hours 30 minutes)	Practice session (3 hours 30 minutes)
Lunch (30 minutes)	Lunch (30 minutes)	Lunch (30 minutes)	Lunch (30 minutes)	Lunch (30 minutes)
Classroom session (2 hours 15 minutes) • Module 1: Introduction to the Infection Prevention Course (45 minutes) • Module 2: Importance and Purpose of Infection Prevention (60 minutes) • Module 3: Handwashing and Use of Gloves (30 minutes)	Classroom session (1 hour 45 minutes) • Module 4: Antiseptics and Disinfectants (30 minutes) • Module 5: Aseptic Technique (30 minutes) • Module 7: Introduction to Processing of Instruments and Other Items (45 minutes)	Classroom session (2 hours) • Module 8: Decontamination and Preparation of Chlorine Solutions (40 minutes) • Module 9: Cleaning Instruments and Other Items (20 minutes) • Module 10: Sterilization and Storage (30 minutes) • Module 11: High-Level Disinfection and Storage (30 minutes)	Classroom session (1 hour 45 minutes) • Module 6: Use and Disposal of Needles and Other Sharps (20 minutes) • Module 12: Housekeeping (20 minutes) • Module 13: Waste Disposal (30 minutes) • Small-group discussion of problems at the facility (35 minutes)	Classroom session (2 hours) • Module 14: Implementation Plans and Closure
Wrap-up (15 minutes)	Wrap-up (15 minutes)	Wrap-up (15 minutes)	Wrap-up (15 minutes)	
Total time = 6 hours 30 minutes	Total time = 6 hours	Total time = 6 hours 15 minutes	Total time = 6 hours	Total time = 6 hours

SAMPLE COURSE AGENDA #4
Three-Day Off-Site Infection Prevention Course

DAY 1	DAY 2	DAY 3
Module 1: Introduction to the Infection Prevention Course (1 hour 15 minutes)	Opening (15 minutes)	Opening (15 minutes)
Module 2: Importance and Purpose of Infection Prevention (2 hours 15 minutes)	Module 5: Aseptic Technique (1 hour 15 minutes)	Module 11: High-Level Disinfection and Storage (1 hour)
Module 3: Handwashing and Use of Gloves (1 hour 15 minutes)	Module 6: Use and Disposal of Needles and Other Sharps (30 minutes)	Module 12: Housekeeping (1 hour)
Module 4: Antiseptics and Disinfectants (1 hour)	Module 7: Introduction to Processing of Instruments and Other Items (1 hour)	Module 13: Waste Disposal (1 hour)
Wrap-up (15 minutes)	Module 8: Decontamination and Preparation of Chlorine Solutions (1 hour)	Module 14: Implementation Plans and Closure (3 hours)
	Module 9: Cleaning Instruments and Other Items (30 minutes)	
	Module 10: Sterilization and Storage (1 hour 15 minutes)	
	Wrap-up (15 minutes)	
Total time = 6 hours	Total time = 6 hours	Total time = 6 hours 15 minutes

SAMPLE COURSE AGENDA #5
Five-Day Off-Site Infection Prevention Course

DAY 1	DAY 2	DAY 3	DAY 4	DAY 5
Module 1: Introduction to the Infection Prevention Course (1 hour 45 minutes)	Opening (15 minutes)	Opening (15 minutes)	Opening (15 minutes)	Opening (15 minutes)
Module 2: Importance and Purpose of Infection Prevention (2 hours 30 minutes)	Module 4: Antiseptics and Disinfectants (1 hour 30 minutes)	Module 8: Decontamination and Preparation of Chlorine Solutions (1 hour)	Module 12: Housekeeping (1 hour 15 minutes)	Discussion of site visit(s) (2 hours)
Module 3: Handwashing and Use of Gloves (1 hour 30 minutes)	Module 5: Aseptic Technique (1 hour 45 minutes)	Module 9: Cleaning Instruments and Other Items (45 minutes)	Module 13: Waste Disposal (1 hour 15 minutes)	Module 14: Implementation Plans and Closure (3 hours 45 minutes)
Wrap-up (15 minutes)	Module 6: Use and Disposal of Needles and Other Sharps (45 minutes)	Module 10: Sterilization and Storage (2 hours 15 minutes)	Site visit(s) (3 hours)	
	Module 7: Introduction to Processing of Instruments and Other Items (1 hour 30 minutes)	Module 11: High-Level Disinfection and Storage (1 hour 30 minutes)	Wrap-up (15 minutes)	
	Wrap-up (15 minutes)	Wrap-up (15 minutes)		
Total time = 6 hours	Total time = 6 hours	Total time = 6 hours	Total time = 6 hours	Total time = 6 hours

Adjusting the Curriculum

As the course progresses and the trainer gets to know the participants' learning styles and level of knowledge, the trainer may need to make adjustments to the course content or to the agenda. Time requirements will vary depending on the participants' experience and interests and on the trainer's experience.

Adjustments to the curriculum should not compromise the quality of the training. Trainers should cover all important content and allow sufficient time for discussion.

Create a Positive Learning Environment

Many factors contribute to the success of a training course. One key factor is the learning environment. The trainer can create a positive learning environment by:

- **Respecting each participant.** The trainer should recognize the knowledge and skills the participants bring to the course. Respect can be shown by remembering and using the participants' names, encouraging them to contribute to discussions, and requesting their feedback on the course agenda.
- **Giving frequent positive feedback.** Positive feedback increases people's motivation and learning ability. Whenever possible, the trainer should recognize participants' correct responses and actions by acknowledging them publicly and making such comments as "Excellent answer!" "Great question!" "Good work!"
- **Keeping participants involved.** The trainer should use a variety of training methods that increase participant involvement, such as questioning, case studies, discussions, video viewing, small-group work, and demonstration and practice.
- **Making sure participants are comfortable.** The training room(s) should be well lit, well ventilated, and quiet and should be kept at a comfortable temperature. Breaks for rest and refreshment should be scheduled.

During the Training Course

A segment of time should be set aside at the *beginning* of each training day to allow the participants to raise issues that can interfere with learning, such as those that relate to personal situations, accommodations, or content. Depending on the size of the group, a period of 15–30 minutes may be needed.

Similarly, a segment of time should be set aside at the *end* of each training day to allow the participants to share their learning insights and their assessment of what did and did not go well for them. In addition to bringing closure to the day, this assessment should alert the trainer to the need for adjustments in the agenda when learning needs are identified, gives the participants the opportunity to comment on the way the training course is progressing, and lets the participants make any suggestions for changing the rest of the training. After mentioning the major topics that were covered during the day, the trainer might ask the participants such questions as:

- Which aspect of today's training did you like best?

- What was the most interesting or useful thing you learned today?
- Is there anything that you are still confused about or do not fully understand?
- What, if anything, would you suggest changing about the training to make tomorrow's session better?

If there is not enough time for all the participants to answer each question, the trainer might employ creative, alternative methods, such as:

- Calling on individual participants to answer a specific question
- Having the participants count off from 1 to 4 and then answer the question that corresponds to their number
- Passing around a bag with slips of paper that have the numbers 1 to 4 written on them, and asking each participant to answer the question that corresponds to their number
- Choosing a color and asking all the participants wearing that color to answer a specific question

The trainer might also use some time at the end of each training day (or the end of each module) to see if the objectives were met for each of the modules covered that day. If not, the trainer might ask the participants to review some of the material in the Participant's Handbook that evening, or he or she might note the topics that are problematic for follow-up (see "After the Training Course: Follow-Up," below).

At the end of the day before the last training day (e.g., day 2 of a three-day training or day 4 of a five-day training), the trainer might ask the participants if there is anything discussed in the training that they would like clarified or anything else they would like to he included on the last day.

At the End of the Training Course

It is important to summarize the content and activities of the course. The trainer should highlight key points and be sure to review any specific concerns or difficulties that were raised during the course.

The trainer may choose to use the Knowledge-Assessment Test as a posttest. By comparing the results of the pretest and posttest, he or she can determine changes in the participants' knowledge.

It is also important for the participants to complete an end-of-workshop evaluation so that the trainer may look at overall processes and results (see page 15).

After the Training Course

Follow-Up

Learning about infection prevention does not end at the end of this course. At the completion of the course, most participants will have gained new knowledge and some practical experience with new infection prevention techniques; with practice, they will gain proficiency in the techniques over the next few months.

Some participants may encounter difficulties in initiating an infection prevention program or improving infection prevention practices at their facility. (These are discussed on page 13.) For these and other reasons, the trainer should discuss follow-up with supervisors before the workshop and with participants during the workshop.

Before the beginning of the training course, the trainer should understand his or her role in follow-up. There are several different ways to provide follow-up, depending on the participants' needs, the trainer's availability, and financial considerations. Follow-up mechanisms include:

- Visiting the participants at their facilities. This is the most effective way to follow up on the course. If possible, the trainer should give a one- or two-day on-site refresher training, in which he or she observes the participants' infection prevention practices and gives the participants feedback and assistance in problem-solving, if needed. Administrative issues and any problems the participants may encounter can also be discussed at this time.
- Inviting the participants to visit the trainer's facility or another facility that maintains exemplary infection prevention practices. This allows the participants to observe infection prevention practices, see their impact on service delivery, and obtain helpful advice from health care workers who have successfully implemented appropriate infection prevention practices.
- Requesting a quarterly letter from the participants in which they describe the steps they have taken to initiate an infection prevention program or to improve specific practices. Based on the responses, the trainer can develop a simple quarterly newsletter that summarizes successes and difficulties in implementing infection prevention programs and that responds to frequently asked questions.
- Asking the participants to contact the facility's infection prevention coordinator(s) (see page 4), who can either answer any questions that arise after the training or communicate the questions to the trainer for follow-up with the individual participants.
- Preparing a list of participant contact information and distributing one to each participant (and, if possible, preparing a list of others in the participants' geographic area who have received the infection prevention training). The trainer can encourage participants to stay in contact and to phone, write, or meet with one another after the workshop; they can help each other with questions and concerns about infection prevention.

Follow-up is an important part of training and should be a planned part of any training course. Participants should know who will be conducting follow-up and when and how it will be conducted.

MODULE 1 Introduction to the Infection Prevention Course

Trainer's Notes for Module 1

This module provides information on introducing this training course, including:

- Welcoming the participants
- Introducing the training team and participants
- Discussing workshop logistics
- Developing workshop norms
- Determining the participants' expectations of the course
- Reviewing the course objectives
- Reviewing the course agenda
- Describing the training materials that will be used in the course
- Describing the participant evaluation process
- Giving the participants the Knowledge-Assessment Test

Note: Registration for the workshop should take place *before* the introduction.

Audience

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MODULE 1 Introduction to the Infection Prevention Course

Materials and Supplies

- ✓ Transparencies for Module 1 (optional)
- ✓ Overhead projector (optional)
- ✓ (For each participant) A training package that includes the Participant's Handbook for this curriculum and a copy of the workshop agenda
- ✓ Flipchart paper, masking tape, and colored markers

Advance Preparation

- Make a copy of the Knowledge-Assessment Test for each participant, if possible.
- Create and post a flipchart or sign welcoming the participants to the workshop.
- Create transparencies or flipcharts, as needed.

Introduction

Welcome the participants to the workshop. Explain that the purpose of this training course is to train the participants in how to perform appropriate infection prevention practices that will help reduce the risk of transmitting infections in health care facilities.

Introduce all training team members and support staff. Ask the training team members and participants to write their names in large letters on place cards or name tags. If the group is small or all the participants know one another, ask the participants to introduce themselves to the group, stating their name, where they work, and the work they do.

Training Option

If the group is large and the participants do not know one another, ask them to pair up with someone they do not already know and interview their partner. Then have the pairs introduce one another.

Discuss workshop logistical details, such as the following: beginning and ending times for each day; meal breaks and other breaks; per diems and other financial matters; whom to see about any administrative problems or needs; and expectations regarding independent work, evening sessions, and work on holidays or weekends. (You may want to develop a participant handout that addresses these points.)

MODULE 1 Introduction to the Infection Prevention Course

Introduction

Purpose and Objectives

This curriculum is a training course designed to train health care workers in how to perform appropriate infection prevention practices that will help reduce the risk of transmitting infections in health care facilities. Upon completion of this course, you should be able to:

- Identify the risk of transmitting infections to clients, health care workers, and the community via the health care setting
- Explain the importance of infection prevention in a health care facility
- Explain the internationally accepted, low-tech approaches for reducing the risk of infections
- Identify infection prevention problems at your facility
- Develop a plan to address three priority infection prevention problems at your facility

Directions for Independent Study

If you are preparing for this module independently, you should:

- Study this module.
- Write down any questions you have about this module for later discussion with the trainer.

Review workshop norms and the course purpose and objectives that appear on page 1.1 of the Participant's Handbook, and conduct the following training activities.

Training Activity: Workshop Norms *(Approximate time: 5 minutes)*

Direct the participants to Exercise 1-1: Workshop Norms, which appears on page 1.2 of their handbook, and ask them to complete it individually. Allow 5 minutes for completion. When the participants have finished, ask for volunteers to share their responses.

Training Option

To conduct this exercise as a large-group exercise, write the participants' responses on a piece of flipchart paper. Ask for comments on the norms, and add or delete them according to the group's consensus. If no one mentions "Having fun," add it to the list. Display the completed flipchart where all the participants can see it throughout the training course.

Training Activity: Workshop Expectations and Objectives *(Approximate time: 15–20 minutes)*

Direct the participants to Exercise 1-2: Workshop Expectations and Objectives, which appears on page 1.2 of their handbook, and ask them to complete it individually. Allow 5 minutes for completion. When the participants have finished, ask for volunteers to share their responses. Record their responses on a flipchart. Then review the course objectives and compare the participants' expectations with the course objectives. Point out the expectations that will be met by the course.

The participants may have some expectations that will *not* be met by the course as it is designed. If it is possible and appropriate to modify the course to meet those expectations (e.g., include some additional material), you may do so. If some of the participants' expectations cannot be met, because they are impractical or outside the scope of the course (e.g., learning to be an infection prevention trainer), explain to the participants why this is the case.

Training Option

To conduct this exercise as a small-group exercise, divide the participants into small groups and ask them to discuss their expectations for the training course with the other members of their group. Allow 10 minutes for discussion. Ask for a volunteer from each group to share the group's expectations with the entire class, and compare them with the course objectives.

Review the workshop agenda with the participants. Ask them if they have any questions or recommendations for changes in the schedule.

Exercise 1-1: Workshop Norms

Review the "Tips for a Good Workshop" and, in the space provided, list any other ways that you can think of to help make sure you get the most from this workshop.

Tips for a Good Workshop

- Arrive on time
- Do not interrupt when others are speaking
- Ask questions
- Be prepared
- Respect others' views

Exercise 1-2: Workshop Expectations and Objectives

In the space provided, list the things you expect to gain from this training course. Your responses may be general or specific, and may range from the types of knowledge you wish to gain to other types of benefits, such as enjoying a few days away from your daily work.

Compare your expectations with the course purpose and objectives, which appear on page 1.1. Note any expectations that are not on the list, and mention them to the trainer. At the end of the workshop, review this list to see if your expectations were met.

Training Materials

The Participant's Handbook

Distribute the Participant's Handbook to the participants. Explain that it is organized into modules, and ask the participants to follow along in the handbook as you describe the various components that appear in each module, such as the purpose and objectives, "At My Facility..." exercise, and Summary/Self-Assessment.

"At My Facility..."

Explain to the participants that this exercise will be used to create an implementation plan at the end of the course to address infection prevention needs or problems at their facilities.

Training Materials

The Participant's Handbook

This handbook contains information on all of the topics usually covered in an infection prevention training course and all of the technical information needed to perform appropriate infection prevention practices. The handbook is used throughout the training course to assist you in learning the content of the course. After the course, you may use the handbook as a review guide and technical resource. The handbook also contains diagrams, charts, and other graphic materials that you may want to adapt for use at your facility.

If you have received this handbook in advance of the infection prevention workshop, you may begin independent study to prepare yourself for the training.

Note: Throughout this handbook, the term *service providers* will be used to refer to the staff at a health care facility who provide clinical services. Service providers may include doctors, medical officers, nurses, midwives, and medical or surgical assistants. Similarly, the term *ancillary staff* will be used to refer to the staff at a health care facility who provide support services, such as handling specimens, housekeeping, processing of instruments and other items used in clinical procedures, and handling waste. Ancillary staff may include laboratory technicians and assistants, orderlies, nursing assistants, ward assistants, housekeepers, and cleaners.

"At My Facility..."

One of the most important parts of this (or any) training course is determining how to apply what you have learned to your daily work. The "At My Facility..." exercise that appears at the end of most modules is designed to stimulate your thinking about the infection prevention practices currently being performed at your facility and help you identify any problems that may exist. This information will be used at the end of the workshop to develop implementation plans.

Evaluation

Explain that this is a knowledge-based course and that the participants will be evaluated primarily using a Knowledge-Assessment Test. The participants may also be evaluated on performing the practices at their facility, especially if the training is held on-site.

If you have made copies of the Knowledge-Assessment Test, distribute one copy to each participant; if not, ask the participants to turn to the copy in their handbook and tear it out. (The test appears on pages 1.5 and 1.6 of their handbook.) Explain that the test is designed to give the trainer a general understanding of the participants' knowledge about infection prevention in order to determine the course work that should be emphasized in the workshop.

Explain to the participants that it is important for the trainer to compare individual participants' knowledge at the beginning of the course with their knowledge at the end of the course to gauge how much each individual participant has learned in the training. It is also important for the trainer to compare the learning of the group as a whole. To accomplish this, ask the participants to write their name at the top of the test, and complete the test individually. Allow 20 minutes for completion. Review and correct the assessments as soon as possible. The answers appear in this Trainer's Manual but do not appear in the Participant's Handbook.

Record the test results on one copy of the Individual and Group Performance Matrix, which appears in Appendix D. (The second copy will be used to record the results of the posttest.) (*Note:* If you do not have access to a copy machine, use a pencil to record the results so that the matrix can be reused during subsequent infection prevention trainings.) You can use the results of the assessment to adapt the training course to the participants' needs and can compare the pretest and posttest results as a way to measure what the participants learned in the course. After you have graded the tests and recorded the results on the matrix, return the tests to the participants so they can check the correctness of their responses.

Training Options

- If there are few participants, read the questions aloud and ask the participants to answer them orally. Record the responses of the group as a whole on the matrix for comparison with the posttest results.
- If some of the participants are low-literate/illiterate, ask some of the other participants to assist them in completing the test.

Explain that the Summary/Self-Assessment questions at the end of most modules may be used to review the content of the module and to identify any areas that need reinforcing.

Evaluation

Because infection prevention encompasses a wide range of practices and involves many different levels of staff playing different roles, this is primarily a knowledge-based training course. Your performance will be evaluated primarily using a Knowledge-Assessment Test given at the end of the training, as well as by your participation in various course activities. Evaluation may also include observation of your ability to properly perform infection prevention practices, especially if you are participating in training that is conducted at the health care facility at which you work (rather than at another facility or a conference center or hotel). When training is conducted at your own facility, there is more opportunity for the trainer to observe infection prevention practices as they are performed and to suggest ways to improve them, if needed. When training is conducted at another location, the trainer may demonstrate appropriate infection prevention practices so that you can perform them in your daily work.

Knowledge-Assessment Test

At the beginning of this workshop, the trainer will ask you to complete a Knowledge-Assessment Test, which appears on the next two pages. This assessment is designed to help the trainer determine the course work that should be emphasized during the workshop. At the end of this workshop, the trainer will ask you to complete the Knowledge-Assessment Test again. The results of this test will be used to measure the change in the group's knowledge, as well as every participant's individual knowledge, of infection prevention practices as a result of the training.

Do **not** complete the Knowledge-Assessment Test if you are studying the content of this course independently.

Summary/Self-Assessment Questions

Summary/Self-Assessment questions appear at the end of most modules in this handbook. They are intended to help you review the content of the module and to identify any areas that need reinforcing. Your responses will not be graded. When the group has finished answering the questions, the trainer may ask for volunteers to share their answers. If course time is limited, the trainer may ask you to complete the questions in the evening. If you are studying this material independently, answer the questions after you review the content in each module.

Answers to Knowledge-Assessment Test

Answers to true/false questions:

1. F
2. F
3. T
4. F
5. T
6. T
7. T
8. F
9. T

Answers to multiple-choice questions:

10. a, b, c

Knowledge-Assessment Test

Decide whether each of the following statements is T (true) or F (false). Write your response for each statement in the space provided.

1. ____ Since it is easy to tell which clients are infected with HIV and other bloodborne infections, it is not necessary to take appropriate steps to protect yourself from infections with every client.

2. ____ Boiling is a method of sterilization.

3. ____ Items such as pickups (lifters, cheatle forceps), suture needles, and surgical scrub brushes should not be left soaking in antiseptic or disinfectant solutions.

4. ____ Fumigation (fogging) with formaldehyde or other disinfectants is an effective and efficient way to reduce contamination of surfaces such as walls, ceilings, and floors.

5. ____ Hands should always be washed after removing gloves following a clinical procedure.

6. ____ For steam sterilization to be effective, steam must reach all surfaces of the instruments and other items.

7. ____ Contamination can be minimized by reducing the number of people permitted into operating theaters, procedure rooms, and areas in which instruments and other items are processed.

8. ____ As long as instruments and other items will be sterilized or high-level disinfected, it is not necessary to clean them with detergent and water.

9. ____ Sorting medical waste from general waste at the point at which it is generated is a good way to reduce the amount of waste requiring special handling.

The following are multiple-choice questions. More than one option may be correct for each question. Please circle the correct response(s) for each question.

10. Following appropriate infection prevention practices is important to:

    a. Prevent infections in service providers and ancillary staff
    b. Prevent infections, such as wound infections, abscesses, and pelvic inflammatory disease (PID), in clients
    c. Protect the community from infections that originate in health care facilities

11. a
12. a, c
13. a, b
14. b, c
15. a, b

11. Decontaminating instruments and other items immediately after use in a 0.5% chlorine solution for 10 minutes:

    a. Reduces the risk of infections in facility staff by killing HIV and the hepatitis viruses
    b. Removes blood and tissue, making it unnecessary to clean the instruments and other items
    c. Allows instruments and other items to be reused immediately

12. Handwashing:

    a. Decreases client sickness and death
    b. Is usually performed appropriately in most health care facilities
    c. Protects both the client and service provider from infections

13. Antiseptic and disinfectant solutions:

    a. Should be stored in a cool, dark place
    b. Can be easily contaminated
    c. Can be used interchangeably

14. To reduce the risk of infections and injury:

    a. All hypodermic needles should be recapped
    b. In a sterile field, sharps should be passed in a kidney basin or other container
    c. Sharps should be disposed of in a puncture-resistant container

15. Housekeeping staff are at risk of infections:

    a. When cleaning operating theaters and procedure rooms
    b. When disposing of medical waste
    c. They are not at risk of infections as long as they are not directly involved in client-care activities

MODULE 2 Importance and Purpose of Infection Prevention

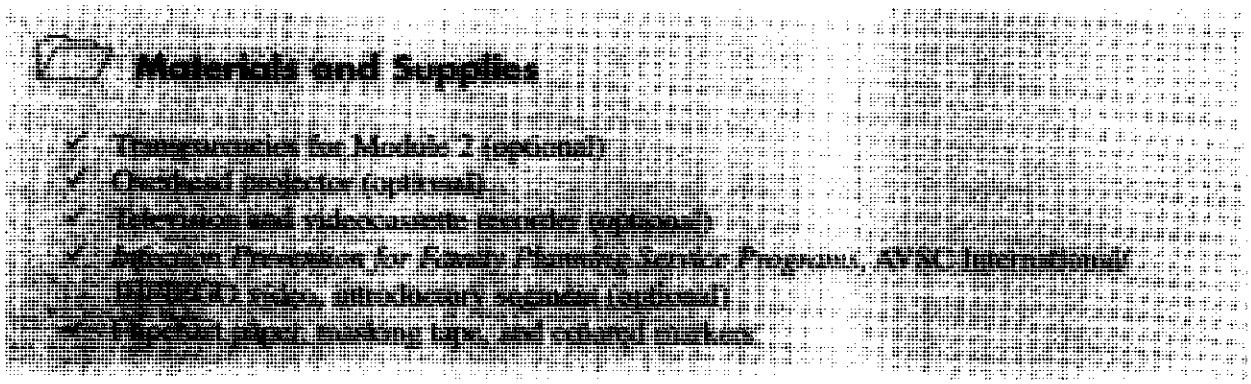
Trainer's Notes for Module 2

This module provides a broad overview of the spread of infections and how to reduce the risk of transmitting infections in health care facilities. Health care workers must have some understanding of how infections are transmitted, how clients are at risk of infections during clinical procedures, the risks health care workers face on a daily basis as a result of being exposed to potentially infectious material, and the risks faced by the community at large.

Audience

Training Time

MODULE 2 Importance and Purpose of Infection Prevention



Advance Preparation

- Determine which training activities will be used to present the content of this module. For on-site training, review the activities presented in Appendix E: On-Site Training Activities. Prepare or gather any supplies needed for the activities you will be conducting.
- Cue the video to the beginning, if used.
- Create transparencies or flipcharts, as needed.

Introduction

Introduce this module by reviewing the purpose and objectives that appear in the Participant's Handbook. If desired, you may conduct the following optional activity.

Optional Activity: Case Study *(Approximate time: 5 minutes)*

Read aloud the introductory case study, and direct the participants to the instructions that appear in their handbook.

MODULE 2 Importance and Purpose of Infection Prevention

Introduction

Purpose and Objectives

This module provides a broad overview of how infections are spread and will help you better understand how good infection prevention practices can protect you, your clients, and the community at large. Upon completion of this module, you should be able to:

- Identify who is at risk of infections in the health care setting
- Define *microorganism*
- Describe the six components of the disease-transmission cycle
- Explain how infections are transmitted among clients, health care workers, and the community via the health care setting
- Describe the importance and purpose of good infection prevention practices
- Correct misinformation and misconceptions about infection transmission
- Explain what standard precautions are
- Explain the health care worker's responsibility in infection prevention

Read the following case study, and try to keep it in mind as you learn the content of this module. See if you can determine whether the situation presents a risk of infection transmission and, if so, what should be done differently to reduce the risk. Questions about the case study appear in the Summary/Self-Assessment at the end of this module.

Mrs. Gonzales comes to the family planning clinic of the district hospital for an IUD insertion. The family planning clinic has run out of gloves due to a supply shipment delay. Even though the only service provider trained to insert IUDs has a cut on her finger, she decides to conduct the pelvic examination and insert the IUD without wearing gloves because Mrs. Gonzales has traveled a long distance to come to the clinic.

Directions for Independent Study

If you are preparing for this module independently, you should:

- Study this module.
- Answer the "At My Facility..." questions for this module.
- Answer the Summary/Self-Assessment questions at the end of this module.
- Write down any questions you have about this module for later discussion with the trainer.

Overview of Infectious Diseases

Review the material in the Participant's Handbook. If desired, you may conduct the following optional activity.

Optional Activity: Discussion Topic *(Approximate time: 15 minutes)*

Facilitate a discussion on infectious diseases by asking the participants:

- What are some infections and diseases that are believed to be controlled, yet continue to exist and spread in your community, in your country, or in other parts of world?
- Why do you think they are not being controlled?
- What are some new infections or diseases that have arisen recently?
- Why do you think they are arising?

Overview of Infectious Diseases

Infectious diseases are constantly in transition. New diseases emerge, known diseases become widespread or re-emerge, and some diseases are eradicated. Over the past few decades, the world has seen increased outbreaks of diseases such as plague, tuberculosis, and cholera that were once better controlled or occurred rarely. Other known diseases, such as hepatitis B, are becoming increasingly common. In addition, infectious agents that often cause incurable diseases, such as human immunodeficiency virus (HIV) and hepatitis C virus, have been newly identified and are becoming a significant cause of illness and death in many parts of the world. Lastly, some microorganisms are developing resistance to common antibiotics, making treatment of these infections more complicated.

Along with the infections and diseases mentioned above, hospital-acquired infections are a continuing—and, in many places, increasing—problem. During their stay in a hospital or clinic, clients may acquire infections caused by a wide range of microorganisms, including *staphylococcus*, *streptococcus*, and many gram-negative bacteria, such as *pseudomonas*, *E. coli*, and *klebsiella*.

The reasons why this has been occurring are multiple and complex, including:

- Rapid population growth
- Increased poverty
- Expansion of the population into "remote" areas
- Environmental degradation
- Improved transportation, which leads to easier spread of disease
- Inadequate or deteriorating public health infrastructures
- Widespread and often inappropriate availability and use of antibiotics
- Poor infection-control and infection prevention programs

This training course will address the last factor, poor infection-control and infection prevention programs.

Who Is at Risk of Infections?

Review the material in the Participant's Handbook, and conduct the following training activity. If desired, you may also conduct the following optional activity.

Training Activity: Discussion Topic *(Approximate time: 10 minutes)*

Ask the participants to identify the persons at their facilities whom they think are at risk of infections from the work that they do. Note their responses on a flipchart. If their responses focus only on clients and service providers, guide them to think about others who might be at risk by asking:

- Are the ancillary staff who work at the facility at risk of infections? If so, how?
- Who would be at risk of infections if contaminated needles, syringes, and scalpel blades were simply thrown into an open garbage heap instead of being placed in a puncture-resistant container?
- Who would be at risk of infections if contaminated bandages, dressings, cotton wool, and gauze were deposited in a public garbage pile and left to scatter?

Optional Activity: Discussion Topic *(Approximate time: 15 minutes)*

Facilitate a discussion by asking the participants:

- Why is a health care facility an ideal setting for infections to spread?
- What are some examples of how infections are spread?

Emphasize that everyone who works at a health care facility is at risk of infections—from the doctors and nurses to the cleaning staff. Because of the different tasks they perform, each level of staff is at risk in a different way. For example, service providers have the greatest exposure to infections during clinical procedures, while cleaning staff are at risk of infections and injury when cleaning instruments and other items or disposing of waste.

As the participants grasp the broader picture of who is at risk of infections from service-delivery practices, reinforce the goal and purpose of infection prevention practices by re-emphasizing the three categories of people at risk:

- Clients
- Service providers and ancillary staff
- Members of the community

Link this material to the discussion of the disease-transmission cycle by stating that in order to develop a willingness to practice infection prevention, the participants need to understand how infections are transmitted and where infection prevention practices break the disease-transmission cycle, thereby protecting everyone's health.

Who Is at Risk of Infections?

Health care facilities are ideal settings for the transmission of infections because:

- Invasive procedures that have the potential to introduce microorganisms into parts of the body, where they can cause infections, are performed routinely.
- Service providers and ancillary staff are constantly performing clinical procedures or other activities that expose them to potentially infectious microorganisms.
- Many clients receive services in a limited physical space, often during a short period of time.
- Many of the people seeking health care services are sick and thus may be more susceptible to infections or have infections that can be transmitted to others.

Those Who Are at Risk of Infections from the Provision of Clinical Services

Clients

Clients are at risk of postprocedure infections when, for example:

- Service providers do not wash their hands before and after providing care to each client and before and after every procedure
- Service providers do not adequately prepare clients before clinical procedures
- Service providers do not correctly process instruments and other items used in clinical procedures

Service providers and ancillary staff

Service providers and ancillary staff are at significant risk of infections because they are exposed to potentially infectious blood and other body fluids on a daily basis.

- Service providers are at risk, for example, during clinical procedures and when handling sharps.
- 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. This is a serious situation in nonindustrialized countries, where these staff members may have little education or training and therefore may have less understanding of their own risk of infections.

It is estimated that in the United States, 250–300 health care workers die each year from occupationally acquired hepatitis B. This number is believed to be even higher in nonindustrialized countries, because there are more people infected with hepatitis B and because the service-delivery conditions and poor infection prevention practices put health care workers at high risk.

The community

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

- Improperly disposed of medical waste—including contaminated dressings, tissue, needles, syringes, and scalpel blades—can be found by children or others scavenging in open dumps, or can scatter on the ground where adults and children travel, putting community members at risk of infections and injury.

- Some infections can be spread by staff to their family members or others in the community. For example, the Ebola virus outbreak in Africa in 1995 was spread throughout the community, in part, because of poor infection prevention practices in health care facilities.

Remember: Everyone who works at a health care facility is potentially at risk of infections. Not only are the doctors, nurses, and midwives who have direct contact with clients at risk, but those who wash the instruments and other items, clean the procedure rooms, and dispose of the waste are at risk, as well.

The Disease-Transmission Cycle

Review the definition of and key information on *microorganisms*, and present the information on the disease-transmission cycle that appears in the Participant's Handbook. If desired, you may conduct the following optional activity. Highlight the "mode of transmission" point in the disease-transmission cycle and explain that it is the most effective place to stop the cycle.

Optional Activity: Large-Group Exercise *(Approximate time: 30 minutes)*

The purpose of this exercise, "Transmission of Bloodborne Infections," is to make the participants aware that anyone may have a bloodborne infection; demonstrate how a few infections can quickly spread, resulting in many more infections; and act as a starting point for discussion of how to break the cycle of disease transmission to reduce the risk of infections in clients, health care workers, and the community. The exercise works best with larger groups, but it can be done with as few as five or six participants. *(Instructions for this activity—"Transmission of Bloodborne Infections"—appear in Appendix F: Additional Trainer's Resources.)*

After reviewing the components of the cycle, you may want to provide an example of a disease with which the participants are likely to be familiar, such as malaria, as this may make it easier for them to understand the cycle. If so, review the example of the transmission of malaria that appears on page 2.8 of the Participant's Handbook. To provide an example of a disease that may be transmitted in the health care setting, review the example of the transmission of hepatitis B that also appears on page 2.8 of the Participant's Handbook. Ask the participants to give other examples, if possible, specifying all the elements of the disease-transmission cycle.

The Disease-Transmission Cycle

Definition

Microorganisms: **organisms that can be seen only with the magnification of a microscope. They exist everywhere in the environment—in people, animals, plants, soil, air, and water and other solutions.**

Some microorganisms are normally present on people's skin and in our respiratory, intestinal, and genital tracts; these microorganisms are called **normal flora.** Other microorganisms are normally not found on or in the human body and are usually associated with disease; these microorganisms are known as **pathogens**.

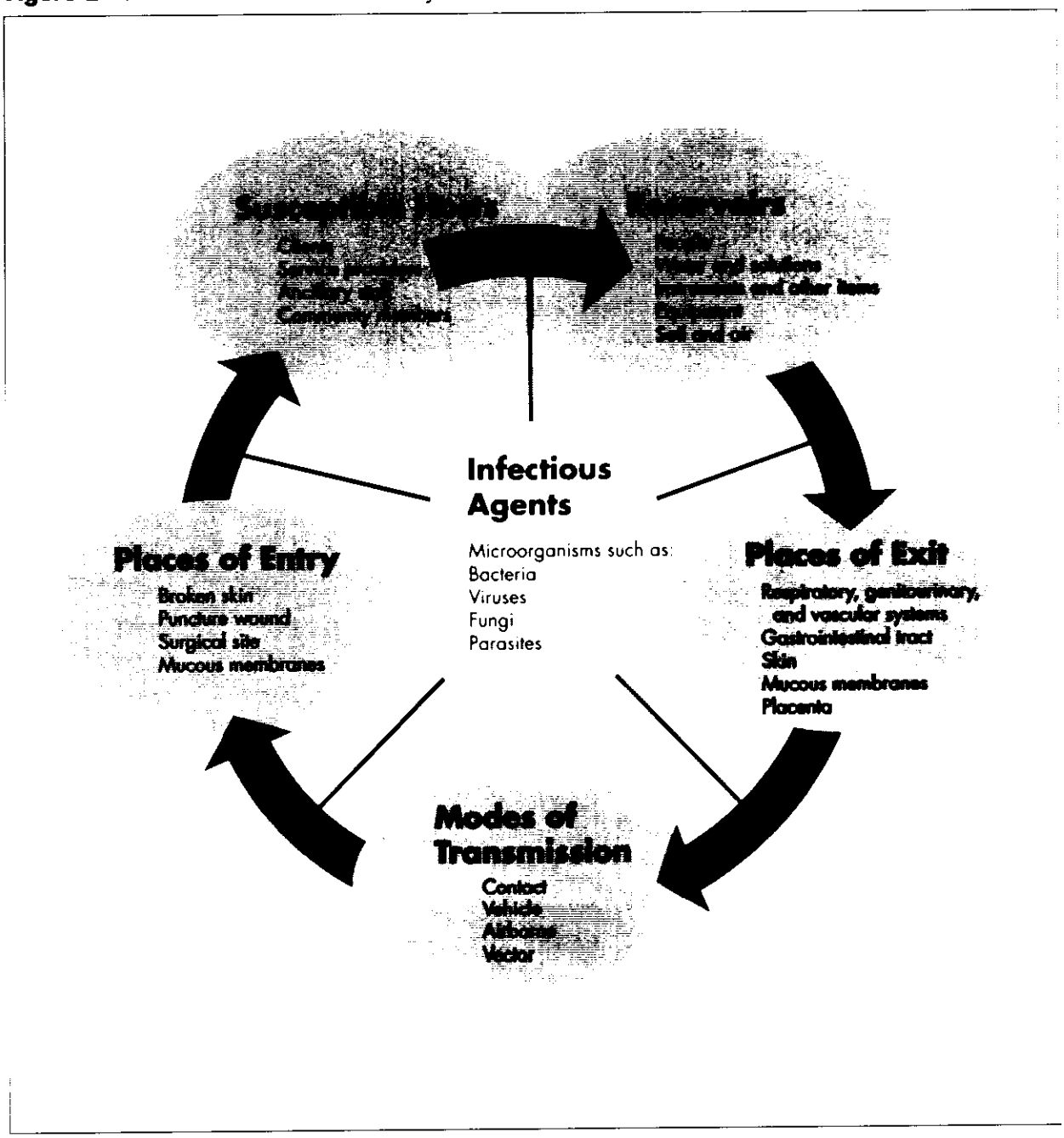
All microorganisms, including normal flora, can cause infection or disease if certain conditions exist.

Microorganisms can cause infection or disease when:

- Normal flora are introduced into an area of the body in which they are not normally found
- Pathogens are introduced into the body
- Microorganisms are introduced into the body of a person who is immunocompromised and thus susceptible to infections to which he or she otherwise would not be susceptible

The disease-transmission cycle, shown in Figure 2-1 on the next page, describes how infections are transmitted from one person to another. To prevent the transmission of infections, the disease-transmission cycle needs to be broken at some point.

Figure 2-1. The Disease-Transmission Cycle



The infectious agent survives, grows, and/or multiplies in a reservoir and then leaves the reservoir through a place of exit by a mode of transmission. The infectious agent then enters the susceptible host through a place of entry. The components of the disease-transmission cycle are discussed in detail on the next page.

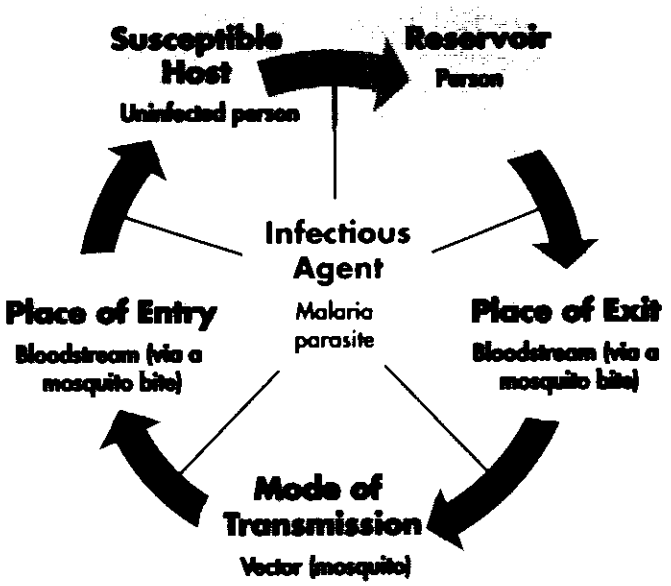
The six components of the disease-transmission cycle:

- ***Infectious agent***
  The microorganism that can cause infection or disease. The infectious agent can include bacteria, viruses, fungi, and parasites.
- ***Reservoir***
  The place where the agent survives, grows, and/or multiplies. People, animals, plants, soil, air, water and other solutions, and instruments and other items used in clinical procedures can serve as reservoirs for potentially infectious microorganisms.
- ***Place of exit***
  The route by which the infectious agent leaves the reservoir. The infectious agent can leave the reservoir through the bloodstream, broken skin (e.g. puncture, cut, surgical site, or rash), mucous membranes (e.g., eyes, nose, mouth), the respiratory tract (e.g., lungs), the genitourinary tract (e.g., vagina, penis), the gastrointestinal tract (e.g., mouth, anus), or the placenta by means of blood, excretions, secretions, or droplets that come from these places.
- ***Mode of transmission***
  The way in which the infectious agent moves from the reservoir to a susceptible host. Transmission can occur by four modes:
  - *Contact* - The infectious agent can be transmitted directly from the reservoir to a susceptible host through touch (e.g., *staphylococcus*), sexual intercourse (e.g., gonorrhea, HIV), or droplets (e.g., *influenza*, tuberculosis).
  - *Vehicle* - 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., hepatitis B, HIV), water (e.g., cholera, shigella), or instruments and other items (e.g ., hepatitis B, HIV, *pseudomonas*).
  - *Airborne* - The infectious agent can be carried by air currents (e.g., measles, tuberculosis).
  - *Vector* - The infectious agent can be transmitted to a susceptible host through insects and other invertebrate animals (e.g., mosquitos can transmit malaria and yellow fever; fleas can transmit plague).
- ***Place of entry***
  The route by which the infectious agent moves into the susceptible host. The infectious agent can enter the susceptible host through the bloodstream, broken skin (e.g., puncture, cut, surgical site, rash), mucous membranes (e.g., eyes, nose, mouth), the respiratory tract (e.g., lungs), the genitourinary tract (e.g., vagina, penis), the gastrointestinal tract (e.g., mouth, anus), or the placenta.
- ***Susceptible host***
  A person who can become infected by the infectious agent. For the purpose of this training, susceptible hosts include clients, service providers, ancillary staff, and members of the community.

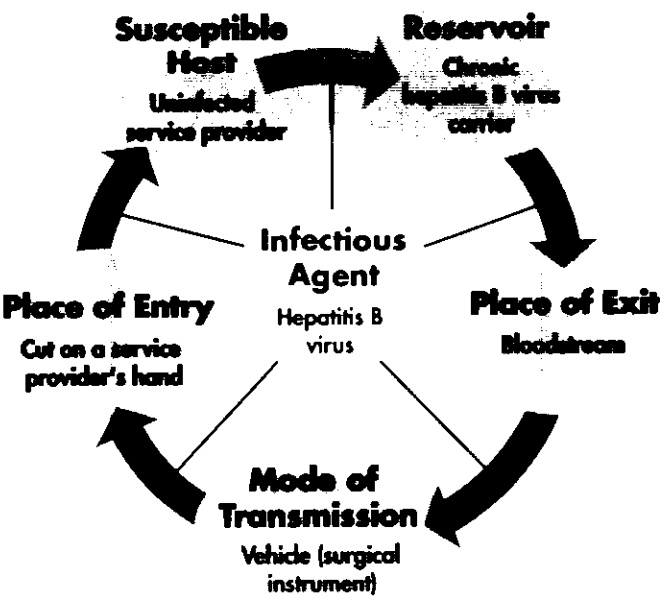
Remember: The "mode of transmission" is the easiest point at which to break the disease-transmission cycle. In a health care facility, this can be accomplished by following appropriate infection prevention practices, such as handwashing, practicing aseptic technique, correctly processing instruments and other items for reuse, and correctly disposing of medical waste. (These practices will be covered in detail later in this training course.)

The disease-transmission cycle is sometimes difficult to understand. The following examples illustrate how specific infections may be transmitted via the disease-transmission cycle.

An example of how malaria may be transmitted



An example of how hepatitis B may be transmitted in the health care setting



Infection Transmission in the Health Care Setting

Review the material on how infection transmission can occur among clients, staff, and the community, and conduct the following training activity.

Training Activity: Discussion Topic *(Approximate time: 10 minutes)*

Ask the participants:

- How can infections be transmitted from clients to health care workers?
- How can health care workers spread infections to clients, family members, and the community?
- Are infections routinely transmitted from health care workers to clients?

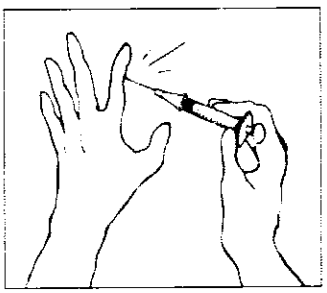
Remind the participants that ways to protect themselves and their clients will be covered in detail throughout the upcoming modules.

Infection Transmission in the Health Care Setting

Infections can be transmitted among clients, staff, and the community, as follows:

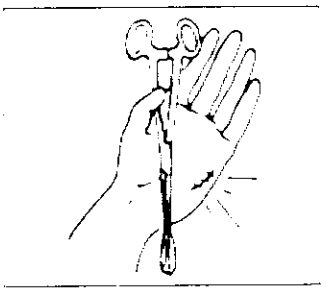
Clients can transmit infections to health care workers

This can occur when the health care worker is exposed to the client's infectious blood and other body fluids, such as:



When the health care worker's skin is pierced or cut by contaminated needles or other sharp instruments

When the client's blood or other body fluids are splashed on the health care worker's mucous membranes (e.g., eyes, nose, mouth)



When the health care worker's broken skin (e.g., cuts, scratches, rashes, chapped skin, fungal infections) is exposed to the client's blood or other body fluids

Almost all cases of transmission of hepatitis B and HIV from clients to health care workers have occurred through preventable accidents, such as needlestick injuries.

Health care workers can spread infections from one client to another and from clients to the health care worker's family and community members

Infections are spread from one client to another primarily via indirect routes, such as:

- When health care workers do not wash their hands before and after contact with clients and then carry infections from one client to another
- Through the use of surgical instruments, needles, syringes, and other equipment that have not been processed properly

Infections can be transmitted from clients to the health care worker's family and community:

- When health care workers do not wash their hands before leaving the facility and then touch family members or household items
- When medical waste is not disposed of properly, which puts members of the community in contact with the waste
- When health care workers wear contaminated clothing home from the facility
- When health care workers contract infections and spread them to family members, who in turn spread them to other members of the community

Transmission of infections from health care workers to clients is uncommon

Transmission of bloodborne infections, such as HIV and the hepatitis viruses, from a health care worker to a client is extremely rare, especially when appropriate infection prevention practices are followed. If these practices are followed, the risk to the client is very small; consequently, in most circumstances, health care workers who are infected may continue to perform their regular activities without the risk of transmitting infections to clients.

Importance of Following Infection Prevention Practices

Review the material in the Participant's Handbook. If desired, you may conduct one or more of the following optional activities. Highlight the following points:

- Infection prevention practices are the responsibility of all staff, though the tasks are different for each level of staff.
- Appropriate infection prevention practices are equally as important to ensuring client safety as correct surgical or other techniques, because good infection prevention practices protect the client, health care workers, and the community from infections.
- People who work in health care facilities are responsible for client safety and the well-being of other facility staff during and after clinical procedures. This includes ensuring that appropriate infection prevention practices are followed at their facilities.

Optional Activity: Video Viewing *(Approximate time: 15–20 minutes)*

Show the introductory segment from the infection prevention video, which provides an overview of infection prevention practices. When the segment is over, review the material presented with the participants and allow for questions.

Training Option

The video can be shown either at the beginning of the session to introduce the topic or at the end of the session for review.

Optional Activity: Discussion Topic *(Approximate time: 20 minutes)*

Facilitate a discussion on the participants' role in infection prevention by asking:

- Why is infection prevention important in a health care facility?
- What kinds of infections are the most important to prevent? Why?

Note the participants' responses on a flipchart. Then present the information in the Participant's Handbook, and compare it with the participants' responses. If their responses were incorrect, write the correct responses on the flipchart. Allow for the participants' questions, and clarify, as necessary.

Ask the participants to name any problems related to infection prevention practices that they are aware of at their facilities. Note their responses on a flipchart, and save it for use in developing implementation plans in Module 14: Implementation Plans and Closure. Tell the participants that as they learn new information during this training course, they should make notes about additional problems or issues they identify on the "At My Facility..." page in their handbook. All of this information will be useful when they develop implementation plans at the end of the course.

End this session by emphasizing that in a health care facility, breaking the disease-transmission cycle at the "mode of transmission" point can be accomplished by following appropriate infection prevention practices, such as handwashing, practicing aseptic technique, correctly processing instruments and other items for reuse, and correctly disposing of medical waste. For this reason, health care workers need to be conscientious about following appropriate infection prevention practices.

Importance of Following Infection Prevention Practices

As stated in the previous section, in order to prevent the spread of infections, the disease-transmission cycle needs to be broken at some point. The easiest point at which to break the cycle is the mode of transmission. Following appropriate infection prevention practices breaks the cycle at the mode of transmission step.

Following appropriate infection prevention practices:

- Prevents postprocedure infections, including surgical-site infections, in clients
- Results in high-quality, safe services
- Prevents infections in service providers and ancillary staff
- Protects the community from infections that originate in health care facilities
- Prevents the spread of microorganisms that are resistant to antibiotics
- Lowers the costs of health care services, since prevention is less expensive than treatment

Infection prevention has traditionally focused on preventing postprocedure infections in clients. However, continuing problems with hepatitis B, as well as the emergence of HIV and the more recently identified hepatitis C and D viruses, have caused a shift in the focus of infection prevention. Attention is now directed toward minimizing the risk of transmitting infections not only to clients, but also to service providers and ancillary staff, including cleaning and housekeeping personnel, and to members of the community.

Remember: The goals of infection prevention are to minimize postprocedure infections in clients and to prevent transmission of life-threatening infections to clients, service providers, ancillary staff, and members of the community.

Just as everyone who works at a health care facility is at risk of infections, every health care worker has a role to play in performing the appropriate infection prevention practices. The correct infection prevention practices can and should be adopted by all staff at the facility as they apply to their respective duties. In order for infection prevention to be as effective as possible, all staff members must do their part.

Remember: Infection prevention is *everybody's* business.

Misconceptions about Infection Transmission

Review the material on misconceptions about infection transmission that appears in the Participant's Handbook. If desired, you may conduct the following optional activity.

Optional Activity: Small-Group Exercise *(Approximate time: 20 minutes)*

Divide the participants into two groups. Ask Group 1 to discuss the ways they think HIV and hepatitis B are transmitted. Ask Group 2 to discuss the ways that people may believe that HIV and hepatitis B are transmitted, but which are actually incorrect. Allow 10 minutes for completion. After 10 minutes, ask for a volunteer from each group to present the group's work. Facilitate a discussion of why people's perceptions about transmission of HIV and hepatitis B may or may not be true. Guide the participants in categorizing the viruses' various modes of transmission under the following headings: blood, sexual contact, and perinatal transmission (mother to child). Clear up any confusion and correct any misinformation, as needed.

ADAPTED FROM: AIDSTECH. *AIDS/STD Education and Counseling Training Manual.* Impact/Family Health International, pp. 21, 22.

Misconceptions about Infection Transmission

Many health care workers have misconceptions about infections, infection transmission, and their own risk of infections. Knowing the facts about infection transmission and correcting these misconceptions can help ensure that health care workers will perform appropriate infection prevention practices and change inappropriate practices.

1. Misconceptions about the Transmission of HIV, Hepatitis B, and Hepatitis C

Misconceptions about how these viruses are transmitted often lead to inappropriate practices, such as service providers denying services to clients. (Other inappropriate practices are described on page 2.13.)

Scientific studies have shown that HIV and hepatitis B are transmitted through:

- Blood and other body fluids - through:
  - Broken skin
  - Injuries from contaminated needles or other sharp instruments
  - Transfusion of infected blood or blood products
  - IV injection using contaminated needles, syringes, or drugs
  - Splashes of contaminated body fluids into or onto the mucous membranes of a health care worker
  - Use of contaminated razors or tattooing needles
- Sexual contact - through unprotected vaginal or anal intercourse. Transmission through oral sex has been reported, but is much lower than through vaginal or anal intercourse.
- Perinatal transmission - infections are passed from mother to infant during pregnancy, labor and delivery, or breastfeeding

Like HIV and hepatitis B, hepatitis C is transmitted through blood and other body fluids. However, the risk of transmitting hepatitis C through sexual contact or perinatal transmission is considered to be much lower.

There is *no* evidence of transmission of HIV, hepatitis B, or hepatitis C from:

- Casual social contact
- Sharing eating utensils
- Insect bites
- Donating blood
- Consuming food or drink

HIV is **not** transmitted through tears, sweat, saliva, vomit, feces, or urine. Although these substances can contain HIV, they do not contain the virus in amounts significant enough to cause infection. To date, there is no documentation of HIV transmission through these substances. Blood, semen, cervical/vaginal secretions, and breast milk are the only body fluids for which HIV transmission has been documented. At this time, it is believed that hepatitis B is transmitted through saliva and feces and is **not** transmitted through tears, sweat, vomit, or urine. There is no conclusive evidence at this time about whether or not hepatitis C is transmitted through these substances.

Household transmission refers to transmission of a virus without recognized blood, sexual, or perinatal exposure. HIV is **not** transmitted through household transmission. Instances of household transmission of hepatitis B have been documented, though this occurs infrequently. Infection occurs primarily among young children who are exposed for long periods of time to family members who are persistent hepatitis B carriers. It is likely that most of these cases are actually due to unrecognized exposure of mucous membranes, cuts, or other breaks in the skin to infectious blood or saliva. There is no documentation at this time of household transmission of hepatitis C.

2. Misconceptions about the Incidence of Hospital-Acquired Infections and Prevalence of Infections in the Community

Health care workers often believe that the incidence of postprocedure and other hospital-acquired infections at their facility is low. Similarly, they may believe that the incidence of serious infections (such as HIV or hepatitis C) in their community is also low and thus not of concern. In reality, it is difficult to track the incidence of postprocedure and other hospital-acquired infections and to know how many people have bloodborne infections because:

- Postprocedure infections may be difficult to identify, especially for many outpatient services. On average, surgical-site infections occur within 7–10 days after a clinical procedure has been performed.
- Infections do not always cause problems serious enough to make clients seek medical attention. Though the infections may prolong the healing process, eventually they may resolve on their own.
- Clients may seek treatment for postprocedure infections at another facility or a pharmacy.
- Clients or staff may not find out they are infected with HIV or the hepatitis viruses until years after the infection occurs, when little connection to a past clinical procedure or workplace accident would be evident.
- There is little reliable data on the prevalence of viruses such as HIV or the hepatitis viruses for many countries throughout the world.
- It does not take many infected people to put the community at risk of infections. A few initial infections can lead to many other infections.

The time to institute effective infection prevention practices is *now*, so that if life-threatening infections are not already prevalent in the community, they do not become so.

3. Misconceptions about a Health Care Worker's Safety When Appropriate Infection Prevention Practices Are *Not* Followed

Many health care workers believe that they need to follow appropriate infection prevention practices only with clients whom they know to be infected. Thus, they may be in favor of screening clients for HIV and hepatitis B before providing clinical services (e.g., surgery) to identify those clients who are infected. This practice is not recommended because:

- Some bloodborne infections (e.g., hepatitis C) cannot be easily detected through testing.
- Test results may appear negative for a period of time after a person becomes infected (the time period varies, depending on the type of infection and the test being used).
- Screening is not possible during emergency situations. If infection prevention practices are

not followed routinely, health care workers may not have the knowledge or supplies needed to follow the practices and protect themselves in an emergency.

- Screening is costly and may divert money away from needed training, supplies, and equipment.
- Screening may lead to a false sense of security on the part of health care workers, who may believe that they are not at risk of infections when treating clients who have tested negative on screening tests.

Practicing appropriate infection prevention procedures with every client, regardless of a client's known or presumed infection status, can reduce the risk of infections for clients, health care workers, and the community.

4. Misconceptions about the Feasibility of Following Appropriate Infection Prevention Practices

Many health care workers believe that infection prevention practices require fancy, expensive equipment or supplies. But this is not the case. It is just as feasible to institute appropriate infection prevention practices in low-resource settings as it is in high-resource settings. The internationally accepted standards presented in this training course use low-tech approaches that are practical, simple, and inexpensive and utilize mostly locally available supplies.

The standards in this course are based on many years of accumulated data that demonstrate the effectiveness, importance, and usefulness of the recommended practices. Some of the infection prevention practices recommended in this manual are new, while others represent different ways of carrying out existing principles of infection prevention. (For example, in the past, used needles were routinely recapped to prevent health care workers from needlestick injuries. Today, recapping needles is not recommended; needles should be placed in puncture-resistant containers immediately after use. The principle behind both practices is the same, but the methods are different.)

Sometimes it is difficult for people to change previously learned or habitual behavior. *It is important to keep in mind that because science and medicine are always evolving, recommended practices may change over time.*

Consequences of Misconceptions about Infection Transmission

Misconceptions about transmission of infections can influence how services are provided to clients and which procedures are followed.

Misconceptions may lead to:

- Service providers denying services to clients
- Service providers being unnecessarily afraid of or worried about providing services
- Increased risk of infections in clients
- Some staff members not taking appropriate steps to protect themselves
- Ineffective practices being performed. For example, in health care settings, most infections are spread by direct contact, especially by the hands of health care workers—not by airborne transmission, as many people believe. Ineffective practices, such as fumigation, tend to be performed when there is misinformation about infection transmission. (Fumigation is covered later in this training course.)

Standard Precautions

Review the material in the Participant's Handbook. If desired, you may conduct the following optional activity. Explain that whereas *universal precautions* refers to practices performed to protect health care workers from exposure to bloodborne microorganisms, *standard precautions* is a much broader term—the precautions help protect both clients and health care workers from exposure to not only blood, but also to other body fluids that can transmit infections. Reinforce the fact that standard precautions are the foundation for the infection prevention practices discussed in this training course.

Optional Activity: Discussion Topic *(Approximate time: 10 minutes)*

Begin the session by asking the participants: Have you ever heard the term *universal precautions*? *standard precautions*? If the participants are unfamiliar with these terms, introduce the term *standard precautions* by stating that it is being used to replace *universal precautions*, a term with which the participants may be more familiar. If the participants are familiar with these terms, ask:

- Do you practice either of these approaches at your facility?
- If so, do your practices match those listed in the Participant's Handbook?
- If not, what measures must be taken to incorporate these practices?

Record their responses on a flipchart and save it for use in developing implementation plans in Module 14: Implementation Plans and Closure.

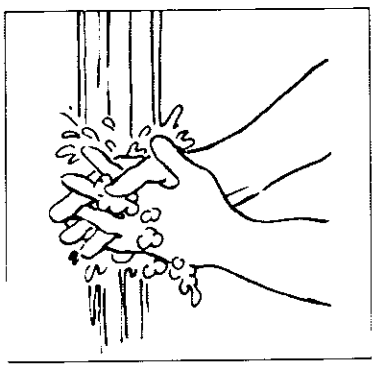
Standard Precautions

Definition

Standard precautions: **a set of clinical practice recommendations designed to help minimize the risk of exposure to infectious materials, such as blood and other body fluids, by both clients and staff. They help break the disease-transmission cycle at the mode of transmission step.**

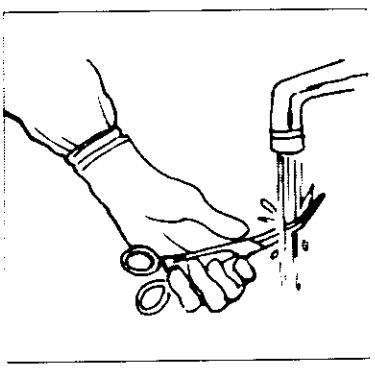
Calling the precautions "standard" means that they should be followed routinely, all the time. Standard precautions should be followed with every client, regardless of his or her presumed infection status. This is important, since it is not always possible to tell who is infected with viruses such as HIV and the hepatitis viruses, and often the infected persons themselves do not know that they are infected. It is safer to follow standard precautions with each and every client rather than to follow them when dealing with some clients and not others.

Standard Precautions

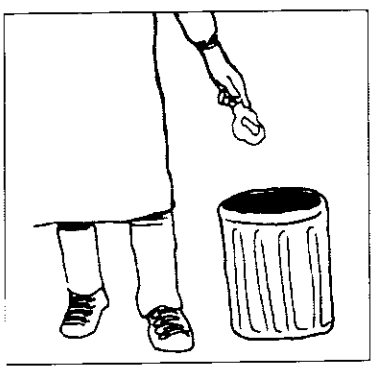


Wash your hands.

Wear gloves, eye protection or face shields, and gowns, when appropriate.

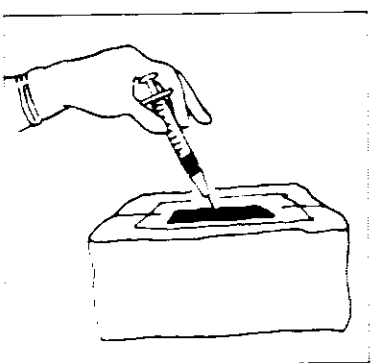


Correctly process instruments, other items used in clinical procedures, and client-care equipment.



Maintain correct environmental-cleanliness and waste-disposal practices.

Handle, transport, and process used/soiled linen correctly.



Prevent injuries with sharps.

Details of each of these procedures will be covered later in this training course.

"At My Facility..."

Ask the participants to write their responses to the questions in the space provided. Remind them to answer the questions as honestly as possible. Ask them to think about their response to each question to see if it reflects an appropriate infection prevention practice or if there are issues that need to be addressed. Ask them to write down any problems they identify. Allow 10 minutes for completion.

Optional Activity: Discussion Topic *(Approximate time: 10 minutes)*

Ask for volunteers to share their responses, and allow for discussion.

If the optional activity was conducted during the session "Standard Precautions," ask the participants to keep the material they generated as a possible resource for their implementation plan for improving infection prevention practices, which they will develop in Module 14: Implementation Plans and Closure.

"At My Facility..."

Think about your clinical setting and write your answers to the following questions in the space provided. At your facility:

- Do staff understand the ways in which their work poses the risk of transmitting infections to clients, themselves, and the community?

- Do staff have a general understanding of how infections are transmitted and a good knowledge of how specific infections, such as hepatitis B and HIV, are transmitted?

- Are staff using standard precautions when caring for clients and handling instruments and other items used in all clinical procedures?

- Are staff open to change and to implementing new practices to reduce the risk of infections?

Do your responses to these questions reflect an understanding or performance of appropriate infection prevention practices at your facility? If, based on your responses, you become aware of some problems or issues that need to be addressed, list them below:

Summary/Self-Assessment Answers

1. Infections can be transmitted in both directions. Infections can pass from Mrs. Gonzales to the service provider because the service provider is not wearing protective gloves; the fact that the service provider has a cut on her hand further increases her risk of infections. Infections can pass from the service provider to Mrs. Gonzales because the service provider's hands may contain potentially infectious microorganisms.
2. The service provider should get a pair of gloves from another part of the hospital or send someone to the market to buy a pair of gloves.

Optional Activity: Discussion Topic *(Approximate time: 10 minutes)*

Read aloud the case study, and facilitate a discussion by asking the participants the questions that appear in the Participant's Handbook.

Answers to true/false questions:

3. T
4. F
5. T
6. T
7. F
8. F
9. T

Summary/Self-Assessment

Answers are provided at the end of this assessment.

Review the following case study, which appeared at the beginning of this module, and answer the questions below:

Mrs. Gonzales comes to the family planning clinic of the district hospital for an IUD insertion. The family planning clinic has run out of gloves due to a supply shipment delay. Even though the only service provider trained to insert IUDs has a cut on her finger, she decides to conduct the pelvic examination and insert the IUD without wearing gloves because Mrs. Gonzales has traveled a long distance to come to the clinic.

1. How might an infection be transmitted between the service provider and Mrs. Gonzales?

2. What should be done differently to reduce the risk of infection transmission?

Decide whether each of the following statements is T (true) or F (false). Write your response for each statement in the space provided.

3. ____ Almost all cases of transmission of HIV and hepatitis B to health care workers have occurred through preventable accidents, such as needlestick injuries. (page 2.9)

4. ____ It is easy to determine the incidence of postprocedure infections in most health care facilities. (page 2.12)

5. ____ Infections can be transmitted from client to client through the use of contaminated surgical instruments, needles, syringes, and other equipment that have not been properly processed between uses. (page 2.9)

6. ____ Since it may not be possible to know whether a client is infected with HIV or hepatitis B, contaminated instruments, needles, syringes, and other items from all clients must be handled as though the client were infected. (page 2.14)

7. ____ The primary purpose of infection prevention is to prevent surgical-site infections. (page 2.10)

8. ____ Transmission of bloodborne infections from infected health care workers to their clients is a common problem. (page 2.9)

9. ____ Because science and medicine are always evolving, recommended infection prevention practices may change from time to time. (page 2.13)

10. F
11. F

Answers to multiple-choice questions:

12. a, b, c
13. b
14. a
15. b, c, e

10. ____ Housekeeping staff are rarely at risk of infections, since they do not generally have direct contact with clients. (page 2.3)

11. ____ It is important to follow standard precautions only when a client is known to be infected with a virus such as HIV or hepatitis B. (page 2.14)

The following are multiple-choice questions. More than one option may be correct. Please circle the correct response(s).

12. Infections can be transmitted from clients to health care workers through exposure to blood or other body fluids: (page 2.9)

    a. From splashes in the health care worker's eye, nose, or mouth
    b. Through broken skin due to rash, chapped skin, or an unhealed cut or scratch
    c. From a needlestick injury
    d. When the client does not wash her hands

13. It is easiest to prevent transmission of infections by breaking the disease-transmission cycle at which step? (page 2.7)

    a. Reservoir
    b. Mode of transmission
    c. Place of entry
    d. Susceptible host

14. Infections are most commonly spread in health care facilities by the following mode of transmission: (page 2.13)

    a. Contact
    b. Airborne
    c. Vector
    d. All of the above

15. HIV can be transmitted through: (page 2.11)

    a. Insect bites
    b. Unprotected vaginal intercourse
    c. Breastfeeding
    d. Casual contact, such as hugging or shaking hands
    e. Use of contaminated syringes

Answers: 1. Infections can be transmitted in both directions. Infections can pass from Mrs. Gonzales to the service provider because the service provider is not wearing protective gloves; the fact that the service provider has a cut on her hand further increases her risk of infections. Infections can pass from the service provider to Mrs. Gonzales because the service provider's hands may contain potentially infectious microorganisms; 2. The service provider should get a pair of gloves from another part of the hospital or send someone to the market to buy a pair of gloves; 3. T; 4. F; 5. T; 6. T; 7. F; 8. F; 9. T; 10. F; 11. F; 12. a, b, c; 13. b; 14. a; 15. b, c, e

MODULE 3 Handwashing and Use of Gloves

Trainer's Notes for Module 3

This module provides an overview of handwashing and the use of gloves to prevent the transmission of infections during service delivery. It also explains why these practices are important.

Audience [illegible]

Training Time

30 minutes to 1½ hours, depending on which training activities are used.

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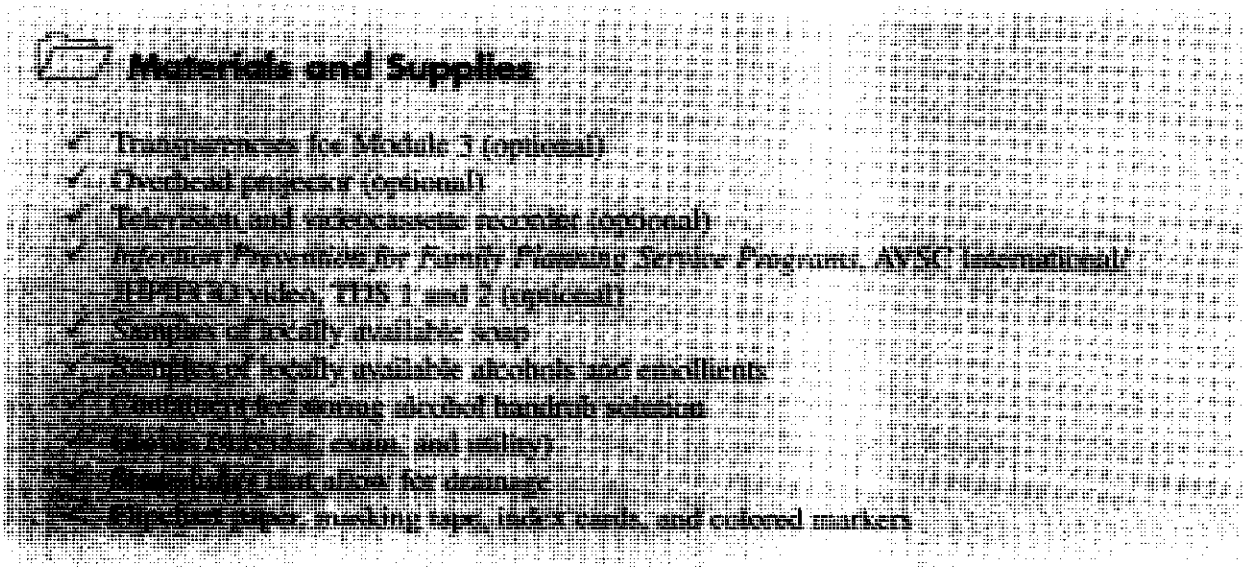
MODULE 3 Handwashing and Use of Gloves



Advance Preparation

- Determine which training activities will be used to present the content of this module. For on-site training, review the activities presented in Appendix E: On-Site Training Activities. Prepare or gather any supplies needed for the activities you will be conducting.
- Find out what types of soap are available in the participants' locale and get samples, if possible.
- Find out what types of gloves for surgical, examination, and utility needs are available in the participants' locale, and get samples, if possible.
- Cue the video to TDS 1, if used.
- Observe how handwashing and use of gloves are practiced at the participants' facilities, if possible.
- Create transparencies or flipcharts, as needed.

Introduction

Introduce this module by reviewing the purpose and objectives that appear in the Participant's Handbook. If desired, you may conduct the following optional activity.

Optional Activity: Case Study *(Approximate time: 5 minutes)*

Read aloud the introductory case study, and direct the participants to the instructions that appear in their handbook.

MODULE 3 Handwashing and Use of Gloves

Introduction

Purpose and Objectives

This module provides an overview of handwashing and the use of gloves to prevent infections in health care facilities. It also explains why these practices are important and describes ways to try to improve compliance with handwashing and the appropriate use of gloves. Upon completion of this module, you should be able to:

- Explain the importance of routine handwashing in infection prevention
- List the appropriate times to wash hands in a health care facility
- Explain the three kinds of handwashing and when each is performed
- Describe the steps of routine handwashing in a health care facility
- List several ways to improve compliance with appropriate handwashing behavior
- Describe the three kinds of gloves and when each is used in a health care facility

Read the following case study, and try to keep it in mind as you learn the content of this module. See if you can determine whether the situation presents a risk of infection transmission and, if so, what should be done differently to reduce the risk. Questions about the case study appear in the Summary/ Self-Assessment at the end of this module.

There is often no running water in the postoperative ward of the local maternity hospital. When running water is not available, the doctors generally do not wash their hands before and after examining each client. Examination gloves are also not always available. When they are available, the doctors wear them while examining the clients; however, they do not wash their hands after taking off the gloves. When examination gloves are not available, the doctors examine the clients without wearing gloves.

Directions for Independent Study

If you are preparing for this module independently, you should:

- Study this module.
- Complete Exercise 3-1: Case Studies.
- Complete Exercise 3-2: Appropriate Use of Gloves in Service Delivery.
- Answer the "At My Facility..." questions for this module.
- Answer the Summary/Self-Assessment questions at the end of this module.
- Write down any questions you have about this module for later discussion with the trainer.

Importance of Routine Handwashing in Infection Prevention

Review the information on the significance of handwashing, and conduct the following training activity.

Training Activity: Discussion Topic *(Approximate time: 10 minutes)*

Facilitate a discussion on handwashing by asking the participants:

- Why do you think handwashing is important in the clinical setting?
- Which staff members in the clinical setting need to wash their hands?

Some of the participants may think that because they *do* wash their hands during service delivery, this information is not important and they do not need to pay attention to it. Remind them that handwashing is the most important infection prevention practice and that even when it is performed, it is often performed improperly. In addition, most staff do not wash their hands as often as they think they do.

Review the information on resident and transient microorganisms and the service provider's role in reducing the risk of infections by washing hands when appropriate. Explain that the purpose of handwashing is to decrease the number of microorganisms on the hands and thereby prevent the spread of infections.

Appropriate Times for Handwashing

Review the times and situations when hands should be washed. If desired, you may conduct the following optional activity.

Optional Activity: Discussion Topic *(Approximate time: 10 minutes)*

Ask the participants to list times and situations when hands should be washed. Record their responses on a flipchart. If necessary, point out additional situations when handwashing is appropriate. Help the participants group the various situations they have listed into the broad categories listed in the Participant's Handbook. Compare their responses with the times and situations listed in the handbook.

During the course of the session, highlight the fact that hands should be washed before and after contact with each and every client or with any object that might be contaminated with blood or other body fluids, and before and after wearing gloves for clinical procedures, since hands can become contaminated if gloves contain invisible holes or tears.

Encourage the participants to post the list of times and situations when hands should be washed in their facilities after the training course.

Importance of Routine Handwashing in Infection Prevention

For more than 100 years, experts have known that handwashing is the most important way to reduce the spread of infections in the health care setting. However, handwashing is often under-emphasized, not performed, or not performed correctly in health care facilities.

Why Handwashing Is So Important

Our skin contains microorganisms that normally live within the outer layers of the skin or in the glands of the skin. These **resident microorganisms** cannot easily be removed from the skin either by mechanical friction (scrubbing or rubbing) or by washing with plain soap or detergent. However, killing them or inhibiting their growth can reduce the risk of infections. (Ways to kill or inhibit the growth of microorganisms will be covered later in this module.)

Our skin also acquires microorganisms during the course of our work and daily living. These **transient microorganisms** can easily be removed both by mechanical friction and by washing with plain soap or detergent. During the course of their work, service providers' hands can easily become contaminated with potentially infectious transient microorganisms. If service providers do not wash their hands, any potentially infectious microorganisms contained on them can cause infections in clients. In addition, during their work service providers and ancillary staff may be exposed to potentially contaminated blood and other body fluids, even when gloves are worn, putting them at risk of infections. Handwashing can help reduce this risk.

Numerous scientific studies have shown that handwashing:

- Significantly reduces the number of potentially infectious microorganisms on the hands of service providers
- Reduces client sickness (morbidity) and death (mortality) caused by infections spread in the health care facility

Appropriate Times for Handwashing

Hands should be washed:

- Immediately after arriving at work
- Before examining each client
- After examining each client
- After touching any instrument or object that might be contaminated with blood or other body fluids, or after touching mucous membranes (e.g., eyes, nose, mouth)
- Before putting on gloves for clinical procedures
- After removing gloves (hands can become contaminated if gloves contain invisible holes or tears)
- After using the toilet or latrine
- Before leaving work at the end of the day

The Three Kinds of Handwashing

Review the three different kinds of handwashing and explain when each should be used. Conduct the following training activity.

Training Activity: Discussion Topic *(Approximate time: 10 minutes)*

Ask the participants what types of soap are locally available for use in the clinical setting. Then ask what type of soap is used at their facilities. Use this information to help the participants recognize what resources are available to them.

The Three Kinds of Handwashing

There are three kinds of handwashing used in the clinical setting. Each kind is appropriate in different situations.

The three kinds of handwashing:

1. Handwashing with plain soap and running water (routine handwashing)

- Removes transient microorganisms and soil (any material that should **not** be found on clean hands, such as dirt, blood, feces, and remnants from food)
- Is appropriate in most situations when hands should be washed, including immediately after arriving at work, before and after contact with a client, after handling specimens or potentially contaminated items, after using the toilet or latrine, and before leaving work

2. Handwashing with an antiseptic and running water

- Removes transient microorganisms and soil and kills or inhibits the growth of resident microorganisms. Some antiseptics continue to kill and inhibit the growth of resident microorganisms for several hours after hands are washed. (Antiseptics are covered in detail in Module 4: Antiseptics and Disinfectants.)
- May reduce the risk of infections in high-risk situations, such as before invasive procedures (e.g., insertion of central venous catheters or chest tubes, angiography, or spinal tap) or contact with clients at high risk of infections (e.g., newborns or immunosuppressed clients)

Note: Surgical handscrub, which is more complex than handwashing with antiseptic, is covered in Module 5: Aseptic Technique.

3. Alcohol handrub

- Kills or inhibits the growth of both transient and resident microorganisms but does **not** remove microorganisms or soil
- Can be used when handwashing with soap and running water is not possible or practical (such as when running water is not available), as long as hands are not visibly soiled with dirt, blood, or other organic material. (More information on the use and preparation of an alcohol handrub solution is provided on page 3.5.)
- Is only one kind of antiseptic handrub. While other types of antiseptic handrubs may be commercially available, in this handbook we discuss alcohol handrub because alcohol is the most commonly available solution that can be used for an antiseptic handrub.

For most activities, routine handwashing with plain soap and running water for 10–15 seconds is sufficient. Antiseptic is generally not necessary.

Steps of Handwashing

Review the five steps of routine handwashing. As you describe the steps, perform a mock demonstration by showing the motion of how to rub hands together. If desired, you may conduct one or more of the following optional activities.

Optional Activity: Video Viewing *(Approximate time: 5–10 minutes)*

Show TDS 1 (length 3:18) from the infection prevention video, which presents both handwashing and surgical handscrub. *Stop the video* after the portion on handwashing. Review the material presented with the participants and allow for questions.

Training Option

The video can be shown either at the beginning of the session to introduce the topic or at the end of the session for review.

Optional Activity: Demonstration and Practice *(Approximate time: 5 minutes)*

Demonstrate the steps of handwashing, and ask the participants to practice them. (This activity is most appropriate for ancillary staff.)

Optional Activity: Large-Group Exercise *(Approximate time: 10–15 minutes)*

Ask for volunteers to rub the cut end of a chili pepper on one fingertip. Ask them to rinse their hands in water and then taste the fingertip where the chili was rubbed. The fingertip will have a strong chili taste. Then ask the participants to wash their hands with soap and water, as described in their handbook, and taste the fingertip again. This time, the chili taste will be gone or be quite a bit weaker.

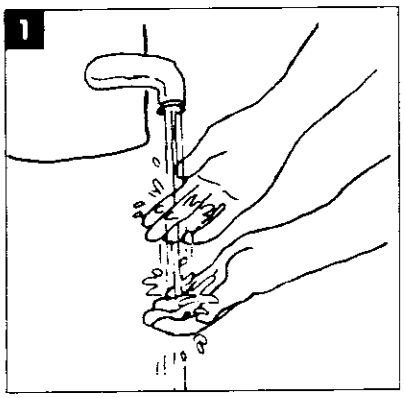
Explain to the participants that this exercise reinforces the importance of proper handwashing technique and the use of soap rather than just rinsing hands in plain water. Add that in the exercise, the oil from the chili, which causes the strong taste, represents transient microorganisms on the skin; neither the chili oil nor the microorganisms can be seen. Just as rinsing with water does not remove the chili taste, it also does not remove transient microorganisms.

Highlight the importance of:

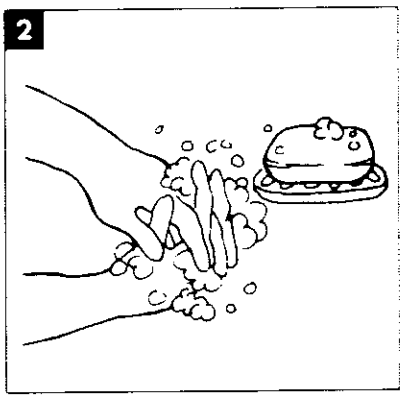
- Rinsing hands under a stream of running water via a tap, spigot, or pitcher
- Keeping bar soap in a soap dish that allows for adequate drainage
- Using small bars of soap, if available, or cutting large ones into smaller pieces to reduce the likelihood of contamination
- Using a clean, personal towel to dry hands or allowing hands to air-dry

Steps of Handwashing

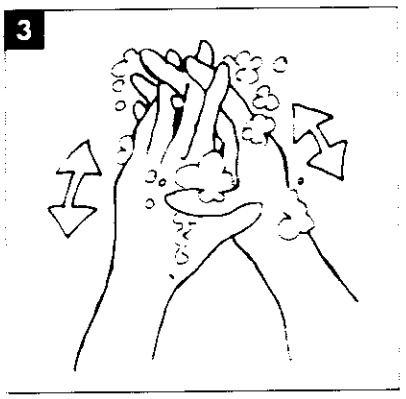
Steps of Routine Handwashing



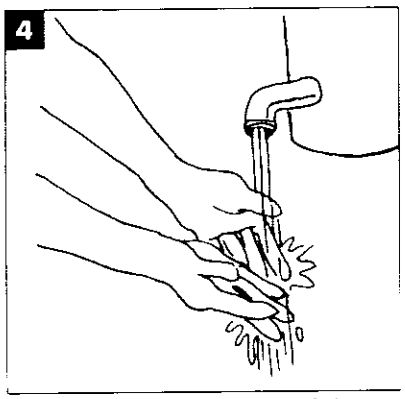
Wet hands with running water.



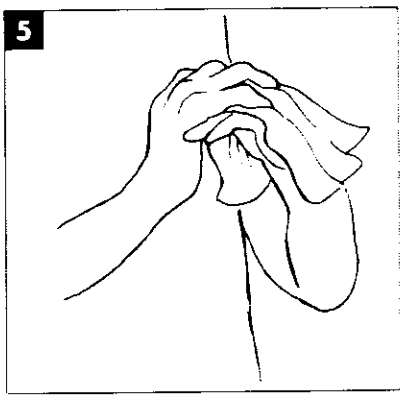
Rub hands together with soap and lather well. Make sure to rub all parts of your hands.



Vigorously weave fingers and thumbs together and slide them back and forth for 10–15 seconds (longer if hands are visibly soiled). Remember to wash around the nails.



Rinse hands under a stream of clean, running water until all soap is gone.



Dry hands with a clean towel or allow hands to air-dry.

After handwashing, hands should be visibly clean. When first arriving at work or if hands are heavily soiled with dirt, blood, or other organic material (such as when gloves have been torn), handwashing for several minutes may be necessary to wash hands well.

Note: After you have washed your hands in preparation for a clinical procedure, **do not touch any** unclean surfaces before touching the client, touching clean instruments or other items, or putting on gloves.

Remember: Use soap or detergent when washing hands; water alone does not effectively remove protein, oils, grease, and dirt. After handwashing, rinse hands under running water to wash away the microorganisms and soil.

Review the steps of using an alcohol handrub. As you describe the steps, perform a mock demonstration by showing the motion of how to rub hands together. Then review the steps of preparing an alcohol handrub solution, and conduct the following training activity. If desired, you may also conduct the following optional activity.

Training Activity: Demonstration and Practice *(Approximate time: 10 minutes)*

Demonstrate how to prepare an alcohol handrub solution. Pass around the prepared solution, and ask the participants to sample it by rubbing it into their skin until dry. Review the proper use of an alcohol handrub. Reinforce the fact that when alcohol is used, it should be rubbed into the hands until dry.

Optional Activity: Discussion Topic *(Approximate time: 5 minutes)*

Ask the participants if running water is ever unavailable at their facility. If so, ask how they can properly wash hands when running water is not available. Guide the discussion, correcting any misinformation or misconceptions the participants may have.

Microorganisms grow and multiply in moisture and standing water. Therefore:

- Keep bar soap on a soap rack or in a dish that allows for drainage. Leaving soap in a pool of water will lead to increased growth of microorganisms.
- Avoid dipping or washing hands in a basin containing standing water, even if an antiseptic solution (such as Dettol or Savlon) is added. Microorganisms and soil will not be washed away, and the water can easily become contaminated from repeated use.
- Use small bars of soap, if available, or cut large ones into smaller pieces to reduce the likelihood of contamination.

To clean hands when running water is not available, use either:

- A bucket with a tap that can be turned off to lather hands and turned on again for rinsing
- A bucket and pitcher, with one person pouring the water over the other's hands and allowing it to drain into the bucket
- An alcohol handrub, which does not require water

Steps of Alcohol Handrub

1. Apply 3–5 mL of alcohol or an alcohol handrub solution (see below).
2. Rub hands together until they are dry.

Because using alcohol alone tends to dry the skin, it is best to use an alcohol handrub solution.

To prepare on alcohol handrub solution, add together:

- 2 mL of glycerine, propylene glycol, or sorbitol, *and*
- 100 mL of 60–90% alcohol

Note: An alcohol handrub does **not** remove soil or organic material such as blood. Therefore, an alcohol handrub should **not** be used when hands are visibly soiled.

Remember: After handwashing, dry hands with a clean towel or air-dry; shared towels can become contaminated quickly. Ask the person in charge of ordering supplies for your facility to cut up a large towel or purchase small towels or facecloths that staff can use to dry their hands; if possible, carry an individual handkerchief or towel attached to your belt or in your pocket to avoid using dirty towels. If necessary, bring a small towel from home for your personal use.

Improving Compliance with Appropriate Handwashing Behavior

Review the issues related to compliance with appropriate handwashing behavior, and conduct the following training activity. Stress that in low-resource settings, a lack of understanding of the importance of handwashing or when it is indicated, as well as an inadequate supply of water or soap, are likely to play a major role in inadequate handwashing behavior.

Training Activity: Discussion Topic *(Approximate time: 20–30 minutes)*

Facilitate a discussion about barriers to handwashing and tbe steps health care workers can take to improve handwashing behavior in their facilities. Ask the participants to list the reasons why people do not always wash their hands when they are supposed to; record their responses on a flipchart. For each barrier to handwashing, ask the participants to provide at least one solution; record their solutions on the flipchart next to the corresponding barriers. Solutions could include:

- Addressing the lack of staff knowledge (e.g., regular inservice training, posters)
- Maintaining a steady supply of soap
- Making plans for times when water is not readily available (e.g., discussing ways to store a supply of water, alternatives such as alcohol handrub)
- Showing administrative support and commitment (e.g., ensuring that money is budgeted for soap, supporting training activities, posting reminders)
- Promoting role models who wash their hands when appropriate and encourage others to do so

Save the flipchart for use in developing implementation plans in Module 14: Implementation Plans and Closure.

Improving Compliance with Appropriate Handwashing Behavior

Research has shown that service providers wash their hands in only about half of the instances in which it is indicated, and that they tend to overestimate how frequently and how well they wash their hands. Studies have also shown that while doctors wash their hands less often than nurses, doctors tend to do a better job than nurses when they do wash them. In many settings, the reason that service providers and ancillary staff do not wash their hands is **not** because they do not know how to wash them or even that they do not know when to wash them—they simply do not do it. In other words, the problem is one of compliance.

Studies conducted in the United States and Europe have shown that sustained improvement in handwashing behavior most often occurs when the administration of a health care facility shows involvement in and commitment to handwashing as a critical infection prevention practice. This occurs when respected individuals (role models) demonstrate appropriate handwashing behavior and encourage other staff to do the same, reminding staff that handwashing protects them as well as their clients.

In low-resource settings, other issues are likely to play a larger role in inadequate handwashing, such as lack of understanding of the importance of handwashing or when it is indicated, and an inadequate supply of water or soap. Therefore, it is important that these issues be addressed, and that the facility's administration show support for compliance. If, for example, the water supply is erratic at your facility, there should be a plan in place for how water will be made available when the tap is dry.

It is crucial that all staff understand (and be reminded of):

- The importance of handwashing in preventing infections
- The times when handwashing is indicated
- How hands can be effectively washed given the available resources of their facility
- The alternatives to handwashing when running water is not readily available

Exercise 3-1: Case Studies

Use the following cases (or use case histories of your own) to help the participants think through the issues involved in handwashing. Divide the participants into small groups and assign two cases to each group. Allow 10 minutes for completion. Bring the groups together and review each case, asking for a volunteer from each group to present the group's work. Allow for discussion; give feedback and validate or correct the participants' responses, as necessary.

Training Options

- After dividing the participants into small groups, ask each group to complete all of the cases. When the groups are brought together, ask for a volunteer from each group to report the group's responses to only one of the cases.
- Read the cases aloud, and ask for volunteers to respond to the questions. (This works well with low-literate/illiterate staff or when time is short.)
- Ask the participants to write their responses in their handbooks, and ask for volunteers to read them aloud. Alternatively, ask the participants to switch books with another participant and correct the other's responses.

Possible responses:

Case Study 1

a. No. Hands should always be washed before and after contact with every client. Handwashing is the most effective way to prevent transmission of infections.

b. If a sink with running water is not available, one of the following should be provided in each examination room: (1) soap, a bucket with a tap, and a basin: (2) soap, a bucket, a pitcher, and a basin; or (3) a bottle of alcohol or an alcohol handrub solution. Wherever Dr. Karimov washes his hands, he should dry them with a clean towel or allow them to air-dry, since towels used by more than one person can easily become contaminated.

Case Study 2

a. No. Hands should always be washed immediately after arriving at work. Even though Mrs. Gueye's hands appeared to be clean, after having contact with her sick child and taking public transportation, her hands harbored many bacteria and potentially infectious microorganisms.

b. She should have stopped seeing clients and washed her hands as soon as she remembered, and she should wash her hands before and after seeing each client.

Case Study 3

No. Hands should never be dipped in a community basin of water for washing or rinsing; water should always be free-flowing. Even if an antiseptic is added, microorganisms can live and multiply in water. In addition, the doctor should not dry his hands on a community towel. He should dry them with a disposable or personal towel or allow them to air-dry.

Exercise 3-1: Case Studies

Read the following case studies and answer the questions below. Possible responses appear on page 3.9.

Case Study 1

Dr. Karimov works in a family health clinic. The building is old, and none of the sinks are located in or near the examining rooms. Though Dr. Karimov examines many clients during the course of each day, he does not routinely wash his hands before or after examining clients because it is inconvenient to do so.

a. Is this an appropriate practice? Why?

b. What are the alternatives to handwashing for Dr. Karimov?

Case Study 2

Mrs. Gueye is a midwife at a busy medical clinic. This morning, she arrived late to work because she had to take her sick daughter to her mother's house before taking a bus to work. When Mrs. Gueye arrived at the clinic, many people were waiting for her, so she immediately began seeing clients. At one point, she thought about washing her hands, but she felt guilty about coming to work late and did not want to keep her clients waiting any longer. Besides, her hands did not look dirty.

a. Did Mrs. Gueye act appropriately? Why?

b. What should Mrs. Gueye have done in this situation?

Case Study 3

Three days ago, Mr. Patel had surgery. He is now at the clinic waiting for the doctor to examine his surgical incision and change the bandage. The doctor is nearby, washing his hands with soap and water and rinsing them by dipping them in a basin of water. After drying his hands on a towel that has been resting on the windowsill, the doctor examines Mr. Patel's incision.

Has the doctor washed his hands appropriately? Why?

continued

Case Study 4

a. Yes. Water and mechanical friction (scrubbing or rubbing) do not sufficiently clean health care workers' hands. Health care workers must also use soap, which helps remove transient organisms and soil from the skin.

b. Dr. Baptiste should share the infection prevention manual that he received at the training with the supply agent and explain the advantage of using soap and water over using water alone. He could also recommend that the supply agent buy large bars of soap and cut them into several smaller bars, which is more economical and reduces the likelihood of contamination. If the supply agent is still unwilling to supply soap, Dr. Baptiste should pursue the matter with the chief medical officer or administration.

Exercise 3-1: Case Studies continued

Case Study 4

Most of the sinks at the hospital where Dr. Baptiste works have running water, but many of them do not have soap. Dr. Baptiste recently completed an infection prevention training workshop, and he is concerned that handwashing without soap is ineffective. He tells this to the hospital supply agent, who disagrees, saying that rubbing hands together under running water is sufficient. The supply agent also reminds Dr. Baptiste that funds are tight and it is wasteful to have a bar of soap at every sink.

a. Should Dr. Baptiste be concerned with the lack of soap at every sink? Why?

b. How could Dr. Baptiste resolve this issue?

Answers to Exercise 3-1: Case Studies

Possible responses:

Case Study 1

a. No. Hands should always be washed before and after contact with every client. Handwashing is the most effective way to prevent transmission of infections.

b. If a sink with running water is not available, one of the following should be provided in each examination room: (1) soap, a bucket with a tap, and a basin; (2) soap, a bucket, a pitcher, and a basin; or (3) a bottle of alcohol or an alcohol handrub solution. Wherever Dr. Karimov washes his hands, he should dry them with a clean towel or allow them to air-dry, since towels used by more than one person can easily become contaminated.

Case Study 2

a. No. Hands should always be washed immediately after arriving at work. Even though Mrs. Gueye's hands appeared to be clean, after having contact with her sick child and taking public transportation, her hands harbored many bacteria and potentially infectious microorganisms.

b. She should have stopped seeing clients and washed her hands as soon as she remembered, and she should wash her hands before and after seeing each client.

Case Study 3

No. Hands should never be dipped in a community basin of water for washing or rinsing; water should always be free-flowing. Even if an antiseptic is added, microorganisms can live and multiply in water. In addition, the doctor should not dry his hands on a community towel. He should dry them with a disposable or personal towel or allow them to air-dry.

Case Study 4

a. Yes. Water and mechanical friction (scrubbing or rubbing) do not sufficiently clean health care workers' hands. Health care workers must also use soap, which helps remove transient organisms and soil from the skin.

b. Dr. Baptiste should share the infection prevention manual that he received at the training with the supply agent and explain the advantage of using soap and water over using water alone. He could also recommend that the supply agent buy large bars of soap and cut them into several smaller bars, which is more economical and reduces the likelihood of contamination. If the supply agent is still unwilling to supply soap, Dr. Baptiste should pursue the matter with the chief medical officer or administration.

The Three Kinds of Gloves

Review the three different kinds of gloves and conduct the following training activity. If desired, you may also conduct one or more of the following optional activities. Note that health care workers must wear gloves whenever they may come in contact with blood, other body fluids, or medical or hazardous chemical waste, and they must change their gloves before each client.

Training Activity: Demonstration *(Approximate time: 10 minutes)*

Display and circulate samples of the three kinds of gloves. Explain that each kind is appropriate for use in a different situation and that some kinds are reusable and some are not. Then ask the participants to name the acceptable alternatives when each kind is not available.

Training Option

If the participants can visit a store during the course of the training, ask them to explore the variety of gloves that are available locally and compare the costs to find the most cost-effective products for surgical, examination, and utility needs.

Optional Activity: Video Viewing *(Approximate time: 5 minutes)*

Show TDS 2 (length 1:42) from the infection prevention video, which presents the different kinds of gloves. Review the material presented with the participants and allow for questions.

Training Option

The video may be shown either at the beginning of the session to introduce the topic or at the end of the session for review.

Highlight the point that in many low-resource settings, surgical gloves—which are the most expensive—are often used when supplies of the other kinds of gloves run out or are not available (e.g., using surgical gloves when cleaning instruments and other items, because "there are insufficient funds" to purchase utility gloves). This is extremely costly and may result in a shortage of surgical gloves. It is important to use the proper supplies whenever possible.

Optional Activity: Individual or Large-Group Exercise *(Approximate time: 20 minutes)*

Ask the participants to turn to Exercise 3-2: Appropriate Use of Gloves in Service Delivery, which appears on page 3.12 of their handbook.

Optional Activity: Discussion Topic *(Approximate time: 10 minutes)*

If most or all of the participants are doctors and/or administrators, facilitate a discussion on the appropriate use of surgical gloves by asking:

- Are examination and utility gloves usually available for use at your facility?
- If not, what kinds of gloves do staff use when these gloves are recommended for use?
- What measures could be taken to ensure that staff have access to them?

The Three Kinds of Gloves

Gloves provide a barrier against potentially infectious microorganisms in blood, other body fluids, and medical waste, lowering the risk of transmitting infections to both health care workers and clients. They also protect against hazardous chemical waste. Health care workers should wear gloves whenever they may come in contact with clients' blood and other body fluids (e.g., while providing clinical services, handling or cleaning used instruments and other items, performing housekeeping activities, etc.). *Just as hands must be washed before and after contact with each client, a separate pair of gloves must be used for each client.* Where resources allow, disposable gloves (gloves that are used once and then thrown away) are preferable to reusable gloves, because gloves are difficult to properly process. Disposable gloves should **never** be processed or reused.

Three kinds of gloves are used in health care settings:

1. Surgical gloves

- Sterile or high-level disinfected surgical gloves should be worn during all procedures in which there will be contact with the bloodstream or tissues under the skin (e.g., surgical procedures, insertion of Norplant implants, pelvic examinations of women in labor).
- Disposable, sterile surgical gloves are recommended for use whenever possible because it is difficult to properly process reusable gloves. (Sterilization and high-level disinfection are covered in detail in Module 10: Sterilization and Storage and Module 11: High-Level Disinfection and Storage, respectively.)

Note: Surgical gloves are covered in detail in Module 5: Aseptic Technique.

2. Single-use examination gloves

- These should be worn for all procedures in which there will be contact with intact mucous membranes (e.g., IUD insertion, manual vacuum aspiration, pelvic examination) or where the primary purpose of wearing gloves is to reduce the risk of exposing the service provider to blood or other body fluids (e.g., drawing blood, working in the laboratory).
- Examination gloves are usually made of latex or vinyl and may be supplied in bulk in a box or individually packaged. These gloves are clean, but not sterile.
- As the name "single-use" implies, these gloves should be discarded after use and not reused.

Note: If examination gloves are not available, use surgical gloves.

3. Utility or heavy-duty household gloves

- These thick rubber gloves should be worn for handling contaminated instruments and other items, handling medical or hazardous chemical waste and linen, performing housekeeping activities, and cleaning contaminated surfaces.
- They are reusable after rinsing.

Note: If utility gloves are not available, use examination or surgical gloves. Take special care when wearing examination or surgical gloves for these activities, since they can tear easily.

Present the information on guidelines for double gloving, and explain to the participants that careful consideration should be given regarding double gloving in settings in which gloves are reused, supplies are scarce or unreliable, and the risk of exposure to hepatitis B and HIV is high. If desired, you may conduct the following optional activity.

Optional Activity: Discussion Topic *(Approximate time: 10 minutes)*

If most or all of the participants are doctors and/or administrators, facilitate a discussion on double gloving by asking: What are the advantages and disadvantages of double gloving at your facility? Write their responses on a flipchart, and assist the participants in determining whether double gloving is appropriate for them to use.

Remember:

- **Always wash hands before putting on gloves for clinical procedures.**
- **Always wash hands whenever any gloves are removed, since gloves may contain invisible holes or tears that can expose hands to contaminated blood and other body fluids.**
- **Remove used gloves before touching anything. Countertops, faucets, and pens and pencils are frequently contaminated because health care workers touch them while wearing used gloves.**
- **Processing gloves for reuse is not recommended, since gloves are difficult to properly process. Processing and reusing disposable gloves is especially not recommended.**
- **Studies have shown that invisible holes or tears are likely to occur when gloves are processed for reuse. Therefore, reusable gloves should be tested for leaks each time they are processed. (See page 9.5 for ways to test for leaks.)**
- **Surgical gloves are the most expensive. Whenever possible, they should be used only for procedures in which there will be contact with the bloodstream or tissues under the skin.**

Double Gloving

Several recent studies have shown that double gloving—wearing two pairs of surgical gloves—during major surgical procedures reduces the risk of service providers' hands being contaminated with blood and other body fluids. However, there is no consensus among professional medical organizations or government regulatory bodies on the use of double gloving during surgical procedures, and it is recommended that each facility make its own policy.

There are several concerns regarding double gloving:

- Some doctors find that wearing two pairs of gloves is undesirable because it decreases sensitivity and blood circulation.
- In many low-resource settings, double gloving may be problematic due to inadequate supplies of gloves or the additional cost of using two pairs of gloves for contact with each client.

Where cost and availability are **not** major obstacles, facilities may consider the benefits of double gloving for procedures in which there is an increased likelihood that the gloves will tear or be punctured. In addition, although reuse of disposable (single-use) surgical gloves is not recommended, in those circumstances in which it is necessary to process and reuse disposable gloves, double gloving may help protect service providers from exposure to potentially infectious blood and other body fluids, since invisible holes or tears are more likely to occur when gloves have been processed.

Exercise 3-2: Appropriate Use of Gloves in Service Delivery

Ask the participants to complete the chart by filling in the requested information. Allow 15 minutes for completion. Ask for volunteers to share and explain their answers. Allow for questions, and validate or correct the participants' answers, as necessary. Answers appear on page 3.16 of the Participant's Handbook.

Training Options

- As participants call out their answers, fill them in on a transparency of the incomplete chart.
- To conduct this exercise as a large-group exercise, prepare a flipchart of the incomplete chart and index cards with the answers for the cells in the last three columns. Display the flipchart in the front of the room, and place the index cards face-up on a table. Ask for volunteers to read aloud the procedure, select the index cards with the correct information to place in the three related cells of that procedure, and attach the cards to the flipchart using tape. Guide the rest of the participants in assessing the accuracy of the volunteers' answers. Continue until all the cells have been filled in correctly.

Training Tip

This exercise is most appropriate for service providers, who must know what types of gloves to use in various clinical situations. The exercise should not be performed if all of the participants are ancillary staff, such as housekeepers and cleaners.

Exercise 3-2: Appropriate Use of Gloves in Service Delivery

Instructions: Complete the chart by filling in the requested information. Answers appear on page 3.16.

Task/Procedure	Are Gloves Needed? (Yes/No)	Preferred Type of Glove (Surgical, Examination, Utility)	Alternate Type of Glove if the Preferred Type Is Not Available
Taking blood pressure			
Drawing blood			
Performing a pelvic exam			
Handling medical or hazardous chemical waste			
Performing a vasectomy			
Giving a Depo-Provera injection			
Handling or cleaning used instruments and other items			
Taking someone's temperature			
Removing Norplant implants			
Inserting an IUD			
Performing a minilaparotomy tubal ligation			
Cleaning spilled blood or other body fluids			
Performing manual vacuum aspiration			

ADAPTED FROM: Tietjen, L., Cronin, W., and McIntosh, N. 1992. *Infection prevention for family planning service programs: A problem-solving reference manual.* Durant, OK: Essential Medical Information Systems, Inc., p.18.

"At My Facility..."

Ask the participants to write their responses to the questions in the space provided. Remind them to answer the questions as honestly as possible. Ask them to think about their response to each question to see if it reflects an appropriate infection prevention practice or if there are issues that need to be addressed, and to write down any problems they identify. Allow 10–15 minutes for completion.

Optional Activity: Discussion Topic *(Approximate time: 10 minutes)*

Ask for volunteers to share their responses, and allow for discussion.

"At My Facility..."

Think about your clinical setting and write your answers to the following questions in the space provided. At your facility:

- Are hands washed before and after each clinical procedure?

- Do staff routinely wash their hands after removing gloves?

- Is a common basin used for handwashing?

- Is running water available for handwashing? If not, is an acceptable alternative procedure available and used?

- Is soap used for handwashing?

- Is a common towel used to dry hands after washing?

- Is the most appropriate type of glove used for various procedures (e.g., surgical gloves for surgery; examination gloves, if available, for IUD insertion; and utility gloves for cleaning used instruments and other items)?

- Are utility gloves used for handling medical and hazardous chemical waste and for housekeeping tasks?

- Are efforts made to monitor and, if necessary, improve handwashing compliance?

Do your responses to these questions reflect an understanding or performance of appropriate infection prevention practices at your facility? If, based on your responses, you become aware of some problems or issues that need to be addressed, list them below:

Summary/Self-Assessment Answers

1. Direct contact is the most common way that infections are transmitted. Doctors can easily pass microorganisms from one client to another if they do not wash their hands between examining each client. Doctors are also at risk of infections when they examine clients without wearing gloves because this exposes them to direct contact with the client's blood and other body fluids.
2. Gloves should be worn whenever possible. When gloves are worn, hands should be washed after removing the gloves, since small holes in the gloves can expose the doctors to infections.

Optional Activity: Discussion Topic *(Approximate time: 10 minutes)*

Read aloud the case study, and facilitate a discussion by asking the participants the questions that appear in the Participant's Handbook.

Answers to true/false questions:

3. F
4. T
5. T
6. T
7. F
8. T
9. T

Summary/Self-Assessment

Answers are provided at the end of this assessment.

Read the following case study, which appeared at the beginning of this module, and answer the questions below:

There is often no running water in the postoperative ward of the local maternity hospital. When running water is not available, the doctors generally do not wash their hands before and after examining each client. Examination gloves are also not always available. When they are available, the doctors wear them while examining the clients; however, they do not wash their hands after taking off the gloves. When examination gloves are not available, the doctors examine the clients without wearing gloves.

1. Who is at risk of infections in this situation? Why?

2. What should be done differently to reduce the risk?

Decide whether each of the following statements is T (true) or F (false). Write your response for each statement in the space provided.

3. ____ Handwashing with plain soap and water removes transient microorganisms and soil and kills or inhibits the growth of resident microorganisms. (page 3.3)

4. ____ Keeping bar soap on a rack that allows for drainage can limit the growth of microorganisms. (page 3.5)

5. ____ Gloves provide a barrier against potentially infectious microorganisms that can be found in blood, other body fluids, and medical waste. (page 3.10)

6. ____ A separate pair of gloves must be used for each client. (page 3.10)

7. ____ An alcohol handrub kills or inhibits the growth of transient and resident microorganisms and removes soil. (page 3.3)

8. ____ Hands should be washed after removing gloves, because the gloves could contain invisible holes or tears, which could cause the hands to become contaminated. (page 3.2)

9. ____ Housekeeping staff should wear utility gloves when cleaning operating theaters and procedure rooms. (page 3.10)

10. F
11. T
12. T

Answer to multiple-choice question:

13. a, b, c, d

10. ____ Single-use examination gloves are not acceptable for use during IUD insertion. (page 3.10)

11. ____ Handwashing is the most important procedure for reducing the risk of infections in health care settings. (page 3.2)

12. ____ For most health care activities, handwashing with plain soap and water for 10–15 seconds is adequate. (page 3.3)

The following is a multiple-choice question. More than one option may be correct. Please circle the correct response(s).

13. Hands should be washed: (page 3.2)

    a. Before examining a client
    b. Before putting on gloves for a pelvic examination or IUD insertion
    c. After removing gloves
    d. Immediately after arriving at work

Answers: 1. Direct contact is the most common way that infections are transmitted. Doctors can easily pass microorganisms from one client to another if they do not wash their hands between examining each client. Doctors are also at risk of infections when they examine clients without wearing gloves because this exposes them to direct contact with the client's blood and other body fluids; 2. Gloves should be worn whenever possible. When gloves are worn, hands should be washed after removing the gloves, since small holes in the gloves can expose the doctors to infections; 3. F; 4. T; 5. T; 6. T; 7. F; 8. T; 9. T; 10. F; 11. T; 12. T; 13. a, b, c, d

Answers to Exercise 3-2: Appropriate Use of Gloves in Service Delivery

Task/Procedure	Are Gloves Needed? (Yes/No)	Preferred Type of Glove (Surgical, Examination, Utility)	Alternate Type of Glove if the Preferred Type Is Not Available
Taking blood pressure	No		
Drawing blood	Yes	Examination	Surgical
Performing a pelvic exam	Yes	Examination	Surgical
Handling medical or hazardous chemical waste	Yes	Utility	Surgical or examination
Performing a vasectomy	Yes	Surgical	No alternative
Giving a Depo-Provera injection	No		
Handling or cleaning used instruments and other items	Yes	Utility	Surgical or examination
Taking someone's temperature	No		
Removing Norplant implants	Yes	Surgical	No alternative
Inserting an IUD	Yes	Examination	Surgical
Performing a minilaparotomy tubal ligation	Yes	Surgical	No alternative
Cleaning spilled blood or other body fluids	Yes	Utility	Surgical or examination
Performing manual vacuum aspiration	Yes	Examination	Surgical

MODULE 4 Antiseptics and Disinfectants

Trainer's Notes for Module 4

This module covers the difference between antiseptics and disinfectants and teaches the participants to use each appropriately.

Audience **The content of this module is geared toward all staff, as well as supervisors, administrators, and personnel involved in making decisions about the purchasing and use of supplies. Most of the content may apply to ancillary staff, depending on the tasks for which they are responsible (e.g., pouring solutions for use in clinical procedures, processing and storage of instruments and other items, housekeeping and cleaning activities). Ancillary staff do not need to learn detailed information about antiseptics and disinfectants, as appears in the charts on pages 4.5–4.9.**

☞ Training Tip

Because only some of the antiseptics and disinfectants covered in this module are likely to be available to the participants, it would be useful to focus on those products during this session. If possible, find out in advance of this session which products are locally available, either in the market, hospital store, or central stores. This will help you narrow the training to those products of interest and use to the participants. Similarly, if you are able to visit the participants' facilities before the training, observe which products are being used and how they are being used, or ask which products have been used in the past.

Training Time

15 minutes to 1½ hours, depending on which training activities are used.

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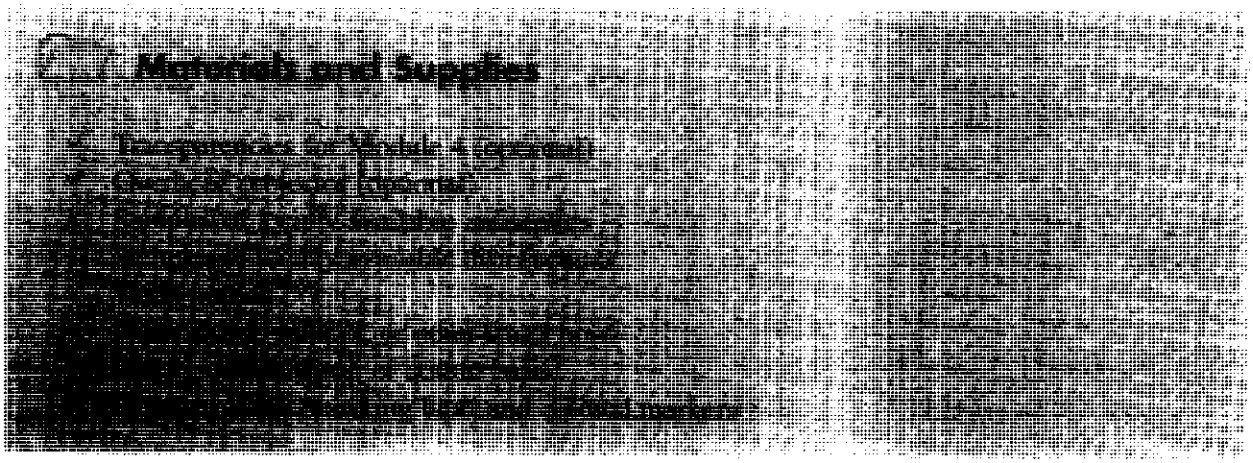
MODULE 4 Antiseptics and Disinfectants



Advance Preparation

- Determine which training activities will be used to present the content of this module. For on-site training, review the activities presented in Appendix E: On-Site Training Activities. Prepare or gather any supplies needed for the activities you will be conducting.
- Research the types of antiseptic and disinfectant solutions available in the participants' locale and obtain them for display during the session.
- Observe the use of antiseptics and disinfectants in the participants' facilities, if possible.
- Create transparencies or flipcharts, as needed.

Introduction

Introduce this module by reviewing the purpose and objectives that appear in the Participant's Handbook. If desired, you may conduct the following optional activity.

Optional Activity: Case Study *(Approximate time: 5 minutes)*

Read aloud the introductory case study, and direct the participants to the instructions that appear in their handbook.

MODULE 4 Antiseptics and Disinfectants

Introduction

Purpose and Objectives

The purpose of this module is to learn the difference between antiseptics and disinfectants and how to use each appropriately. Upon completion of this module, you should be able to:

- Define *antiseptic* and *disinfectant*
- List common uses of antiseptics and disinfectants
- List the most common and locally available antiseptic and disinfectant solutions
- Identify ways to protect antiseptics and disinfectants from contamination

Read the following case study, and try to keep it in mind as you learn the content of this module. See if you can determine whether the situation presents a risk of infection transmission and, if so, what should be done differently to reduce the risk. Questions about the case study appear in the Summary/Self-Assessment at the end of this module.

At a nearby facility, used surgical instruments are processed by placing them in a metal basin filled with an antiseptic solution. They are left in the solution until they are used in another procedure.

Directions for Independent Study

If you are preparing for this module independently, you should:

- Study this module.
- Find out which antiseptics and disinfectants are available locally and which are used at your facility.
- Complete Exercise 4-1: Case Studies.
- Answer the "At My Facility..." questions for this module.
- Answer the Summary/Self-Assessment questions at the end of this module.
- Write down any questions you have about this module for later discussion with the trainer.

Definitions and Common Uses

Health care workers are often confused about the differences between antiseptics and disinfectants and often use these solutions inappropriately. Review the main difference between antiseptics and disinfectants—antiseptics are for use on people, and disinfectants are for use on inanimate objects, such as instruments and surfaces. Review the two types of disinfectants (high-level and low-level), their different purposes, and the different situations in which each should be used. If desired, you may conduct the following optional activity.

Optional Activity: Discussion Topic *(Approximate time: 15 minutes)*

Ask the participants to list the various uses of antiseptics and disinfectants, and record their responses on a flipchart. Add any uses that the participants omitted, if necessary. Discuss any misconceptions the participants may have about antiseptics. Then ask them to explain the difference between high-level and low-level disinfectants, and discuss any misconceptions they may have about disinfectants.

Definitions and Common Uses

Definition

Antiseptic: a chemical agent used on the skin and mucous membranes to remove or kill microorganisms without causing damage or irritation to the skin and mucous membranes. An antiseptic may also prevent the growth and development of microorganisms. Antiseptics are **not** meant to be used on inanimate objects, such as instruments and surfaces.

Antiseptics are used for:

- Surgical handscrub
- Skin, cervical, and vaginal preparation before a clinical procedure
- Handwashing in high-risk situations, such as before invasive procedures (e.g., insertion of central venous catheters or chest tubes, angiography, or spinal tap) or before contact with clients at high risk of infections (e.g., newborns or immunosuppressed clients). *Note:* No studies have proven that routine handwashing with an antiseptic reduces the risk of infections any more than handwashing with plain soap.

Remember: Antiseptics are used to remove and kill microorganisms on the skin or mucous membranes without damaging those tissues. They usually do not have the same killing power as chemicals used for disinfection. Therefore, antiseptic solutions should **never** be used to:

- Disinfect inanimate objects, such as instruments and reusable gloves
- Clean surfaces, such as floors or countertops

Instruments and items such as pickups (lifters, cheatle forceps), scissors, scalpel blades, and suture needles should **never** be left soaking in an antiseptic solution; they should always be stored dry. In addition to the fact that antiseptic solutions are made for killing microorganisms on the skin and mucous membranes, and not on objects, microorganisms can live and multiply in antiseptic solutions and contaminate the instruments and other items, leading to infections.

Definition

Disinfectant: **a chemical agent used to kill microorganisms on inanimate objects, such as instruments and surfaces. Disinfectants are not meant to be used on the skin or mucous membranes.**

There are two types of disinfectants:

1. ***High-level disinfectants***
   - Kill bacteria, viruses, and fungi and some, but not necessarily all, bacterial endospores. Some high-level disinfectants are also chemical sterilants and, given sufficient time, will destroy bacterial endospores. (Bacterial endospores cause such diseases as tetanus and gas gangrene. These microorganisms are difficult to kill because they have a protective casing or coating.)
   - Are used for processing instruments and other items.

2. ***Low-level disinfectants***
   - Kill most bacteria and some viruses and fungi, but do not kill tuberculosis-causing microorganisms and bacterial endospores.
   - Are used for cleaning surfaces, such as floors and countertops. They should **not** be used for processing instruments and other items.

Remember: Disinfectants are harsh chemicals that can damage tissues. Because of the potential for tissue damage, disinfectants should never be used on the skin or mucous membranes.

Instruments and items such as pickups (lifters, cheatle forceps), scissors, scalpel blades, and suture needles should not be left soaking indefinitely or stored in a disinfectant solution; if they are high-level disinfected or sterilized, they should soak only for the amount of time specified and then be removed from the disinfectant solution, rinsed, and stored dry. (High-level disinfection and sterilization are covered in detail in Module 11: High-Level Disinfection and Storage and Module 10: Sterilization and Storage, respectively.) Microorganisms can live and multiply in disinfectant solutions, which can contaminate the instruments and other items, leading to infections.

Common Antiseptics and Disinfectants

The content on common antiseptics and disinfectants that appears in the Participant's Handbook is provided for reference use by the participants. **At the beginning of this session, explain to the participants that they are not expected to memorize all of this information.**

Ask the participants which antiseptics and disinfectants are locally available and used at their facilities. Note their responses on a flipchart. Then review the information on the appropriate antiseptics and disinfectants. If desired, you may conduct the following optional activity.

Optional Activity: Discussion Topic *(Approximate time: 15–30 minutes)*

Purchase several of the locally available antiseptics and disinfectants and pass them out to the participants. Ask the participants the following questions about the product they are holding:

- What is the active ingredient in this product?
- What should this product be used for? What should this product **not** be used for?
- What are the advantages and disadvantages of this product?

During the course of this session, highlight the following important points (as appropriate):

Antiseptics

- Chlorhexidine (with or without cetrimide) and iodophor solutions are the preferred antiseptics for use in health care settings. While products containing chlorhexidine are ideal for surgical handscrub and skin preparation in general, they may not be the best antiseptic to use in the genital area because of the small potential for irritation. Iodophors are a better choice for use in the genital area; however, if an iodophor is not available, a product containing chlorhexidine is the best alternative.
- Hexachlorophene and iodine solutions are **not** recommended for use in routine surgical handscrub or for use on mucous membranes.
- Benzalkonium chloride (BZK) and mercury laurel are disinfectants and should **not** be used as antiseptics. (Compounds containing mercury should never be used.)

Disinfectants

- In most low-resource settings, chlorine and glutaraldehyde are the only available solutions that are suitable for high-level disinfection (HLD); glutaraldehyde may also be used for sterilization.
- Low-level disinfectants are suitable for housekeeping, but tend to be more expensive and less readily available than chlorine/detergent solutions.
- Hydrogen peroxide, formaldehyde, alcohol, and iodophors should **not** be used for HLD.

Training Tip

Be prepared to answer questions or explain more about each of the common antiseptics and disinfectants, especially if the participants are not familiar with infection prevention practices or routine use of antiseptics or disinfectants.

Common Antiseptics and Disinfectants

Antiseptics and disinfectants vary from one country to another, and a wide variety of products are commercially available throughout the world. This handbook discusses the most common types of antiseptics and disinfectants and provides the trade names of the most commonly available commercial products. In general, these antiseptics and disinfectants have been studied the most extensively and, thus, their effectiveness is known.

You may be using or have access to different commercial products than the ones discussed in this handbook, and they may contain some of the same types of antiseptics or disinfectants as those listed here. It is difficult to provide guidance on all products. If possible, use the antiseptics and disinfectants discussed in this handbook, since others have probably not been studied well and their effectiveness may not be known.

In some cases, the labeling of commercial products may be confusing or may contradict what is presented in this handbook. Again, the information presented here reflects, to the greatest extent possible, the most up-to-date scientific studies on antiseptics and disinfectants.

Information on the most common antiseptics and disinfectants appears on the next few pages. *This content is provided for reference—you are not expected to memorize all of this information.* It is provided to guide you in how to properly use the products that are currently available at your facility, how to change your use of the products that are available to you, and how to use any new products that become available.

Common Antiseptics

1. Alcohol (60–90% ethyl or isopropyl)

Antimicrobial spectrum	Effective against a broad range of microorganisms
Advantages	• Kills microorganisms most rapidly • Most effective in reducing microorganisms • Effectiveness is only moderately reduced by blood or other organic material
Disadvantages	• Has a drying effect on skin • Cannot be used on mucous membranes
Comments	• Cannot be used when skin is dirty; wash the area before applying • Must dry completely to be effective • The 60–70% strength is most effective because: – Alcohol must be diluted for optimal killing of microorganisms – It is less drying to skin – It is less expensive

2. Chlorhexidine gluconate (e.g., Hibitane, Hibiclens, Hibiscrub)/chlorhexidine gluconate with cetrimide (e.g., Savlon)

Antimicrobial spectrum	Effective against a broad range of microorganisms, but has a minimal effect on tuberculosis and fungi
Advantages	• Has a good, persistent effect; remains effective for at least 6 hours after being applied • Effectiveness is not reduced by blood or other organic material
Disadvantages	• On rare occasions, products containing chlorhexidine have been reported to cause irritation, especially when used in the genital area • Effectiveness can be reduced by hard water, hand creams, and natural soaps
Comments	• Recommended antiseptic for surgical handscrub and skin preparation • Preparations without cetrimide are preferable to those with cetrimide • While products containing chlorhexidine are ideal for surgical handscrub and skin preparation in general, they may not be the best antiseptics to use in the genital area, vagina, and cervix because of the small potential for irritating these areas. Iodophors are a better choice for use in these areas. However, if an iodophor is not available, a product containing chlorhexidine is the best alternative. • *Caution:* The concentration of chlorhexidine in products with the name *Savlon* may vary from one country to another. Savlon products containing at least 4% chlorhexidine are appropriate for use as antiseptics; Savlon products containing less than 4% chlorhexidine in an alcohol base are also adequate, but should not be used on mucous membranes.

3. Hexachlorophene (e.g., pHisoHex)

Antimicrobial spectrum	Poor effectiveness against most microorganisms
Advantages	• Has a good, persistent effect with repeated use; remains effective for at least 6 hours after being applied • Effectiveness is not reduced by blood or other organic material
Disadvantages	• Potentially toxic to the nervous system • Occasional use is not effective in reducing the number of microorganisms on hands • If use of hexachlorophene is discontinued after long-term use, rebound increase in growth of bacteria will occur (bacteria whose growth was being inhibited by its use will grow and multiply), causing large-scale contamination
Comments	• Contraindicated for routine use on irritated or broken skin or mucous membranes • Not recommended for use in surgical handscrub or skin preparation due to its limited capacity to kill microorganisms

4. Iodine, including tincture of iodine (iodine and alcohol)

Antimicrobial spectrum	Effective against a broad range of microorganisms
Advantages	Fast-acting
Disadvantages	• Can cause skin irritation • Effectiveness is markedly reduced by blood or other organic material
Comments	• Too irritating for routine use in surgical handscrub or for use on mucous membranes • Because of the potential to cause skin irritation, when used for preprocedure skin preparation, iodine must be allowed to dry and then removed from the skin with alcohol • *Note:* If you receive any antiseptic solution from your facility's pharmacy or central supply that is labeled simply "iodine," ask the pharmacist or person in charge of supplies what the solution contains. For example, if you receive a brown liquid in a bottle, put a small amount in your hand and rub it. If it seems more sudsy than usual, it is an iodophor, not iodine.

5. *Iodophors (solutions such as povidone iodine [e.g., Betadine] that contain iodine in a complex form, making them relatively nonirritating and nontoxic)*

Antimicrobial spectrum	Effective against a broad range of microorganisms
Advantages	• Less irritating to the skin than iodine • Can be used on mucous membranes
Disadvantages	Effectiveness is moderately reduced by blood or other organic material
Comments	• Recommended antiseptic for surgical handscrub and client preparation • Best antiseptic for use in the genital area, vagina, and cervix • Effective 1–2 minutes after application; for optimal effectiveness, wait several minutes after application • Most preparations should be used full strength; do not dilute • Distinctly different from iodine. Iodophors are sudsy; pure iodine is not. • *Note:* If you receive any antiseptic solution from your facility's pharmacy or central supply that is labeled simply "iodine" or "iodophor," ask the pharmacist or person in charge of supplies what the solution contains. For example, if you receive a brown liquid in a bottle, put a small amount in your hand and rub it. If it seems more sudsy than usual, it is an iodophor, not iodine.

6. *Para-chloro-meta-xylenol (PCMX, chloroxylenol) (e.g., Dettol)*

Antimicrobial spectrum	Fairly effective against most microorganisms
Advantages	• Has a persistent effect over several hours • Activity is only minimally reduced by blood or other organic material
Disadvantages	Less effective than chlorhexidine and iodophors
Comments	• ***Not* recommended for routine use** • PCMX is available in both antiseptic and disinfectant preparations. *Antiseptic* PCMX preparations containing alcohol should **not** be used on mucous membranes. *Disinfectant* preparations containing PCMX should **not** be used as antiseptics.

Antiseptics Appropriate for Use in Clinical Procedures

Antiseptic	Use		
	Surgical Handscrub	**Preprocedure Skin Preparation**	**Mucous Membranes, Such as the Vagina and Cervix**
Alcohol	Yes	Yes	No
Chlorhexidine gluconate with or without cetrimide	Yes	Yes	Yes. However, products containing chlorhexidine may not be the best antiseptics to use in the genital area because of the small potential for irritation. If an iodophor is not available, a product containing chlorhexidine is the best alternative.
Hexachlorophene	No	No	No
Iodine, including tincture of iodine (iodine and alcohol)	No	Yes	No
Iodophors	Yes	Yes	Yes
Para-chloro-*meta*-xylenol (PCMX, chloroxylenol)	Yes, but not recommended for routine use	Yes, but not recommended for routine use	Yes. *Caution:* PCMX preparations containing alcohol should *not* be used on mucous membranes.

Avoid use of the following:

- Hydrogen peroxide (0.3%) is available in antiseptic preparations to prevent infections due to minor cuts, burns, and abrasions. These preparations are **not** appropriate for use in surgical handscrub and client skin preparation.
- Products containing quaternary ammonium compounds, such as benzalkonium chloride (e.g., Zephiran), are disinfectants and should **not** be used as antiseptics. These products are easily contaminated by common bacteria, easily inactivated by cotton gauze, and incompatible with soap.
- Compounds containing mercury (such as mercury laurel) should **not** be used because they are highly toxic, cause blisters, and cause central nervous system disturbances (such as numbness, speech impairment, and deafness) or death when inhaled. They can also be absorbed through the skin and can cause birth defects in a pregnant woman who is exposed to small doses.

Common High-Level Disinfectants

The two chemicals most commonly available in most low-resource settings that are suitable for high-level disinfection (HLD) of instruments and other items are chlorine and glutaraldehyde. (HLD is covered in detail in Module 11: High-Level Disinfection and Storage.) *Note:* Glutaraldehyde may also be used as a chemical sterilant.

1. Chlorine

Antimicrobial spectrum	Effective against a broad range of microorganisms, including tuberculosis-causing microorganisms. Does not necessarily kill all bacterial endospores.
Advantages	• Fast-acting • Least expensive effective disinfectant
Disadvantages	• Can be corrosive to metals with prolonged contact (more than 20 minutes) • Can be irritating to the skin, eyes, and respiratory tract
Comments	• Available in liquid (sodium hypochlorite), powder (calcium hypochlorite), and tablet (sodium dichloroisocyanurate) form • Can be used for decontamination (by soaking for 10 minutes) and HLD (by soaking for 20 minutes) of instruments and other items (but **not** for use on laparoscopic equipment). Can also be used for disinfection of surfaces. • Leaves a residue, so instruments and other items must be rinsed thoroughly with boiled water after HLD • A new solution should be prepared daily (or sooner, if it becomes heavily contaminated), since potency is lost over time and after exposure to light

2. Glutaraldehyde (e.g., Cidex)

Antimicrobial spectrum	Effective against a broad range of microorganisms, including tuberculosis-causing microorganisms. Soaking for 10 hours can kill bacterial endospores.
Advantages	Not corrosive to instruments and other items when used as directed
Disadvantages	Irritating to the skin, eyes, and respiratory tract. When handling glutaraldehyde, wear gloves, prepare in a well-ventilated space, and limit exposure to the chemical.
Comments	• Used most commonly for processing medical equipment, such as laparoscopes, which cannot be heat-sterilized • Can be used for HLD (by soaking for 20 minutes) and sterilization (by soaking for 10 hours) of instruments and other items. *Note:* These times apply to use of Cidex only; time for sterilization with other products may vary, so follow the manufacturer's instructions. • Leaves a residue, so instruments and other items must be rinsed thoroughly with boiled water after HLD and with sterile water after sterilization • A new solution should be prepared every 14 days (or sooner, if it becomes cloudy); the time may vary depending on the product, so follow the manufacturer's instructions • Preparations vary, so follow the manufacturer's instructions

Do *not* use the following solutions for high-level disinfection (HLD):

1. Hydrogen peroxide (6%)

- Is both an antiseptic and a disinfectant.
- The commonly available 3% solutions should **not** be used for HLD, although they are suitable for disinfecting surfaces. The solution suitable for HLD usually must be prepared by diluting more-concentrated commercially available hydrogen peroxide solutions.
- May cause corrosion, which may damage laparoscopes and metal, rubber, and plastic items.
- Rapidly loses effectiveness when exposed to heat and light, requiring careful storage. For this reason, the World Health Organization recommends that hydrogen peroxide **not** be used in tropical areas or warm climates.
- Its use for HLD has not been as well studied as other disinfectants, making this the least appropriate choice.

2. Formaldehyde

Is potentially cancer-causing and extremely irritating to the skin, eyes, and respiratory tract. Therefore, routine use of formaldehyde for processing instruments and other items or for disinfection of environmental surfaces is **not** recommended.

3. Alcohol (60–90% ethyl or isopropyl)

- Is both an antiseptic and a disinfectant.
- Although effective against a wide range of microorganisms, does not kill all viruses and, therefore, should **not** be used for HLD.
- Can be used to disinfect thermometers and stethoscopes, although thermometers should **not** remain soaking in an alcohol solution, since the solution can become contaminated.

4. Iodophors

- Because of their low levels of iodine (which allow them to become contaminated with microorganisms), are **not** recommended for use as disinfectants.
- The most commonly available iodophors are antiseptic preparations, which are **not** suitable for disinfection.

5. Sporicidin

- Is a glutaraldehyde-based product that also contains phenol.
- In the past, it was available in many parts of the world. However, testing revealed it to be ineffective for chemical high-level disinfection/sterilization, and it has been removed from the market in many countries. Therefore, it should **not** be used for high-level disinfection or sterilization, even if it is still locally available.

Common Low-Level Disinfectants

Low-level disinfectants—such as phenols (carbolic acid—e.g., Phenol, Lysol) and quaternary ammonium compounds (such as benzalkonium chloride—e.g., Zephiran)—are suitable for use in disinfecting walls, floors, and furnishings. However, most products have few (if any) advantages over using chlorine/detergent solutions, which are less expensive and often more readily available. (Preparing a chlorine solution is covered on pages 8.3 and 8.4.)

Remember: Instruments and items such as pickups (lifters, cheatle forceps), scissors, scalpel blades, and suture needles should not be left soaking indefinitely or stored in a disinfectant solution; if they are high-level disinfected or sterilized, they should soak only for the amount of time specified and then be removed from the disinfectant solution, rinsed, and stored dry. (High-level disinfection and sterilization are covered in detail in Module 11: High-Level Disinfection and Storage and Module 10: Sterilization and Storage, respectively.) Microorganisms can live and multiply in disinfectant solutions, which can contaminate the instruments and other items, leading to infections.

Preventing Contamination of Antiseptics and Disinfectants

Review the material in the Participant's Handbook, and conduct the following training activity. If desired, you may also conduct the following optional activity.

Training Activity: Demonstration *(Approximate time: 10 minutes)*

Demonstrate some of the ways to prevent contamination of antiseptics and disinfectants listed in the Participant's Handbook. For example:

- Demonstrate how to pour a solution from its original, large container into a smaller bottle for daily use without contaminating the stock solution.
- Demonstrate how to pour an antiseptic solution into an iodine bowl, gallipot, or other small bowl for use during a clinical procedure.

Optional Activity: Discussion Topic *(Approximate time: 10–15 minutes)*

Facilitate a discussion by asking the participants how antiseptics and disinfectants are received and stored at their facilities. Record their responses on a flipchart. After reviewing the information in the Participant's Handbook on ways to prevent solutions from becoming contaminated, ask the participants to identify the practices used at their facilities that would increase the chances of contamination. For each incorrect practice, guide the group in discussing what could be done to change the practice and thereby minimize the risk of contaminating the solutions. Record their comments on a flipchart and save it for use in developing implementation plans in Module 14: Implementation Plans and Closure.

Highlight the fact that because antiseptics and disinfectants can become contaminated if handled improperly, these solutions must be kept from coming in contact with health care workers' skin or with instruments and other items—including gauze, cotton wool, cotton balls, soiled countertops, and work areas—that are not sterile or high-level disinfected. Storing gauze and cotton in solutions is particularly risky, since they provide a good medium for microorganisms to grow. Solutions may also be more susceptible to contamination and thus less effective when exposed to heat and direct light.

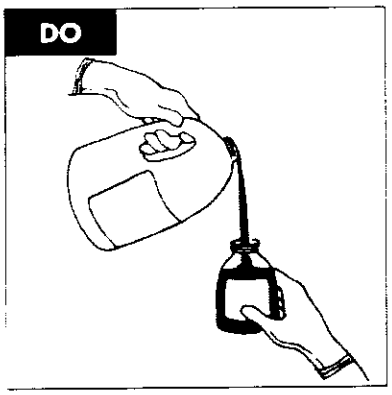
Preventing Contamination of Antiseptics and Disinfectants

Even though antiseptics and disinfectants are effective in killing microorganisms, their abilities are limited, and they can easily become contaminated. Using contaminated antiseptics and disinfectants can cause infections in clients if used for handwashing, client skin preparation, or processing instruments and other items. Contamination of the following commonly used products has been reported: chlorhexidine gluconate with or without cetrimide, hexachlorophene, povidone iodine, phenols, and benzalkonium chloride and other quaternary ammonium compounds.

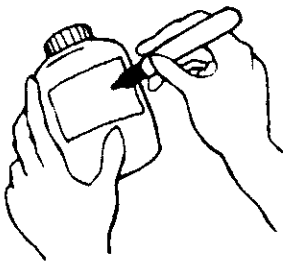
Antiseptics and disinfectants can become contaminated when:

- Dilution is necessary, and the water used to dilute the solution is contaminated
- Containers in which antiseptics and disinfectants are placed are contaminated
- Microorganisms from the service provider's skin or a contaminated instrument or other item come in contact with the solutions during use, such as when removing cotton balls from a solution for use in skin preparation
- The area in which solutions are prepared or used is not clean

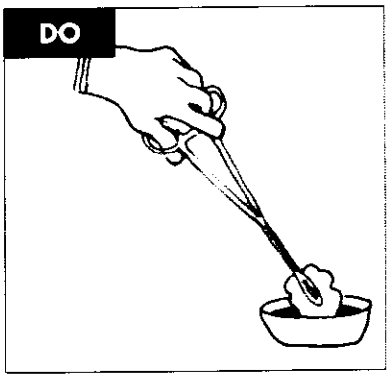
To Prevent Contamination

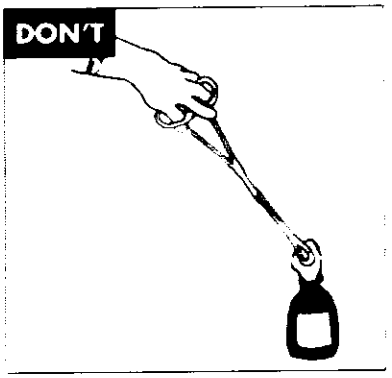


Pour solutions into smaller containers for use during service delivery to avoid contaminating the stock containers. Because solutions in these smaller containers are opened, closed, and handled repeatedly, they are at increased risk of contamination. After one week, clean reusable containers with soap and water, and air-dry before refilling.



Label reusable containers with the date each time they are washed, dried, and refilled.

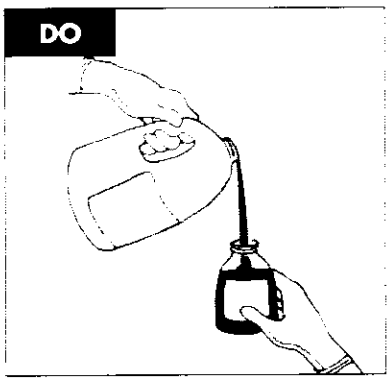


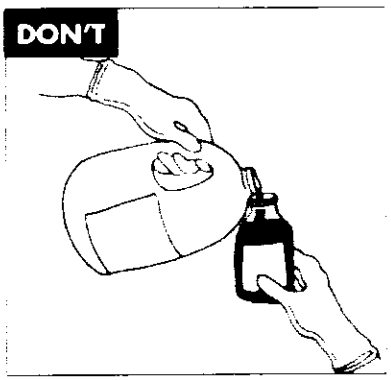


Pour the amount of antiseptic needed for one client into a small bowl or gallipot before starting the procedure. Discard any remaining solution at the end of the procedure.

continued

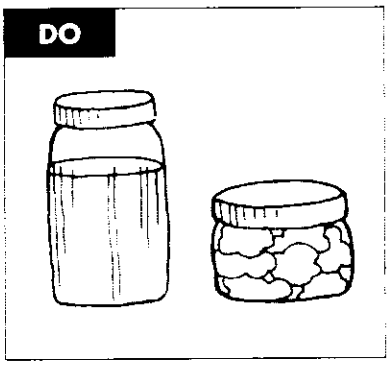
To Prevent Contamination continued

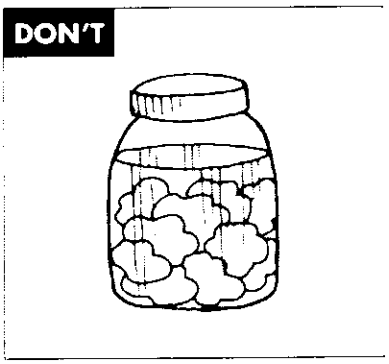




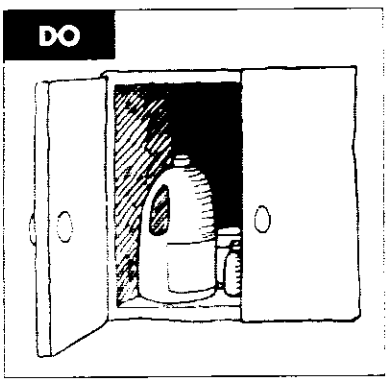
Pour solutions out of the container without touching the rim or the solution itself with your hands, a cotton swab, or gauze; these can contaminate the entire container of solution.

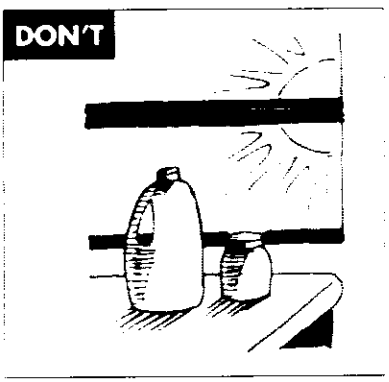
Keep bottles secure by carefully closing their caps or tops. When removing the bottle cap or top, be careful where you place it. If it becomes contaminated, the entire bottle will become contaminated once the cap or top is replaced.





Store gauze, cotton wool, and cotton balls separately from antiseptic solutions. Storing them in antiseptic solutions increases the likelihood of contaminating the solutions, since gauze and cotton provide a good medium for microorganisms to grow. Contamination can occur when microorganisms from the service provider's hands or a contaminated instrument or other item come in contact with the gauze/cotton and antiseptic.





Store antiseptics and disinfectants in a cool, dark area. Avoid storing them in direct light or excessive heat, as this may reduce their strength.

Exercise 4-1: Case Studies

Use the following cases (or use case histories of your own) to help the participants think through the appropriate uses of antiseptics and disinfectants. Divide the participants into small groups and assign two cases to each group. Allow 10 minutes for completion. Bring the groups together and review each case, asking for a volunteer from each group to present the group's work. Allow for discussion; give feedback and validate or correct the participants' responses, as necessary.

Training Options

- After dividing the participants into small groups, ask each group to complete all of the cases. When the groups are brought together, ask for a volunteer from each group to report the group's responses to only one of the cases.
- Read the cases aloud, and ask for volunteers to respond to the questions. (This works well with low-literate/illiterate staff or when time is short.)
- Ask the participants to write their responses in their handbooks, and ask for volunteers to read them aloud. Alternatively, ask the participants to switch books with another participant and correct the other's responses.

Possible responses:

Case Study 1

a. No. Alcohol is not appropriate for high-level disinfection, because it does not inactivate all viruses.

b. In most low-resource settings, chlorine or glutaraldehyde are the only chemicals available for high-level disinfection.

Case Study 2

a. Iodophors have a good broad-spectrum killing power with long-lasting effect on the skin. They are also good for client preparation. Hexachlorophene has poor effectiveness against most microorganisms and is not recommended for routine use.

b. No. Iodophors are antiseptics and are therefore not appropriate for use in disinfecting inanimate objects.

Case Study 3

a. No. Iodine is very irritating to mucous membranes and should not be used in the vagina or on the cervix.

b. An iodophor would be the best choice, followed by a product containing chlorhexidine. Remember that there is a small potential for irritation when products containing chlorhexidine are used in the genital area or vagina or on the cervix.

Exercise 4-1: Case Studies

Read the following case studies and answer the questions below. Possible responses appear on page 4.17.

Case Study 1

Nurse Otto works in an outpatient surgical clinic. This morning, she finds that she has run out of the disinfectant she usually uses to high-level disinfect the instruments and other items. Since the clinic will open in less than an hour, she puts the instruments and other items to be used that day in a metal container and pours alcohol over them for high-level disinfection.

a. Is this an appropriate use of alcohol? Why?

b. If alcohol is not appropriate, which solution(s) do you think would be more appropriate?

Case Study 2

Dr. Soto, a new surgeon at your clinic, has requested that the staff use an iodophor (Betadine) for surgical handscrub, rather than the hexachlorophene product that is currently being used. One of the other doctors agrees and adds that an iodophor could also be used for processing instruments.

a. Why do you think Dr. Soto is encouraging the use of an iodophor for surgical handscrub?

b. Would an iodophor be appropriate for processing instruments and other items? Why?

Case Study 3

Before inserting an IUD, Midwife Ames uses iodine to prepare the vagina and cervix.

a. Is this an appropriate solution to use for a vaginal/cervical preparation? Why?

b. If iodine is not appropriate, which solution(s) do you think would be more appropriate?

continued

Case Study 4

a. No. Benzalkonium chloride, a quaternary ammonium, is a disinfectant and thus should not be used as an antiseptic. In addition, it becomes easily contaminated, is slow-acting in killing microorganisms, and is inactivated by cotton.
b. Appropriate options would be povidone iodine, chlorhexidine, or alcohol.
c. No. Cotton balls should not be left soaking in an antiseptic solution, since repeated dipping of forceps or fingers into the container to pick up the cotton balls will contaminate both the solution and the remaining cotton balls. Store cotton balls and antiseptic solutions separately.

Exercise 4-1: Case Studies continued

Case Study 4

In the local clinic, cotton balls are kept in a small, covered basin filled with benzalkonium chloride (Zephiran). Before giving an injection, Dr. Shah takes out a cotton ball with her hand and uses it to wipe the client's skin.

a. Is this an appropriate solution for injection-site skin preparation? Why?

b. If this solution is not appropriate, which solution(s) do you think would be more appropriate?

c. Is it appropriate to keep cotton balls soaking in an antiseptic solution? Why?

Answers to Exercise 4-1: Case Studies

Possible responses:

Case Study 1

a. No. Alcohol is not appropriate for high-level disinfection, because it does not inactivate all viruses.

b. In most low-resource settings, chlorine or glutaraldehyde are the only chemicals available for high-level disinfection.

Case Study 2

a. Iodophors have a good broad-spectrum killing power with long-lasting effect on the skin. They are also good for client preparation. Hexachlorophene has poor effectiveness against most microorganisms and is not recommended for routine use.

b. No. Iodophors are antiseptics and are therefore not appropriate for use in disinfecting inanimate objects.

Case Study 3

a. No. Iodine is very irritating to mucous membranes and should not be used in the vagina or on the cervix.

b. An iodophor would be the best choice, followed by a product containing chlorhexidine. Remember that there is a small potential for irritation when products containing chlorhexidine are used in the genital area or vagina or on the cervix.

Case Study 4

a. No. Benzalkonium chloride, a quaternary ammonium, is a disinfectant and thus should not be used as an antiseptic. In addition, it becomes easily contaminated, is slow-acting in killing microorganisms, and is inactivated by cotton.

b. Appropriate options would be povidone iodine, chlorhexidine, or alcohol.

c. No. Cotton balls should not be left soaking in an antiseptic solution, since repeated dipping of forceps or fingers into the container to pick up the cotton balls will contaminate both the solution and the remaining cotton balls. Store cotton balls and antiseptic solutions separately.

"At My Facility..."

Think about your clinical setting and write your answers to the following questions in the space provided. At your facility:

- Are antiseptic solutions used appropriately (e.g., for client preparation, surgical handscrub, and handwashing in high-risk situations)?

- Are items such as scalpel blades, suture needles, and scissors left soaking in antiseptic or disinfectant solutions for indefinite periods of time?

- Are antiseptics and disinfectants handled in ways that reduce the risk of contaminating stock solutions?

- Are low-level disinfectants used only for cleaning floors and other surfaces (such as countertops and equipment)?

- Does it seem that the most appropriate antiseptic and disinfectant solutions are currently being used at your facility?

- Is there a commitment to avoid using dangerous products, such as formaldehyde and compounds containing mercury?

Do your responses to these questions reflect an understanding or performance of appropriate infection prevention practices at your facility? If, based on your responses, you become aware of some problems or issues that need to be addressed, list them below:

Summary/Self-Assessment Answers

1. No. Antiseptics are for use on the skin and should not be used on inanimate objects. Instruments and other items should always be stored dry after processing and should never be stored soaking in solutions.
2. The instruments should be sterilized or high-level disinfected and then stored dry until use.

Optional Activity: Discussion Topic *(Approximate time: 10 minutes)*

Read aloud the case study, and facilitate a discussion by asking the participants the questions that appear in the Particpant's Handbook.

Answers to true/false questions:

3. T
4. F
5. T
6. T
7. F
8. F
9. T

Summary/Self-Assessment

Answers are provided at the end of this assessment.

Read the following case study, which appeared at the beginning of this module, and answer the questions below:

At a nearby facility, used surgical instruments are processed by placing them in a metal basin filled with an antiseptic solution. They are left in the solution until they are used in another procedure.

1. Is this an appropriate practice to reduce the risk of infections?

2. What should be done differently to reduce the risk?

Decide whether each of the following statements is T (true) or F (false). Write your response for each statement.

3. ____ Chlorine solutions are cheap and effective disinfectants. (page 4.9)

4. ____ Antiseptics are suitable for use when processing instruments and other items. (page 4.2)

5. ____ Microorganisms can live and multiply in both antiseptic and disinfectant solutions. (pages 4.2 and 4.3)

6. ____ Chlorhexidine and iodophors are the preferred antiseptics for use in clinical services. (pages 4.5 and 4.7)

7. ____ Alcohol or antiseptic solutions containing alcohol are ideal for use on mucous membranes such as the vagina and cervix. (page 4.5)

8. ____ Storing scalpel blades, suture needles, and pickups (lifters, cheatle forceps) in a container filled with chlorhexidine gluconate with cetrimide (e.g., Savlon), carbolic acid (e.g., Lysol), or PCMX (e.g., Dettol) is a good way to reduce the risk of infections in health care settings. (pages 4.2 and 4.3)

9. ____ Solutions containing mercury should never be used in health care settings. (page 4.8)

The following are multiple-choice questions. More than one option may be correct. Please circle the correct reponse(s).

10. Antiseptics are used for: (page 4.2)

    a. Processing instruments and other items
    b. Surgical handscrub
    c. Skin and vaginal preparations before clinical procedures
    d. Handwashing before touching newborns or immunocompromised clients

11. Disinfectants are used for: (page 4.3)

    a. Processing instruments and other items
    b. Skin and vaginal preparations before surgical procedures
    c. Cleaning surfaces such as floors and countertops
    d. Handwashing before touching newborns or immunocompromised clients

12. Which of the following are often the only appropriate solutions available for use in processing instruments and other items? (page 4.9)

    a. Glutaraldehyde
    b. Formaldehyde
    c. Alcohol
    d. Chlorine

13. Ways to decrease the likelihood of contaminating an antiseptic solution include: (pages 4.13 and 4.14)

    a. Pouring the amount of solution needed for each procedure into a small container
    b. Storing gauze or cotton wool for client skin preparation in the antiseptic solution for no more than one week
    c. Always pouring the solution out of the container without touching the rim or the solution itself with your hand or with the cotton swab or gauze
    d. Storing the solution in a cool, dark area where it will be protected from direct light and excessive heat

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Answers: 1. No. Antiseptics are for use on the skin and should not be used on inanimate objects. Instruments and other items should always be stored dry after processing and should never be stored soaking in solutions; 2. The instruments should be sterilized or high-level disinfected and then stored dry until use; 3. T; 4. F; 5. T; 6. T; 7. F; 8. F; 9. T; 10. b, c, d; 11. a, c; 12. a, d; 13. a, c, d

MODULE 5 Aseptic Technique

Trainer's Notes for Module 5

This module provides information on how to reduce the risk of transmitting infections during clinical procedures by adhering to aseptic technique, including surgical handscrub, use of barriers such as gloves and surgical attire, proper client preparation, maintaining a sterile field, using good surgical technique, and maintaining a safer environment in the surgical/procedure area.

Audience

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MODULE 5 Aseptic Technique

Materials and Supplies

- ✓ Transparencies for Module 5 (optional)
- ✓ Overhead projector (optional)
- ✓ Television and videocassette recorder (optional)
- ✓ *Infection Prevention for Family Planning Service Programs,* AVSC International/ JHPIEGO video, TDS 1 and 3 (optional)
- ✓ Surgical handscrub supplies (soap/antiseptic, brush/sponge/stick, running water, towels)
- ✓ Samples of locally available alcohols and emollients
- ✓ Containers for storing alcohol handrub solution
- ✓ Surgical attire (surgical gloves, cap, mask, gown or waterproof apron, protective eyewear)
- ✓ Flipchart paper, index cards, masking tape, and colored markers

Advance Preparation

- Determine which training activities will be used to present the content of this module. For on-site training, review the activities presented in Appendix E: On-Site Training Activities. Prepare or gather any supplies needed for the activities you will be conducting.
- Find out what types of alcohol and emollients are available in the participants' locale that can be used to make an alcohol handscrub solution, and get samples, if possible.
- Cue the video to the second part of TDS 1, if used.
- Set up practice areas with gloves.
- Create transparencies or flipcharts, as needed.

Introduction

Introduce this module by reviewing the purpose and objectives that appear in the Participant's Handbook. If desired, you may conduct the following optional activity.

Optional Activity: Case Study *(Approximate time: 5 minutes)*

Read aloud the introductory case study, and direct the participants to the instructions that appear in their handbook.

MODULE 5 Aseptic Technique

Introduction

Purpose and Objectives

All of the infection prevention practices covered in this training course, from handwashing to waste disposal, contribute to reducing the risk of infections in clients, health care workers, and the community. This module covers the principles of aseptic technique—specific practices that can reduce postprocedure infections in clients. Upon completion of this module, you should be able to:

- Explain the general concept of *aseptic technique* for preventing infections during clinical procedures
- Describe the importance of and demonstrate the steps of surgical handscrub
- Describe the options for surgical handscrub and state the criteria for selecting them
- Demonstrate the correct way to put on and remove surgical gloves
- List the situations in which it is necessary to wear surgical attire, and describe how surgical attire protects clients and service providers
- Describe ways to properly prepare a client for clinical procedures
- Explain the importance of establishing and maintaining a sterile field, and describe how to do so
- List ways to perform surgery that minimize the risk of postprocedure infections
- Explain the advantages and disadvantages of using prophylactic antibiotics
- Explain the importance of maintaining a safer environment in the surgical/procedure area

Read the following case study, and try to keep it in mind as you learn the content of this module. See if you can determine whether the situation presents a risk of infection transmission and, if so, what should be done differently to reduce the risk. Questions about the case study appear in the Summary/Self-Assessment at the end of this module.

While putting on gloves before surgery, Dr. Amin lightly brushes the fingertip of one gloved hand against the edge of the counter. Since gloves are always in short supply and he only quickly brushed just one fingertip against the counter, Dr. Amin decides not to change his gloves and proceeds with the surgery.

Directions for Independent Study

If you are preparing for this module independently, you should:

- Study this module.
- Complete Exercise 5-1: Surgical Handscrub Case Studies.
- Complete Exercise 5-2: Matching Exercise.
- Complete Exercise 5-3: Aseptic Technique Case Studies.
- Answer the "At My Facility..." questions for this module.
- Answer the Summary/Self-Assessment questions at the end of this module.
- Write down any questions you have about this module for later discussion with the trainer.

Definition of Aseptic Technique

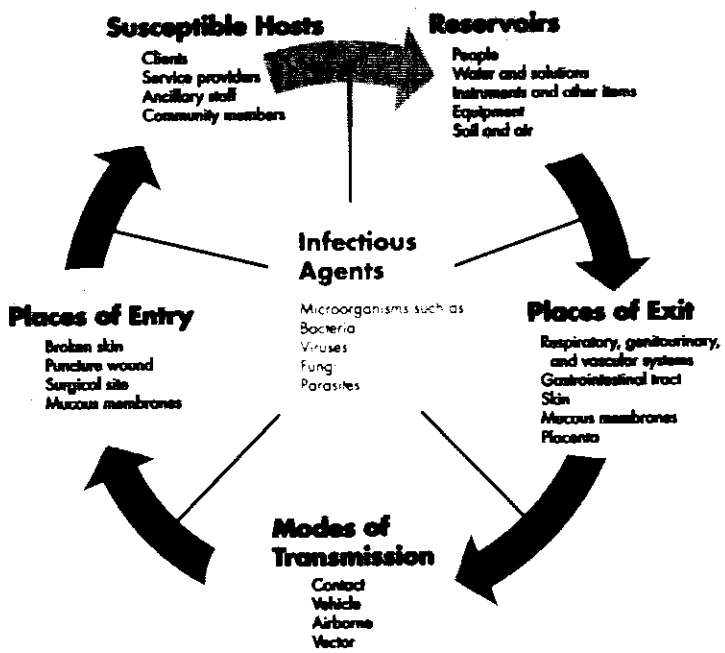
Remind the participants that the most effective way to reduce the transmission of infections is to disrupt the disease-transmission cycle at the "mode of transmission" step. Display a flipchart or transparency showing the disease-transmission cycle, or ask the participants to refer to Figure 5-1 on page 5.2 of their handbook.

Review the definition of aseptic technique and the seven practices that need to be performed to achieve it. Remind the participants that every one of these practices is important in reducing the risk of infections and that they break the disease-transmission cycle at the "mode of transmission" step.

Definition of Aseptic Technique

As discussed in Module 2: Importance and Purpose of Infection Prevention, the most effective way to reduce the transmission of infections is to disrupt the disease-transmission cycle at the "mode of transmission" step.

Figure 5-1. The Disease-Transmission Cycle



Definition

Aseptic technique: practices that help reduce the risk of postprocedure infections in clients by reducing the likelihood that, during clinical procedures, microorganisms will enter areas of the body where they can cause disease. While all infection prevention practices contribute to this effort, aseptic technique refers to those practices performed just before or during a clinical procedure, including:

- Handwashing
- Surgical handscrub
- Using barriers such as gloves and surgical attire
- Properly preparing a client for clinical procedures
- Maintaining a sterile field
- Using good surgical technique
- Maintaining a safer environment in the surgical/procedure area

Handwashing

Review the material in the Participant's Handbook.

Surgical Handscrub

Introduce this topic by stating that the information on antiseptics that was presented in Module 4: Antiseptics and Disinfectants will be applied in this session. Review the steps of surgical handscrub, and conduct the following training activity. If desired, you may also conduct the following optional activity.

Training Activity: Demonstration and Practice *(Approximate time: 10–15 minutes)*

Demonstrate the steps of surgical handscrub, and ask the participants to practice them. Correct any incorrect procedures, if necessary.

Optional Activity: Video Viewing *(Approximate time: 5 minutes)*

Show the second part of TDS 1 from the infection prevention video, which includes a presentation on surgical handscrub. When the segment is over, review the material presented with the participants and allow for questions.

Training Option

The video can be shown either at the beginning of the session to introduce the topic or at the end of the session for review.

During this session, highlight the rationale for the particular steps of surgical handscrub, which appears in the "Remember" box on page 5.5 of the Participant's Handbook.

Explain that ideally, surgical handscrub should be performed before every procedure, but an alcohol handrub may be used instead at certain times. Review the material on alcohol handrub, which appears on page 5.5 of the Participant's Handbook (as well as in Module 3: Handwashing and Use of Gloves). Reinforce the fact that when alcohol is used either as part of surgical handscrub or alone (as a handrub), it should be rubbed into the hands until dry.

Handwashing

Handwashing is one of the most effective ways to reduce the risk of infections. To minimize the risk of postprocedure infections in clients, always wash your hands before and after examining each client and before putting on gloves for clinical procedures. (Handwashing is covered in detail in Module 3: Handwashing and Use of Gloves.)

Surgical Handscrub

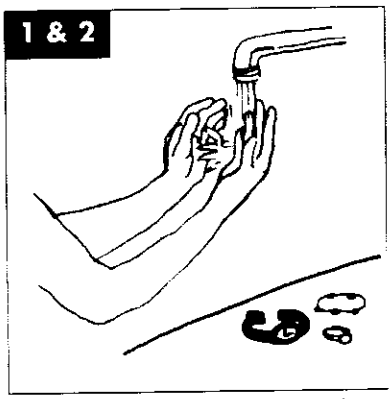
The warm, moist conditions inside surgical gloves provide an ideal environment for the growth of microorganisms. Scrubbing with antiseptics before beginning surgical procedures will help prevent this growth of microorganisms for a period of time and reduce the risk of infections to the client if the gloves develop holes, tears, or nicks during the procedure.

As discussed in Module 4: Antiseptics and Disinfectants, antiseptic agents are used in surgical handscrub because they inhibit the growth and development of microorganisms and are safe for use on the skin. A 3- to 5-minute surgical handscrub with an antiseptic (such as chlorhexidine or an iodophor) is recommended before a surgical procedure.

The steps of surgical handscrub are provided on the next page.

Steps of Surgical Handscrub

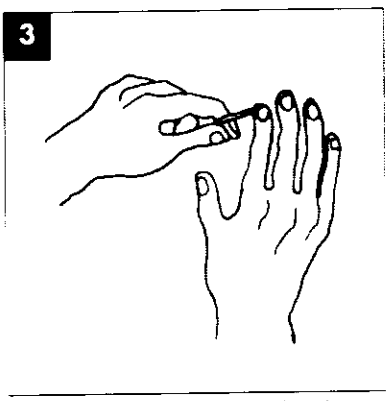
1 & 2



Remove all jewelry on your hands and wrists.

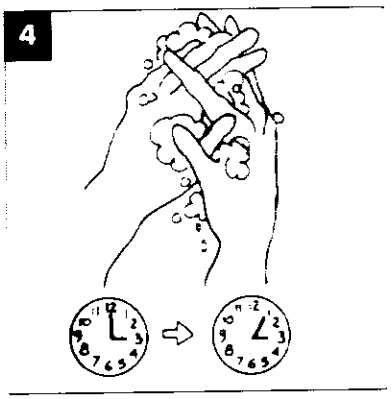
Adjust the water to a warm temperature and wet your hands and forearms thoroughly.

3



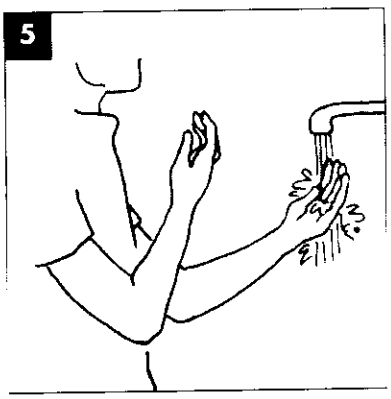
Clean under each fingernail with a stick or brush. (*Note:* Fingernails should be kept short.)

4



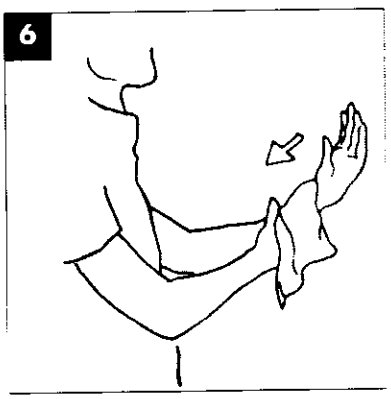
Holding your hands up above the level of your elbow, apply the antiseptic. Using a circular motion, begin at the fingertips of one hand and lather and wash between the fingers, continuing from fingertip to elbow. Repeat this for the second hand and arm. Continue washing for 3–5 minutes.

5



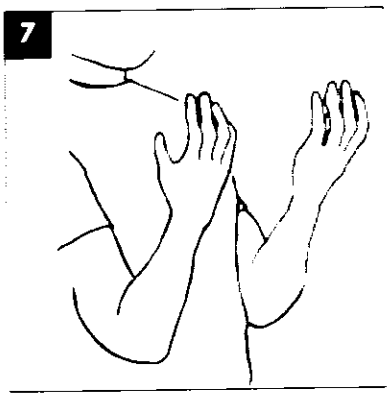
Rinse each arm separately, fingertips first, holding your hands above the level of your elbow.

6



Using a sterile towel, wipe your arm—from fingertips to elbow—dry. Use one side of the towel to dry the first hand and the other side of the towel to dry the second hand.

7



Keep your hands above the level of your waist and do not touch anything.

Note: Recent studies have shown that using a brush to scrub hands during surgical handscrub provides no greater reduction in the number of microorganisms on the hands than scrubbing with antiseptic alone. Surgical handscrub may be performed using either a soft brush or sponge or an antiseptic alone. Avoid using a hard brush, which is not necessary and may irritate the skin.

Remember:

- **Warm water makes antiseptic or soap work more effectively, while very hot water removes more of the protective oils from the skin. Therefore, washing with very hot water should be avoided.**
- **Your hands—more than any other parts of your arms—must be as clean as possible. Therefore, it is important to hold your hands above the level of your elbow to allow the water to flow from your hands (the area of least contamination) to your forearms (the area of most contamination). Otherwise, water may splash onto the unscrubbed portions of your arms and run down over the scrubbed portions, which would contaminate them.**
- **Dry your hands first, and then your forearms, to reduce the possibility of contaminating your hands.**
- **Washing for 3–5 minutes allows adequate time to remove, inhibit, or kill as many microorganisms as possible.**

Alternatives to This Method of Surgical Handscrub

It is best to use an antiseptic for surgical handscrub. However, using soap, followed by an alcohol handrub, is an acceptable alternative to the use of an antiseptic when:

- Staff members are allergic to the available antiseptic solutions
- Antiseptics are not available

To perform surgical handscrub when antiseptics are not available or feasible for use:

- Perform a surgical handscrub with soap and warm, running water in a manner similar to that described on the previous page.
- Apply 3–5 mL of alcohol or an alcohol handrub solution (see below).
- Rub hands together until they are dry.

Because using alcohol alone tends to dry the skin, it is best to use an alcohol handrub solution.

To prepare an alcohol handrub solution, add together:

- 2 mL of glycerine, propylene glycol, or sorbitol, *and*
- 100 mL of 60–90% alcohol

Ideally, surgical handscrub should be performed before every procedure. However, to prevent skin irritation from too-frequent handscrubbing in high-volume settings, use 3–5 mL of an alcohol handrub solution between clients, rubbing your hands together until the alcohol dries. Then scrub every hour or after every four clients (whichever comes first). *Note:* An alcohol handrub does **not** remove soil or organic material such as blood. If gloves are torn or punctured, or if there is blood or other body fluids on the hands after gloves are removed, a surgical handscrub should be performed.

Exercise 5-1: Surgical Handscrub Case Studies

Use the following cases (or use case histories of your own) to help the participants think through the steps and options of surgical handscrub. Divide the participants into small groups and assign two cases to each group. Allow 10 minutes for completion. Bring the groups together and review each case, asking for a volunteer from each group to present the group's work. Allow for discussion; give feedback and validate or correct the participants' responses, as necessary.

Training Options

- After dividing the participants into small groups, ask each group to complete all of the cases. When the groups are brought together, ask for a volunteer from each group to report the group's responses to only one of the cases.
- Read the cases aloud, and ask for volunteers to respond to the questions. (This works well with low-literate/illiterate staff or when time is short.)
- Ask the participants to write their responses in their handbooks, and ask for volunteers to read them aloud. Alternatively, ask the participants to switch books with another participant and correct the other's responses.

Possible responses:

Case Study 1

She may scrub with soap and water, pour 3–5 mL of an alcohol handrub solution onto her hands, and rub her hands together until they are dry.

Case Study 2

She may use 3–5 mL of an alcohol handrub solution between each client, and then scrub every hour or after every four clients (whichever comes first).

Case Study 3

He may scrub with soap and water, pour 3–5 mL of an alcohol handrub solution onto his hands, and rub his hands together until they are dry.

Exercise 5-1: Surgical Handscrub Case Studies

Read the following case studies and answer the questions below. Possible responses appear on the next page.

Case Study 1

Ms. Njeri, a surgical assistant, has been working in the operating theater of a maternity hospital for many years. She enjoys her work and is very good at it. Recently, however, she has become allergic to the only two locally available antiseptics.

What surgical handscrub option does Ms. Njeri have if she is to continue working in the operating theater?

Case Study 2

Nurse Suarez has recently started working at a clinic that provides a variety of contraceptive methods, including vasectomy and tubal ligation. As part of her orientation, for the past two weeks she has been the scrub nurse for all of the surgical procedures. There has been an average of 10 surgical procedures a day, all done in the morning.

To avoid skin irritation from a thorough surgical handscrub between each case, which would increase her risk of infections, what surgical handscrub option is available to Nurse Suarez?

Case Study 3

The clinic where Dr. Singh works has not received the antiseptic solution it ordered from central stores. The clinic has run out of antiseptic and does not have the money to buy the amount of antiseptic needed at the market.

What option for surgical handscrub does Dr. Singh have?

Answers to Exercise 5-1: Surgical Handscrub Case Studies

Possible responses:

Case Study 1

She may scrub with soap and water, pour 3–5 mL of an alcohol handrub solution onto her hands, and rub her hands together until they are dry.

Case Study 2

She may use 3–5 mL of an alcohol handrub solution between each client, and then scrub every hour or after every four clients (whichever comes first).

Case Study 3

He may scrub with soap and water, pour 3–5 mL of an alcohol handrub solution onto his hands, and rub his hands together until they are dry.

Use of Barriers

Explain to the participants that the barriers that will be discussed in this training course are gloves and surgical attire.

Putting On and Removing Surgical Gloves

Review the steps of putting on and removing surgical gloves with the participants, and conduct the following training activity. If desired, you may also conduct the following optional activity.

Training Activity: Demonstration and Practice *(Approximate time: 10 minutes)*

Ask the participants to turn to the steps of putting on and removing surgical gloves, which appear on pages 5.9 and 5.10 of their handbook. Demonstrate putting on gloves while verbalizing the steps, then demonstrate the steps of removing the gloves while verbalizing the steps. Repeat both procedures without verbalizing the steps. Ask for volunteers to demonstrate/practice the procedures, and give feedback.

Training Option

If all of the participants are skilled at gloving, review the steps of putting on and removing gloves, as well as ways that gloves can become contaminated. Ask the participants if they have any questions or concerns about gloving.

Optional Activity: Skills Practice *(Approximate time: 20–30 minutes)*

Divide the participants into pairs, and give each pair a package of gloves. (The gloves do not need to be sterile.) Ask them to turn to the Skills Practice Checklist: Gloving, which appears on pages 5.12 and 5.13 of their handbook. *Instructions for this skills practice appear on page 176.*

During this session, emphasize that sterile or high-level disinfected gloves can become contaminated if they are not put on properly, and that the service provider and others can be exposed to potentially infectious materials if gloves are not removed properly.

Highlight the following points about putting on surgical gloves:

- Pick up the first glove by the cuff, touching only the inside of the cuff (the side that will touch your skin when the glove is put on).
- Touch the second glove only under the fold of the cuff.
- Make adjustments **only** after both gloves are on.
- Always keep gloved hands above the level of the waist.
- If gloves become contaminated, stop what you are doing, step away from the sterile field, remove the contaminated glove, and reglove.

Highlight the "Tips on Removing Surgical Gloves," which appears on page 5.11 of the Participant's Handbook.

Use of Barriers

The appropriate use of barriers helps reduce the risk of postprocedure infections in both clients and service providers by decreasing the likelihood that clients or service providers will be exposed to potentially infectious microorganisms. These barriers include:

- Gloves
- Surgical attire, such as caps, masks, gowns or waterproof aprons, protective eyewear, and sturdy footwear

Putting On and Removing Surgical Gloves

To prevent the spread of infections, sterile or high-level disinfected surgical gloves should be worn during all procedures in which there will be contact with the bloodstream or tissues under the skin (e.g., surgical procedures, insertion of Norplant implants, pelvic examinations for women in labor).

Wearing sterile or high-level disinfected surgical gloves:

- Protects the client from microorganisms on the service provider's hands
- Protects the service provider from infectious microorganisms in the client's blood or other body fluids and on contaminated instruments, other items, and surfaces

Preparation for Putting on Surgical Gloves

Gloves are cuffed to make it easier to put them on without contaminating them. When putting on sterile or high-level disinfected surgical gloves, remember that the first glove should be picked up by the cuff only; the second glove should then be touched only by the other sterile or high-level disinfected surgical glove.

Ways that sterile or high-level disinfected surgical gloves can become contaminated:

- By touching the outside of a sterile or high-level disinfected surgical glove with the ungloved hand as the gloves are being put on
- By touching anything that is not sterile or high-level disinfected
- By tears and punctures
- By holding the gloved hands below the level of the waist

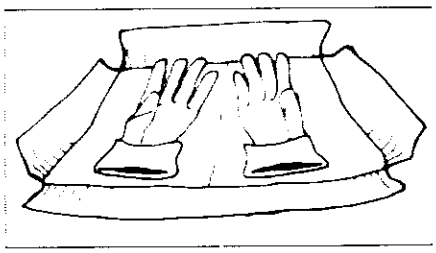
If sterile or high-level disinfected surgical gloves become contaminated:

- Stop what you are doing
- Step away from the sterile field
- Remove the contaminated glove(s)
- Put on new gloves; if only one glove is being replaced, make sure not to contaminate the uncontaminated glove in the process

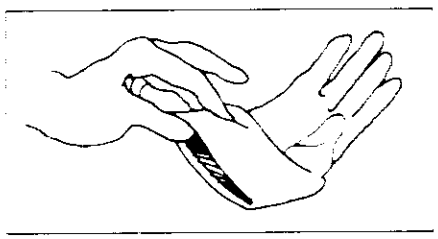
Steps of Putting on Sterile or High-Level Disinfected Surgical Gloves

1 Prepare a large, clean, dry area for opening the package of gloves. (If the gloves have been processed and are not wrapped in a package, lay them on a sterile or high-level disinfected surface.) Either (1) open the outer glove package and then perform a surgical handscrub, or (2) perform a surgical handscrub and then ask someone to open the package for you. Dry your hands completely.

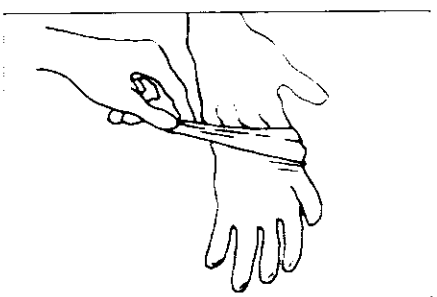
2 Open the inner glove wrapper, exposing the cuffed gloves with the palms up.



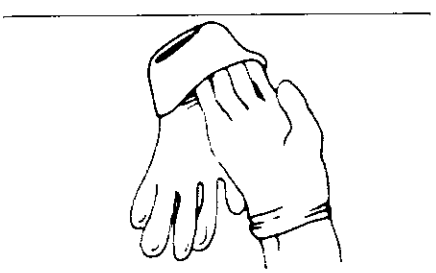
3 Pick up the first glove by the cuff, touching only the inside portion of the cuff (the side that will be touching your skin when the glove is on).



4 While holding the cuff, slip your other hand into the glove. (Pointing the fingers of the glove toward the floor will keep the fingers open.) Be careful not to touch anything, and hold the gloves above waist level. (*Note:* If the first glove is not fitted correctly, wait to make any adjustment until the second glove is on. Then use the sterile or high-level disinfected fingers of one glove to adjust the sterile or high-level disinfected portion of the other glove.)

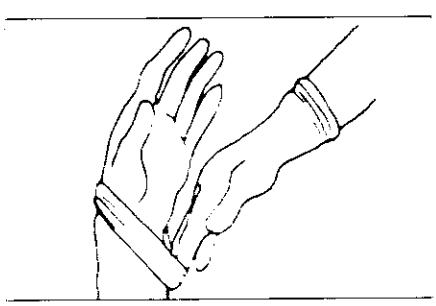


5 Pick up the second glove by sliding the fingers of the gloved hand under the cuff of the second glove. Be careful not to contaminate the gloved hand with the ungloved hand as the second glove is being put on.



6 Put the second glove on the ungloved hand by maintoining a steady pull through the cuff.

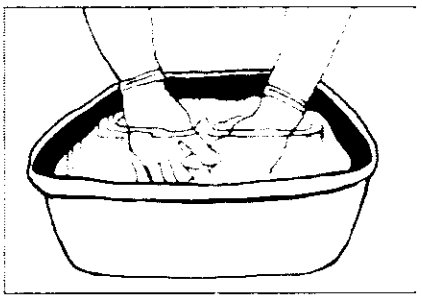
7 Adjust the position of the glove fingers until the gloves fit comfortably.



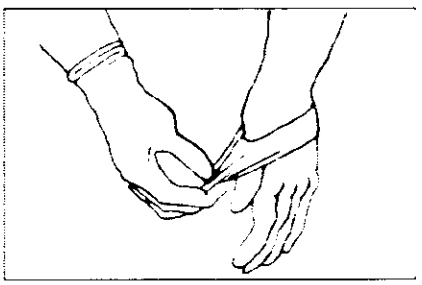
ADAPTED FROM: INTRAH. 1996. Appendix 11: Infection prevention in FP/MCH clinics. In *Guidelines for clinical procedures in family planning: A reference for trainers.* Chapel Hill, NC: INTRAH, pp. A11-22, A11-23.

Steps of Removing Surgical Gloves

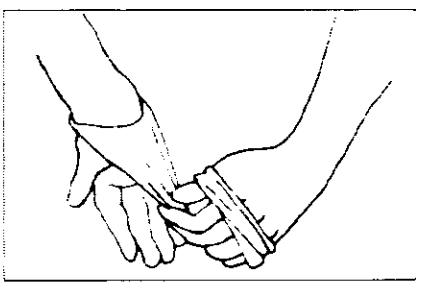
1 Rinse gloved hands in a basin of decontamination solution to remove blood or other body fluids.



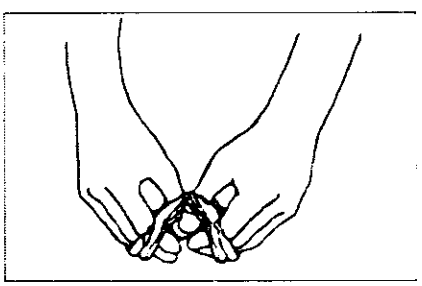
2 Grasp one of the gloves near the cuff and pull it part of the way off. The glove will turn inside out. It is important to keep the first glove partially on your hand before removing the second glove to protect you from touching the outside surface of either glove with your bare hands.



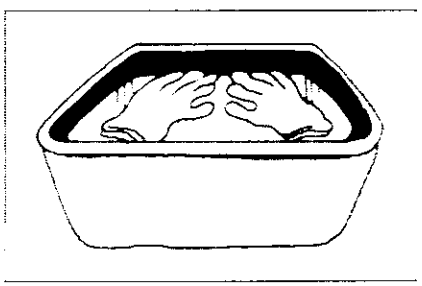
3 Leaving the first glove over your fingers, grasp the second glove near the cuff and pull it part of the way off. The glove will turn inside out. It is important to keep the second glove partially on your hand to protect you from touching the outside surface of the first glove with your bare hand.



4 Pull off the two gloves at the same time, being careful to touch only the inside surfaces of the gloves with your bare hands.



5 If the gloves are disposable or are not intact, dispose of them properly (see pages 13.4 and 13.5 for information on managing medical waste). If they are to be processed for reuse, place them in a container of decontamination solution. Wash your hands immediately after the gloves are removed, since the gloves may contain invisible holes or tears, leaving you at risk of exposure to contaminated blood and other body fluids.



Tips on Removing Surgical Gloves

- As you remove the gloves, avoid allowing the outside surface of the gloves to come in contact with your skin, because the outer surface will have been contaminated with blood and other body fluids.
- Avoid letting the gloves snap, as this may cause contaminants to splash into your eyes or mouth or onto your skin or other people in the area.
- Remove used gloves before touching **anything**. Countertops, faucets, and pens and pencils are frequently contaminated because health care workers touch them while wearing used gloves.

Skills Practice Checklist: Gloving

Review the checklist with the participants, and instruct them to work with a partner to take turns practicing putting on and removing gloves according to the standards on the checklist. Guide the participants who are observing in giving feedback to the participants who are practicing putting on and removing gloves. Observe all the groups to assess the accuracy of the practice and the constructiveness of the comments given by colleagues. Give feedback on what you observe. Continue the practice until each pair of participants has completed each skill correctly twice. Bring the group together to discuss any difficulties or observations and to share comments.

Note that for the purpose of this activity, it is **not** necessary for the participants performing the skills practice to actually perform all of the actions that are not directly involved in putting on or removing gloves (e.g., performing surgical handscrub, placing the used gloves in decontamination solution). The participants need to know when these actions should be performed, but they do not need to demonstrate them here.

Training Option

If some, but not all, of the participants are skilled at gloving, divide the group to allow the skilled participants to assist the unskilled participants in the practice session.

Skills Practice Checklist: Gloving

Instructions: Choose a partner, and take turns observing each other practice putting on and removing gloves according to the standards on the checklist. As you observe your partner perform each action, place a check in the "Yes" box if the action was performed as described in the "Action" column, and place a check in the "No" box if the action was not performed as described in the "Action" column. If you did not observe the action, make a note in the "Comments" column. The "Comments" column can also be used to note any actions that were performed that are not described in the "Action" column or that need to be corrected.

Note: For the purpose of this activity, it is **not** necessary to actually perform all of the actions that are not directly involved in putting on or removing gloves (e.g., performing surgical handscrub, placing the used gloves in decontamination solution). It is important for the individual performing the skills practice to know when these actions should be performed, but he or she does not need to demonstrate them here. Therefore, you may check "Yes" if your partner mentions the action at the appropriate moment, even if he or she does not perform it.

ACTION	YES	NO	COMMENTS
Putting On Gloves			
1. Prepares a large, clean, dry area for opening the package of gloves			
2. Opens the outer glove package and performs surgical handscrub, or performs surgical handscrub and then has someone open the package			
3. Opens the inner glove wrapper, exposing the cuffed gloves with the palms up			
4. Picks up the first glove by the cuff, touching only the inside portion of the cuff			
5. Holds the cuff, with the fingers pointing down, in one hand while slipping the other hand into the glove			
6. Waits to make any adjustment with the first glove until the second glove is on			
7. Picks up the second glove by sliding the fingers of the gloved hand under the cuff of the second glove			

continued

Skills Practice Checklist: Gloving continued

ACTION	YES	NO	COMMENTS
Putting on Gloves continued			
8. Puts the second glove on the ungloved hand by maintaining a steady pull through the cuff			
9. Adjusts the position of the glove fingers until the gloves fit comfortably			
Removing Gloves			
1. Rinses gloved hands in a basin of decontamination solution			
2. Grasps one of the gloves near the cuff and pulls it part of the way off			
3. Leaving the first glove over the fingers, grasps the second glove near the cuff and pulls it off			
4. Pulls off the first glove, being careful to touch only the inside surface with the bare hand			
5. If the gloves are disposable or not intact, disposes of them properly. If the gloves are to be processed for reuse, places them in a container of decontamination solution.			

Surgical Attire

Inform the participants that while the hands are the most common means of transmitting infections in the health care setting, infections can also be transmitted to clients and service providers via the mouth, nose, eyes, scalp, arms, and torso. Therefore, it is important to wear appropriate surgical attire during surgical/clinical procedures. Highlight that surgical attire is intended to offer protection to the client and the provider.

Review the material in the Participant's Handbook, highlighting the chart "Rationale for Wearing Protective Attire during Clinical Procedures," which appears on pages 5.15 and 5.16 of the handbook. Conduct the following training activity and, if desired, one or more of the following optional activities.

Training Activity: Demonstration *(Approximate time: 15 minutes)*

Display each of the garments of surgical attire and ask for volunteers to demonstrate how to properly wear each.

Optional Activity: Discussion Topic *(Approximate time: 20 minutes)*

Facilitate a discussion on surgical attire by asking the participants:

- During surgical procedures, what types of garments are worn at your facility?
- Why are they worn?

Record their responses on a flipchart for reference during the session. Display a diagram of the outline of a person's body, beginning with the head and progressing down, and ask the participants to identify the points at which contamination may occur from the provider to the client and from the client to the provider. Ask the participants which protective garments could be used to protect the provider and the client. Continue to guide the discussion by asking the participants whether flip-flops, sandals and other open shoes, or bare feet are appropriate footwear for the surgical/procedure area. Then refer the participants to the flipchart and ask them to identify the surgical-attire practices at their facility that need improvement. For each incorrect practice, guide the group in discussing what could be done to change the practice. Record their comments on a flipchart and save it for use in developing implementation plans in Module 14: Implementation Plans and Closure.

Optional Activity: Individual Exercise *(Approximate time: 15 minutes)*

Ask the participants to complete Exercise 5-2: Matching Exercise, which appears on page 5.17 of their handbook. *Instructions for this exercise appear on page 186.*

Surgical Attire

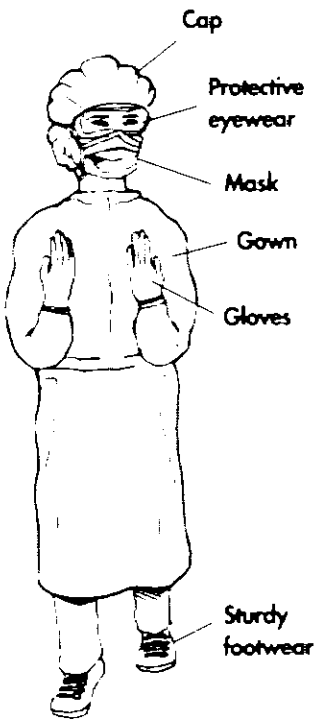
The human body is a major source of microorganisms that can cause postprocedure infections. Such infections can be transmitted from service providers to clients when:

- Bacteria are shed from the service providers' hair and skin
- Microorganisms are expelled from the service providers' noses and mouths during talking, coughing, and breathing

Definition

Surgical attire: **attire such as gloves, caps, masks, and gowns that help reduce the risk of postprocedure infections in clients by reducing the likelihood that clients will be exposed to potentially infectious microorganisms. In addition, this attire—as well as protective eyewear, waterproof aprons, and sturdy footwear—protects the service provider from exposure to clients' potentially infectious blood and other body fluids.**

Appropriate attire, including a cap and mask, should be worn when sterile packs are opened and during most surgical procedures. Some minor surgical procedures (e.g., vasectomy, insertion/removal of Norplant implants) can be performed safely without wearing a cap, mask, or sterile gown.



There is some controversy regarding the need for operating theater staff to wear scrubsuits, including the need for members of the surgical team to wear scrubsuits under their sterile gowns. *There is no scientific evidence to support the use of surgical scrubsuits as a means of reducing infections.* Decisions regarding the use of scrubsuits should be made on an individual basis, weighing the costs (purchase, replacement, laundry) and practicality (storage, availability of changing areas) against any potential benefit. If street clothes are worn in the operating theater, they should be visibly clean.

To protect yourself from exposure to potentially infectious material, always wear the necessary attire, including eyewear, whenever you anticipate splashes, sprays, or splatters of blood or other body fluids (e.g., during delivery, treatment of abortion complications).

Remember: Only clean, intact, and dry attire will be an effective barrier against potentially infectious microorganisms. It is not necessary to sterilize caps, masks, and scrubsuits, since these garments will not have direct contact with the sterile field; gowns, however, should be sterile.

Rationale for Wearing Protective Attire during Clinical Procedures

Garment	How Attire Protects Client	How Attire Protects Service Provider	Comments
Gloves	Prevent microorganisms on the service provider's hands from coming in contact with the client	Prevent the service provider's hands from coming in contact with the client's blood or other body fluids, mucous membranes, and nonintact skin, as well as instruments, other items, or surfaces that have been contaminated with blood or other body fluids	
Masks	Prevent droplets from the service provider's nose and mouth—which contain microorganisms and are expelled during talking, coughing, and breathing—from coming in contact with the client	Prevent the mucous membranes of the service provider's nose and mouth from being exposed to splashes of blood or other body fluids	• Gauze is not an acceptable material for a mask because it is too loosely woven. • Masks should cover the nose and mouth, fitting snugly across the bridge of the nose, at the edge of the cheeks, and under the chin.
Eyewear/ face shields	No protection documented	Prevent the mucous membranes of the service provider's eyes from being exposed to splashes of blood or other body fluids	
Caps	Prevent microorganisms in the service provider's hair, or on skin that is shed from the service provider's head, from falling into the sterile field	No protection documented	

continued

Rationale for Wearing Protective Attire during Clinical Procedures continued

Garment	How Attire Protects Client	How Attire Protects Service Provider	Comments
Gowns and plastic or rubber aprons	Prevent microorganisms on the service provider's arms, torso, and clothing from coming in contact with the client	Prevent the service provider's skin from being exposed to splashes of blood or other body fluids	A waterproof apron should be worn under the gown during all procedures in which large amounts of blood and other body fluids are likely (e.g., cesarean delivery).
Footwear	Clean footwear minimizes the number of microorganisms brought from other areas of the facility or the outside into the surgical/procedure area	Protects the service provider's feet from being injured by contaminated sharp objects and heavy items (e.g., reduces the damage caused when a health care worker steps on an instrument or other item or items accidentally fall on the feet), as well as from being exposed to splashes of blood or other body fluids	• Sturdy footwear must be worn in the operating theater at all times; staff should **never** walk barefoot in the operating theater. Acceptable footwear includes rubber or leather boots or shoes. The footwear should be clean and should completely cover the foot in order to provide protection to the health care worker. Sandals, other open shoes, and bare feet are **not** recommended because they leave parts of the foot exposed. • There is **no** scientific evidence to support the use of shoe covers as a means of reducing the risk of infections in clients.

Exercise 5-2: Matching Exercise

Ask the participants to match the piece of surgical attire with the correct description, and write the garment name in the corresponding box. Allow 10 minutes for completion. Ask for volunteers to give their answers. Allow for questions, and validate or correct their answers, as necessary. Answers appear on page 5.18 of the Participant's Handbook.

Training Options

- As the participants call out the answers, write the correct ones on a transparency of the blank chart.
- To conduct this exercise as a large-group exercise, write the descriptions on a flipchart and write the name of each garment on an index card. Ask for volunteers to pick index cards and tape them next to the appropriate description.
- For low-literate/illiterate participants, the exercise can be conducted orally by asking for volunteers to call out the answers.
- Ask the participants to complete this exercise at the beginning of the session. Review their answers as a way of presenting the material in this session and to facilitate discussion.

Exercise 5-2: Matching Exercise

Instructions: Match the piece of surgical attire in the list below with the correct description, and write the garment name in the corresponding box. Answers appear on the next page.

Cap	Mask
Face shield	Sturdy footwear
Glove	Waterproof apron
Gown	

Piece of Surgical Attire	Description
1.	Prevents droplets containing microorganisms from the service provider's mouth from coming in contact with the client
2.	Protects the service provider's hands from infectious material and protects clients from microorganisms on the service provider's hands
3.	Protects the mucous membranes of the service provider's eyes, nose, and mouth from splashes of blood or other body fluids
4.	Prevents the spread of microorganisms to the client from hair shed by the service provider
5.	Protects the service provider from splashes of blood or other body fluids, and protects the client from microorganisms on the service provider's torso and arms
6.	Protects the service provider from injury by contaminated sharps that may fall or fluids that may spill
7.	Protects the front of the service provider's body when heavy contamination with blood or other fluids is likely

Answers to Exercise 5-2: Matching Exercise

Piece of Surgical Attire	Description
1. **Mask**	Prevents droplets containing microorganisms from the service provider's mouth from coming in contact with the client
2. **Glove**	Protects the service provider's hands from infectious material and protects clients from microorganisms on the service provider's hands
3. **Face shield**	Protects the mucous membranes of the service provider's eyes, nose, and mouth from splashes of blood or other body fluids
4. **Cap**	Prevents the spread of microorganisms to the client from hair shed by the service provider
5. **Gown**	Protects the service provider from splashes of blood or other body fluids, and protects the client from microorganisms on the service provider's torso and arms
6. **Sturdy footwear**	Protects the service provider from injury by contaminated sharps that may fall or fluids that may spill
7. **Waterproof apron**	Protects the front of the service provider's body when heavy contamination with blood or other fluids is likely

Preparing a Client for Clinical Procedures

Review the material in the Participant's Handbook. If desired, you may conduct one or more of the following optional activities.

Optional Activity: Video Viewing *(Approximate time: 5 minutes)*

Show TDS 3 (length 1:06) from the infection prevention video, which covers the recommended practice for cleaning the cervix and vagina with an antiseptic to reduce the risk of postprocedure pelvic infections. When the segment is over, review the material presented with the participants and allow for questions.

Training Option

The video can be shown either at the beginning of the session to introduce the topic or at the end of the session for review.

Optional Activity: Discussion Topic *(Approximate time: 5–10 minutes)*

Facilitate a discussion by asking the participants: What can be done to prepare the surgical/procedure site to minimize the risk of infections during clinical procedures? If the participants do not discuss shaving and site preparation for the skin, vagina, and cervix, raise the issues and validate or correct the participants' responses, as necessary.

Optional Activity: Demonstration and Practice *(Approximate time: 10 minutes)*

Using a pelvic model or a scrotal model, demonstrate how to prepare a client for a clinical procedure. Be sure to show how to apply an antiseptic solution to the vagina and cervix.

Preparing a Client for Clinical Procedures

Client preparation before a clinical procedure involves using an antiseptic solution on the client's skin, vagina, or cervix to destroy or prevent the growth of microorganisms. Most surgical-site infections result from contamination during surgery—not, as many people believe, because clients do not keep the wound clean after surgery. Frequently, bacteria from the client's skin or tissues is the cause of infections. Thus, it is critical to pay strict attention to proper preparation of the client before a procedure.

Shaving the surgical/procedure site is no longer recommended. Shaving causes small nicks and breaks in the skin, which are ideal places for bacteria to grow and multiply and can lead to increased risk of postprocedure infections. Results of two large studies (one with nearly 63,000 subjects) showed that clients who had *not* been shaved had significantly fewer postoperative surgical-site infections than clients who *had* been shaved. Hair around the surgical/procedure site may be clipped very short if it interferes with the procedure.

To reduce the risk of infections if the surgical/procedure site must be shaved:

- Use antimicrobial soap and water or shave dry
- Shave immediately before the procedure, in the operating theater or procedure room

Preparing the Surgical/Procedure Site

The surgical/procedure site should be cleaned with soap and water. This can be done by the client, either at home or at the clinic, or by clinic staff. An appropriate antiseptic solution should then be used to prepare the surgical site.

To prepare the skin:

Wipe the skin in a circular motion, beginning in the center of the site and moving out, using sterile cotton balls, cotton wool, or gauze sponges held by a sponge forceps. Use any of the following antiseptics (which are listed in preferred order):

- An iodophor (e.g., Betadine) - Wait 2 minutes, then wipe off the excess with sterile, dry cotton or gauze.
- 4% chlorhexidine (e.g., Hibiclens) - Wipe off the excess with sterile, dry cotton or gauze.
- 1–3% iodine, followed by 60–90% alcohol (ethyl or isopropyl) - Allow to air-dry.
- Chlorhexidine with cetrimide (e.g., Savlon) - Wipe off the excess with sterile, dry cotton or gauze.

To prepare the vagina and cervix:

Apply a liberal application of an appropriate antiseptic (such as an iodophor) to the vagina and cervix before instrumentation of the uterus (e.g., IUD insertion, uterine evacuation). Alcohol and alcohol-based antiseptics should **not** be used on the vagina, cervix, or other mucous membranes because they are damaging to these tissues. (See page 4.8 for information on which antiseptics are appropriate to use.)

Remember:

- Cotton balls, cotton wool, and gauze sponges should **not** be left soaking in an antiseptic solution, since repeated dipping of the forceps into the container to pick up the cotton or gauze may contaminate the solution and the remaining cotton or gauze.
- Take appropriate measures to avoid contaminating the stock antiseptic solution. Pour the amount of antiseptic needed from the bottle into a smaller container, small cup (such as a gallipot), or basin. Dip the cotton or gauze into the antiseptic and use it to prepare the surgical/procedure site. Discard any remaining antiseptic. **Never** dip cotton or gauze into the stock solution. Alternatively, pour the antiseptic onto the cotton or gauze, making sure not to touch the lip of the antiseptic container with the cotton or gauze. (See pages 4.12–4.14 for more information on preventing contamination of antiseptics.)

Maintaining a Sterile Field

Review the importance and methods of maintaining a sterile field, and conduct the following training activity. If desired, you may also conduct the following optional activity.

Training Activity: Discussion Topic *(Approximate time: 5–10 minutes)*

Facilitate a discussion by asking the participants:

- Is a sterile field routinely maintained during each surgical/clinical procedure at your facility?
- If so, how is it prepared and maintained?

Record their responses on a flipchart. After reviewing the information in the Participant's Handbook, ask the participants to identify practices used at their facilities that would increase the chances of contaminating the surgical/procedure site. For each incorrect practice, guide the group in discussing what could be done to change the practice and thereby minimize the risk of contamination. Record their comments on a flipchart and save it for use in developing implementation plans in Module 14: Implementation Plans and Closure.

Optional Activity: Demonstration *(Approximate time: 5–10 minutes)*

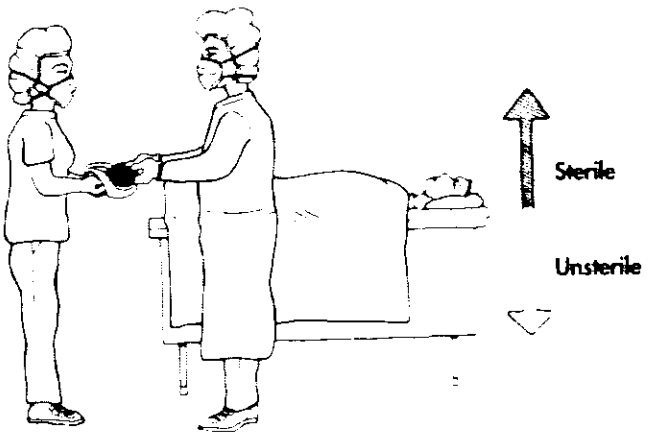
Using a pelvic model or a scrotal model, demonstrate how to "square off" a surgical/procedure site using surgical towels or drapes.

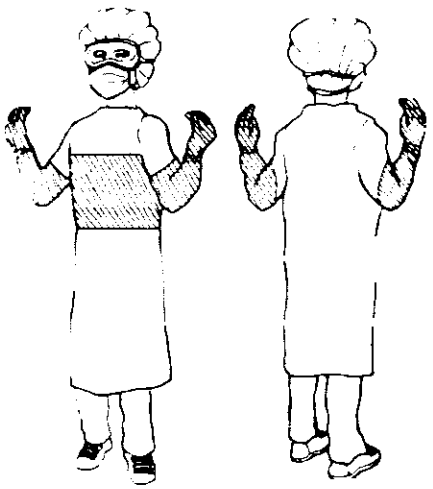
Maintaining a Sterile Field

A sterile field must be established and maintained to reduce the risk of contaminating the surgical/procedure site. The sterile field is created by placing sterile towels and/or surgical drapes around the surgical/procedure site. Additional sterile fields may also be established, such as on the stand holding instruments and other items used in clinical procedures.

A sterile field is maintained by:

- Placing only sterile items within the sterile field
- Opening, dispensing, or transferring sterile items without contaminating them
- Considering items located below the level of the draped client to be unsterile
- Not allowing sterile personnel to reach across unsterile areas or to touch unsterile items
- Not allowing unsterile personnel to reach across the sterile field or to touch sterile items





= Sterile
= Unsterile

- Recognizing and maintaining the service provider's sterile area. (When gowned, this extends from the chest to the level of the sterile field; sleeves are sterile from 5 cm above the elbow to the cuff. The neckline, shoulders, and back are considered to be *unsterile* areas of the gown.)
- Recognizing that the edges of a package containing a sterile item are considered unsterile
- Recognizing that a sterile barrier that has been penetrated (wet, cut, or torn) is considered contaminated
- Being conscious of where your body is at all times and moving within or around the sterile field in a way that maintains sterility
- Not placing sterile items near open windows or doors

Note: A sterile field may contain instruments or other items that were high-level disinfected. Principles of maintaining a sterile field should also be applied during procedures that are being carried out under conditions of high-level disinfection.

When in doubt about the sterility or high-level disinfection status of an item or area, consider it contaminated.

Using Good Surgical Technique

Review the material in the Participant's Handbook, and conduct the following training activity.

Training Activity: Discussion Topic *(Approximate time: 5–10 minutes)*

Ask the doctors in the group what actions can be performed during surgery to minimize the risk of postprocedure infections. Allow for questions and clarify as needed.

Use of Prophylactic Antibiotics

Review the material in the Participant's Handbook.

Using Good Surgical Technique

Postprocedure infections are more likely to occur:

- In tissue that has been damaged due to rough or extensive manipulation during surgery. (In addition, damaged tissue heals more slowly, which increases the time that it is more susceptible to infections.)
- When excessive bleeding occurs, because the tissue is more susceptible to invasion by microorganisms.

Therefore, paying meticulous attention to controlling bleeding and gentle tissue handling during surgery can reduce the risk of infections.

Use of Prophylactic Antibiotics

The use of prophylactic antibiotics (giving antibiotics before a procedure to prevent infections from developing) does **not** take the place of good infection prevention practices. In general, prophylactic antibiotics may be indicated in contaminated or clean-contaminated surgical procedures, in those involving implantation of a foreign body, or when the client is severely immunosuppressed.

Prophylactic antibiotics are often prescribed inappropriately (e.g., antibiotics that are not effective against the microorganisms most likely to cause infections are prescribed) or given at the wrong time in relation to the actual procedure (e.g., given postoperatively versus pre- and intraoperatively), thus decreasing the likelihood that they will have any effect.

Avoid routine use of prophylactic antibiotics; it increases costs and increases the likelihood of promoting antibiotic resistance.

Maintaining a Safer Environment in the Surgical/Procedure Area

Review the material in the Participant's Handbook. Remind the participants that every person who enters a surgical/procedure area contributes to the risk of transmitting infections to clients and is at risk of infections himself or herself.

Maintaining a Safer Environment in the Surgical/Procedure Area

Specific rooms should be designated for performing surgical/clinical procedures and processing instruments and other items. It is important to control traffic and activities in these areas, since the number of people and amount of activity in them influence the number of microorganisms and, thus, the risk of infections.

To maintain a safer environment:

- Limit the entry of unauthorized individuals to surgical/procedure areas
- Close doors and curtains during all procedures
- Require that personnel in the surgical area wear clean clothes, a mask, a cap, and sturdy footwear
- Enclose the surgical/procedure area to minimize dust and eliminate insects; air-condition the room, if feasible
- Disinfect and clean examination/operating tables, counters, instrument carts or trolleys, light handles, and any other surfaces that may have been contaminated with blood or other body fluids during a procedure *before* a new client is brought into the room. (See Module 12: Housekeeping for more information on disinfecting and cleaning environmental surfaces in surgical/procedure areas.)

Exercise 5-3: Aseptic Technique Case Studies

Use the following cases (or use case histories of your own) to help the participants think through the issues involved in aseptic technique. Divide the participants into small groups and assign two cases to each group. Allow 10 minutes for completion. Bring the groups together and review each case, asking for a volunteer from each group to present the group's work. Allow for discussion; give feedback and validate or correct the participants' responses, as necessary.

Training Options

- After dividing the participants into small groups, ask each group to complete all of the cases. When the groups are brought together, ask for a volunteer from each group to report the group's responses to only one of the cases.
- Read the cases aloud, and ask for volunteers to respond to the questions. (This works well with low-literate/illiterate staff or when time is short.)
- Ask the participants to write their responses in their handbooks, and ask for volunteers to read them aloud. Alternatively, ask the participants to switch books with another participant and correct the other's responses.

Possible responses:

Case Study 1

No. The number of people moving through operating theaters and the surrounding processing areas should be kept to a minimum to reduce microbial contamination. Signs limiting access to these areas should be posted, and entrance to the surgical area should be restricted to authorized personnel.

Case Study 2

No. It is not acceptable to have a sterile tray or table next to or in front of a window that is open at the top or bottom. If the operating theater cannot be air-conditioned, ceiling fans or open windows are acceptable only if the following conditions are met: fans are kept clean; blades are wiped frequently with a damp cloth; windows have intact, tight mesh screens; and windows can be opened from the top. Keeping an operating theater cool is important, not only for the comfort of the surgical team, but also to reduce the number of bacteria in the room. However, the integrity of the sterile field should never be compromised. In addition, the amount of airflow during surgical procedures should be minimized. Khun Pensri should rearrange or remove some of the furnishings so that her sterile table is not near a window.

Case Study 3

No. Shaving is no longer recommended for surgical-incision sites because research has shown that shaving actually increases the risk of postoperative infections. If hair must be removed, it is best to cut it with scissors. Also, Nurse Scherbina should wait 2 minutes before wiping off the excess antiseptic solution, since iodophors require several minutes for maximum effectiveness. The incision site should first be washed with soap and water if the client has not already done this at home or in the clinic.

Exercise 5-3: Aseptic Technique Case Studies

Read the following case studies and answer the questions below. Possible responses appear on page 5.26.

Case Study 1

At a seaside hospital, two busy wards are located on opposite ends of the building, connected to each other by the operating theaters and processing areas. Because it is much faster and easier to get from one ward to another by cutting through the operating theaters and processing areas, many staff do so, rather than going outside and all the way around the building to get to the other ward.

Is this an appropriate practice? Why?

Case Study 2

The operating theater where Khun Pensri works as a surgical nurse is not air-conditioned, and the temperature often rises above 40°C (100°F). Before surgeries start, Khun Pensri opens the windows, which are screened. The operating theater has three operating tables, and because of the way the room is set up, the only place for her to put her sterile table is in front of one of the open windows.

Is this an appropriate practice? Why?

Case Study 3

Nurse Scherbina, who works in the operating theater, has prepped many surgical-incision sites in the past 10 years. She always begins by shaving the site using a razor blade. Then she wipes the site with sterile gauze and an iodophor antiseptic (Betadine) in a circular manner, working from the center out, and immediately wipes off the excess antiseptic with dry, sterile gauze.

Is this an appropriate practice? Why?

continued

Case Study 4

No. Gauze is not an acceptable material for masks. Because gauze is loosely woven, even several layers of thickness do not afford a proper barrier.

Case Study 5

No. The scrub nurse was correct to hand the sterile towel to Dr. Chatterjee and to hold open the sterile gown for him. However, a staff member who is sterile should never tie the back of a sterile gown, since the back is not considered sterile. (For example, the back ties of the gown have touched the wearer's clothes and are, therefore, contaminated.) A nonsterile person should tie the gown.

Exercise 5-3: Aseptic Technique Case Studies continued

Case Study 4

Because the washing machines at a district hospital broke down, masks were not ready for the day's surgery staff. One of the orthopedic surgeons recommended that the staff wrap several layers of gauze around their faces to keep their noses and mouths covered. Some staff members preferred the gauze to the masks and continued to use the gauze later when the laundered masks became available.

Is this an appropriate practice? Why?

Case Study 5

Dr. Chatterjee, a surgeon, has just finished his surgical handscrub and enters the operating theater. The gowned scrub nurse hands him a sterile towel, and he dries his hands and arms. He turns to the scrub nurse, who holds open a sterile gown, and he puts it on. Then the scrub nurse ties the gown in the back.

Is this an appropriate practice? Why?

Answers to Exercise 5-3: Aseptic Technique Case Studies

Possible responses:

Case Study 1

No. The number of people moving through operating theaters and the surrounding processing areas should be kept to a minimum to reduce microbial contamination. Signs limiting access to these areas should be posted, and entrance to the surgical area should be restricted to authorized personnel.

Case Study 2

No. It is not acceptable to have a sterile tray or table next to or in front of a window that is open at the top or bottom. If the operating theater cannot be air-conditioned, ceiling fans or open windows are acceptable only if the following conditions are met: fans are kept clean; blades are wiped frequently with a damp cloth; windows have intact, tight mesh screens; and windows can be opened from the top. Keeping an operating theater cool is important, not only for the comfort of the surgical team, but also to reduce the number of bacteria in the room. However, the integrity of the sterile field should never be compromised. In addition, the amount of airflow during surgical procedures should be minimized. Khun Pensri should rearrange or remove some of the furnishings so that her sterile table is not near a window.

Case Study 3

No. Shaving is no longer recommended for surgical-incision sites because research has shown that shaving actually increases the risk of postoperative infections. If hair must be removed, it is best to cut it with scissors. Also, Nurse Scherbina should wait 2 minutes before wiping off the excess antiseptic solution, since iodophors require several minutes for maximum effectiveness. The incision site should first be washed with soap and water if the client has not already done this at home or in the clinic.

Case Study 4

No. Gauze is not an acceptable material for masks. Because gauze is loosely woven, even several layers of thickness do not afford a proper barrier.

Case Study 5

No. The scrub nurse was correct to hand the sterile towel to Dr. Chatterjee and to hold open the sterile gown for him. However, a staff member who is sterile should never tie the back of a sterile gown, since the back is not considered sterile. (For example, the back ties of the gown have touched the wearer's clothes and are, therefore, contaminated.) A nonsterile person should tie the gown.

"At My Facility..."

Ask the participants to write their responses to the questions in the space provided. Remind them to answer the questions as honestly as possible. Ask them to think about their response to each question to see if it reflects an appropriate infection prevention practice or if there are issues that need to be addressed. Ask them to write down any problems they identify. Allow 10–15 minutes for completion.

Optional Activity: Discussion Topic *(Approximate time: 10 minutes)*

Ask for volunteers to share their responses, and allow for discussion.

"At My Facility..."

Think about your clinical setting and write your answers to the following questions in the space provided. At your facility:

- Do staff understand the concept of aseptic technique?

- Do staff perform surgical handscrub using antiseptic solution following the guidelines presented in this handbook? Is there ever a problem getting the supplies of antiseptic that staff need? If so, what plans are in place for times when antiseptics are unavailable?

- Do staff put on surgical gloves carefully, to avoid contaminating them, and use caution when removing gloves so that blood and other body fluids do not get on their or others' skin?

- Is some form of eye protection used during procedures in which splashing of blood or other body fluids could occur? Do staff wear plastic or rubber aprons under their surgical gowns or over their clothing during procedures in which exposure to large amounts of blood and other body fluids is possible?

- Are clients no longer routinely shaved before surgical procedures?

- Is the sterile field adequately maintained during clinical procedures? If not, are there specific problems that occur frequently?

- Is the operating theater a restricted area, in which only necessary staff are permitted?

Do your responses to these questions reflect an understanding or performance of appropriate infection prevention practices at your facility? If, based on your responses, you become aware of some problems or issues that need to be addressed, list them below:

Summary/Self-Assessment Answers

1. Yes. Even by lightly brushing his fingertip against the edge of the counter, Dr. Amin's gloves have become contaminated. Instruments and other items are either sterile or unsterile; there is no such thing as being "a little bit contaminated." This is an important concept to understand regarding aseptic technique.
2. He should change his gloves.

Optional Activity: Discussion Topic *(Approximate time: 10 minutes)*

Read aloud the case study, and facilitate a discussion by asking the participants the questions that appear in the Participant's Handbook.

Answers to true/false questions:

3. T
4. F
5. F
6. T
7. F
8. T
9. F
10. T

Summary/Self-Assessment

Answers are provided at the end of this assessment.

Review the following case study, which appeared at the beginning of this module, and answer the questions below:

While putting on gloves before surgery, Dr. Amin lightly brushes the fingertip of one gloved hand against the edge of the counter. Since gloves are always in short supply and he only quickly brushed just one fingertip against the counter, Dr. Amin decides not to change his gloves and proceeds with the surgery.

1. Is the client at risk of infections? Why?

2. What is the appropriate action for Dr. Amin to take in this situation?

Decide whether each of the following statements is T (true) or F (false). Write your response for each statement in the space provided.

3. ____ Using a soft brush or sponge is preferable to using a hard brush for surgical handscrub. (page 5.4)

4. ____ Surgical handscrub requires at least 10 minutes to remove as many microorganisms as possible. (page 5.3)

5. ____ When using an alcohol handrub, it is not necessary to let the alcohol dry before putting on surgical gloves. (page 5.5)

6. ____ If sturdy footwear that is clean and completely covers the foot is available, shoe covers are not needed for infection prevention purposes. (page 5.16)

7. ____ Caps and masks worn in the operating theater should always be sterile. (page 5.14)

8. ____ Most surgical attire performs a dual function—protecting both the service provider and the client from infections. (page 5.14)

9. ____ Shaving surgical-incision sites is recommended to reduce the risk of postprocedure infections. (page 5.19)

10. ____ If an iodophor solution is used to prepare the skin before a surgical procedure, it should remain on the site for 2 minutes before the procedure, and then the excess should be wiped off with dry gauze. (page 5.19)

11. F
12. T

Answers to multiple-choice questions:

13. a, c
14. b
15. b

11. ____ Most surgical-site infections occur from contamination of the wound after the client leaves the health care facility. (page 5.19)

12. ____ Controlling bleeding and gentle handling of tissue can help reduce the likelihood of postoperative infections. (page 5.22)

The following are multiple-choice questions. More than one option may be correct. Please circle the correct response(s).

13. Which of the following practices contribute(s) to good aseptic technique? (page 5.2)

    a. Properly preparing the surgical site
    b. Incinerating medical waste
    c. Maintaining a sterile field during surgery
    d. Decontaminating instruments and other items after use

14. An alternative to the antiseptic-and-water surgical handscrub is: (page 5.5)

    a. Scrubbing with plain soap and hot water for 15 minutes
    b. Scrubbing with plain soap and warm water for 3–5 minutes, followed by applying 3–5 mL of an alcohol handrub solution
    c. Washing with plain soap and warm water, followed by pouring hydrogen peroxide over the hands and allowing them to air-dry
    d. Scrubbing with warm water alone for 15 minutes

15. When putting on surgical gloves by yourself, the best time to perform a surgical handscrub is: (page 5.9)

    a. Before opening the package of gloves
    b. After opening the package of gloves
    c. After opening the inner glove wrapper
    d. After putting on the first glove

Answers: 1. Yes. Even by lightly brushing his fingertip against the edge of the counter, Dr. Amin's gloves have become contaminated. Instruments and other items are either sterile or unsterile: there is no such thing as being "a little bit contaminated." This is an important concept to understand regarding aseptic technique; 2. He should change his gloves; 3. T; 4. F; 5. F; 6. T; 7. F; 8. T; 9. F; 10. T; 11. F; 12. T; 13. a, c; 14. b; 15. b

MODULE 6 Use and Disposal of Needles and Other Sharps

Trainer's Notes for Module 6

This module provides information on how to reduce the risk of transmitting infections when using and disposing of needles and other sharp instruments and objects (such as suture needles, scalpel blades, IV catheters, and razor blades) and when using multidose vials.

Audience

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MODULE 6 Use and Disposal of Needles and Other Sharps

Materials and Supplies

- ✓ Transparencies for Module 6 (optional)
- ✓ Overhead projector (optional)
- ✓ Television and videocassette recorder (optional)
- ✓ *Infection Prevention for Family Planning Service Programs*, AVSC International/JHPIEGO video, TDS 10 (optional)
- ✓ Supplies for making a sharps-disposal container (a small, heavy cardboard box, empty plastic jug, and/or metal container, scissors, tape)
- ✓ Hypodermic needles and syringes
- ✓ Multidose vial
- ✓ Kidney basin
- ✓ Flipchart paper, masking tape, and colored markers

Advance Preparation

- Determine which training activities will be used to present the content of this module. For on-site training, review the activities presented in Appendix E: On-Site Training Activities. Prepare or gather any supplies needed for the activities you will be conducting.
- Find out whether reusable or disposable needles and syringes are used at the participants' facilities, if possible.
- Cue the video to TDS 10, if used.
- Create transparencies or flipcharts, as needed.

Introduction

Introduce this module by reviewing the purpose and objectives that appear in the Participant's Handbook. If desired, you may conduct the following optional activity.

Optional Activity: Case Study *(Approximate time: 5 minutes)*

Read aloud the introductory case study, and direct the participants to the instructions that appear in their handbook.

MODULE 6 Use and Disposal of Needles and Other Sharps

Introduction

Purpose and Objectives

This module provides information on how to reduce the risk of transmitting infections when using and disposing of needles and other sharp instruments and objects and when using multidose vials. Upon completion of this module, you should be able to:

- List ways that health care workers can become injured by sharps
- Describe and demonstrate the proper procedures for safe use and disposal of needles and other sharps
- Describe and demonstrate the proper procedures for giving injections and use of multidose vials

Read the following case study, and try to keep it in mind as you learn the content of this module. See if you can determine whether the situation presents a risk of infection transmission and, if so, what should be done differently to reduce the risk. Questions about the case study appear in the Summary/Self-Assessment at the end of this module.

Your clinic has a special container for disposing of sharps. The container is located in the vaccination room, since that is where most injections are given. Occasionally, clients need to be given injections in the treatment room, which is down the hall from the vaccination room. When this occurs, the nurses recap the hypodermic needles, carry them down the hall to the vaccination room, and dispose of them in the sharps-disposal container.

Directions for Independent Study

If you are preparing for this module independently, you should:

- Study this module.
- Answer the "At My Facility..." questions for this module.
- Answer the Summary/Self-Assessment questions at the end of this module.
- Write down any questions you have about this module for later discussion with the trainer.

Overview

Review the material in the Participant's Handbook, and conduct the following training activity. Stress that the term *sharps* refers to any sharp instrument or other item used in the delivery of health care services, including hypodermic needles, suture needles, scalpel blades, sharp instruments, IV catheters, and razor blades. Highlight the fact that injuries by hypodermic needlesticks or other sharps are the main cause of occupational exposure to bloodborne pathogens.

Training Activity: Discussion Topic *(Approximate time: 10 minutes)*

Ask the participants to think about if and how many times they or their co-workers have been stuck by hypodermic needles, what the circumstances were, and what was done (e.g., testing, counseling). Ask for volunteers to share their stories. Then ask the participants to give some examples of how and when health care workers might sustain sharp-object injuries. Note their responses on a flipchart. Compare their responses with the ways presented in the Participant's Handbook, and add any additional examples on the flipchart to complete the list. Post the flipchart where all the participants can see it.

Review the information about the varying risk of infections following needlestick injuries for different viruses and which staff are most at risk of infections. Explain how the participants can help reduce the likelihood of injuries with sharps. Stress that minimal handling after use, taking extreme care whenever sharps are handled, wearing utility gloves when washing sharps, and proper disposal are the key points.

Overview

The number-one cause of occupational exposure to bloodborne pathogens is by injury from hypodermic needlesticks or other sharp objects ("sharps"), such as suture needles, scalpel blades, sharp instruments, IV catheters, and razor blades. Most of the documented cases of occupationally acquired HIV and hepatitis B and C infections have occurred through preventable accidents such as needlesticks or injury from other sharps.

The estimated risk of infection following a needlestick injury varies for one virus to another. The estimated risk of infection after exposure to hepatitis B virus from a needlestick ranges from 20–30%, while the risk of hepatitis C virus is 3–10% and of HIV is 0.4%. This variability in risk of infection is related, in part, to the level of virus in the blood. For example, there is generally a much higher concentration of hepatitis B virus in the blood than of HIV, and an accidental splash in the eye of even a tiny amount of blood containing hepatitis B virus can transmit the infection.

All staff who come in contact with sharps—from doctors and nurses to those who dispose of the trash—are at risk of infections.

Health care workers can become injured by sharps by:

- Recapping hypodermic needles after use (this is one of the major causes of sharp-object injuries)
- Any manipulation of used sharps before disposal (such as bending, breaking, or cutting hypodermic needles, which can cause the blood inside to splatter or cause staff to accidentally injure themselves)
- Accidentally sticking another staff member when there is sudden motion involving persons carrying unprotected sharps
- Leaving sharp items in areas where they are unexpected, such as on surgical drapes or bed linen
- Accidentally sticking or cutting themselves during surgical procedures in which there is limited visibility of the hands, many sharp instruments are used, or sharp instruments/suture needles are used in confined spaces (such as many obstetric/gynecological and orthopedic procedures)
- Handling or disposing of waste that contains used hypodermic needles or other sharps
- Unexpected client motion at the time of injections. Always warn clients when you are about to give them an injection.

To prevent injuries due to sharps:

- Handle hypodermic needles, syringes, and other sharps minimally after use, and use extreme care whenever sharps are handled.
- Avoid recapping needles and do not bend, break, or cut them before disposal.
- Dispose of hypodermic needles, scalpel blades, and other sharps in puncture-resistant containers immediately (or as soon as practical) after use. (Disposal of sharps is described more fully in the next section of this module.)
- Always wear utility gloves when disposing of sharps containers.
- Always wear utility gloves when washing sharps.
- Use the "hands-free technique" (described on the next page) to pass sharps during clinical procedures.

The "Hands-Free" Technique for Passing Sharps during Clinical Procedures

Health care workers can accidentally stick each other if, when passing sharps during a procedure, there is sudden motion involving persons carrying unprotected sharps or sharp items are left lying in areas where they are unexpected (such as on surgical drapes). Unprotected sharp items should **not** be passed directly from one person to another.

In the operating theater or procedure room, pass sharp instruments and other items in such a way that the surgeon and assistant are never touching the instrument or other item at the same time (known as the hands-free technique).

To use the hands-free technique:

- The assistant places the instrument or other item in a sterile kidney basin or in a designated "safe zone" in the sterile field.
- The assistant alerts the service provider to the presence of the instrument or other item in the kidney basin or "safe zone."
- The service provider picks up the instrument or other item, uses it, and returns it to the basin or "safe zone."

Disposal and Decontamination of Needles and Other Sharps

Review the material on proper disposal and decontamination of sharps, and conduct the following training activities. If reusable needles and syringes are used at the participants' facilities, review how to decontaminate them.

Training Activity: Demonstration *(Approximate time: 5–10 minutes)*

Demonstrate how to make a sharps-disposal container out of a small, heavy cardboard box, an empty plastic jug, and/or a metal container (whatever is available at the training facility). Ask the participants what they might use at their facilities as sharps-disposal containers.

Training Activity: Demonstration and Practice *(Approximate time: 10 minutes)*

Demonstrate the "one-hand" technique for recapping hypodermic needles. If time allows, distribute needles and syringes to the participants, and allow them to practice the technique.

Training Tip

If the participants already perform the "one-hand" technique, the demonstration alone, without practice by the participants, is sufficient.

Point out that sharps-disposal containers should be conveniently located in areas where sharp objects are frequently used and should be replaced when they are three-quarters full to further reduce the chances of injury.

Remind the participants that improper disposal of contaminated sharp objects can cause infections in the community. If an industrial incinerator that will destroy hypodermic needles and other sharps is not available, the risk of infections should be reduced by decontaminating sharps before disposal and burying them in a pit to make it difficult for others to scavenge them. Mention that more information on proper disposal of medical waste is covered in Module 13: Waste Disposal.

Disposal and Decontamination of Needles and Other Sharps

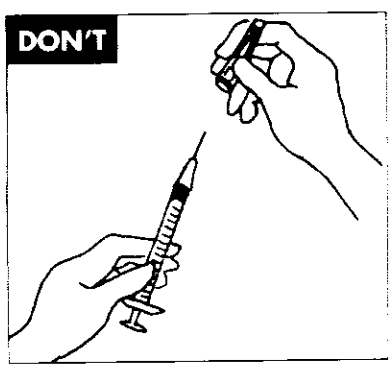
Improper disposal of contaminated sharp objects can cause infections in the health care facility and the community. Make hypodermic needles and other sharps unusable by incinerating them. If an industrial incinerator that will destroy hypodermic needles and other sharps is not available, reduce the risk of infections by decontaminating sharps before disposal, and bury them in a pit to make it difficult for others to scavenge them. (More information on proper disposal of medical waste is provided in Module 13: Waste Disposal.)

Definitions

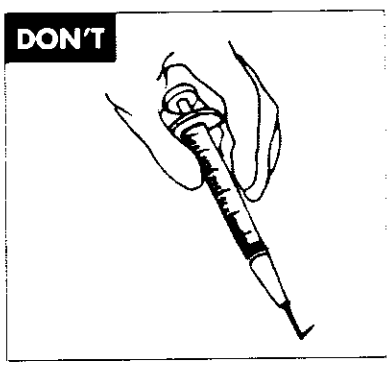
Decontamination: **the first step in processing instruments and other items for reuse. Decontamination kills viruses (such as hepatitis B, other hepatitis viruses, and HIV) and many other microorganisms, making instruments and other items safer to handle by staff who clean them. In addition, decontamination makes instruments and other items easier to clean by preventing blood, other body fluids, and tissue from drying on them. Decontamination is performed by soaking instruments and other items in a 0.5% chlorine solution for 10 minutes immediately after use.**

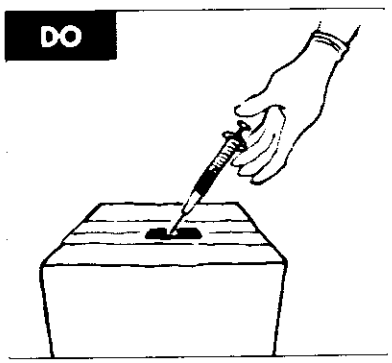
Sharps-disposal container: **a puncture-resistant container for disposal of used needles and other sharp objects. A sharps-disposal container may be made out of a heavy cardboard box, an empty plastic jug, or a metal container.**

When disposing of single-use needles and syringes:



Do *not* recap, bend, or break the needle, and do *not* remove the needle from the syringe by hand.



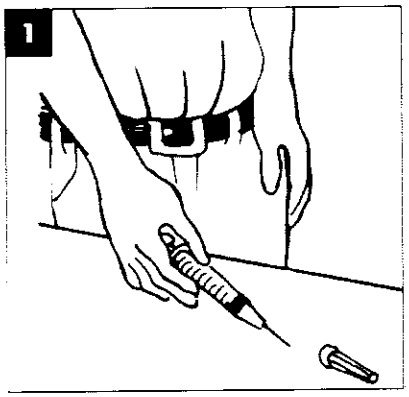


Dispose of the needle and attached syringe in a puncture-resistant sharps-disposal container.

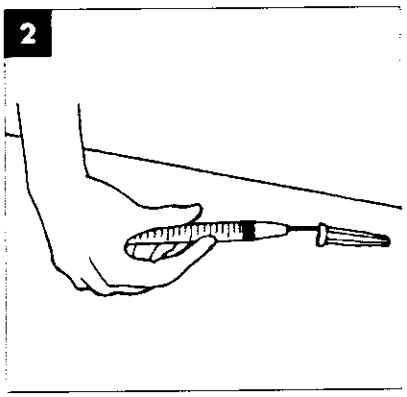
Empty sharps-disposal containers when they are three-quarters full to reduce the chances of injury when disposing of sharps.

Any delay in the disposal of sharps will increase the occurrence of accidents. Sharps-disposal containers should be conveniently located in areas where sharp objects are frequently used.

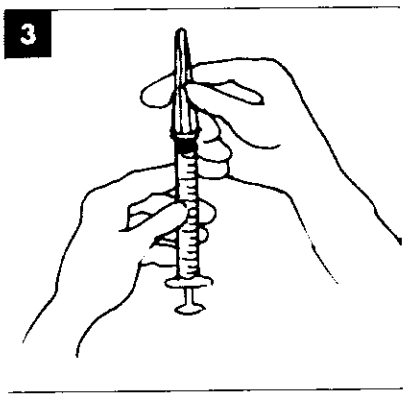
If needles must be recapped, use the "one-hand" technique:



Place the cap on a flat surface, then remove your hand.



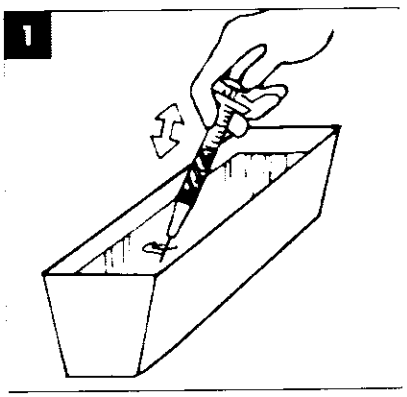
With one hand, hold the syringe and use the needle to "scoop up" the cap.



When the cap covers the needle completely, use the other hand to secure the cap on the needle hub, being careful to handle the cap at the bottom only, near the hub.

Steps of Decontaminating Reusable Hypodermic Needles and Syringes

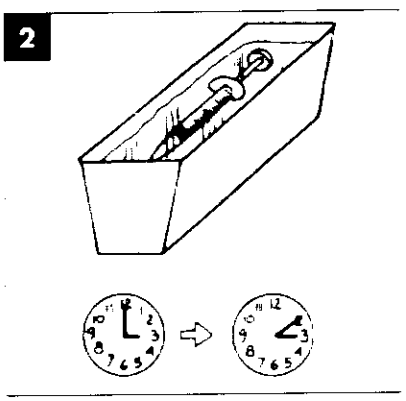
1 Immediately after use, fill the assembled needle and syringe with a 0.5% chlorine solution, and flush (draw in and expel the solution) several times.



2 Drop the needle and syringe into a container of 0.5% chlorine solution, and let them soak for 10 minutes.

3 Remove the needle and syringe from the solution, using pickups (lifters, cheatle forceps) or by hand, if hands are protected by utility gloves.

4 Rinse by flushing with clean water, or clean immediately.



More information on decontamination and processing of needles and syringes is provided in Modules 7–11.

Management of Injuries from Needles and Other Sharps

Review the material on the steps to take after accidental exposure to blood or other body fluids. Highlight the need for all staff who are at risk of exposure to blood or other body fluids to be vaccinated against hepatitis B.

Management of Injuries from Needles and Other Sharps

All staff who are at risk of exposure to blood or other body fluids should be vaccinated against hepatitis B.

If accidental exposure to blood or other body fluids occurs:

- Wash needlesticks and cuts with soap and water
- Flush splashes to the nose, mouth, or skin with water
- Irrigate splashes to the eyes with water or saline

There is **no** scientific evidence that cleaning the wound with an antiseptic or squeezing the wound decreases the risk of transmitting bloodborne pathogens. Do **not** use caustic agents, such as bleach, on sharp-object injuries.

Postexposure Prophylaxis

Postexposure prophylaxis with drugs or other therapy can reduce the risk of transmission of some bloodborne pathogens. Whether postexposure prophylaxis is indicated following exposure to blood or other body fluids depends on a number of factors, including the infection status of the source client (the client whose blood or other body fluids are involved), the type of exposure (e.g., a splash to the skin versus a deep puncture wound with a very bloody hypodermic needle), whether or not the exposed person has been vaccinated against hepatitis B, how much time has passed since the exposure, and the availability of needed drugs or other therapy.

Therapies include:

- **For hepatitis B** - Hepatitis B immune globulin and hepatitis B vaccine can reduce the risk of infection after exposure to blood and other body fluids containing the hepatitis B virus.
- **For HIV** - Several antiretroviral drugs, used either alone or in combination, have been recommended to reduce the risk of HIV transmission following accidental exposure in health care workers. These include zidovudine (AZT, Retrovir), lamivudine (3TC, Epivir), indinavir (Crixivan), and nelfinavir (Viracept).
- **For hepatitis C** - There is no postexposure prophylaxis available for hepatitis C; neither immune globulin nor antiviral drugs have been shown to reduce the risk of hepatitis C transmission.

Detailed protocols for the administration of postexposure prophylaxis are beyond the scope of this training course. If you, a co-worker, or a client has been exposed to blood or other body fluids, consult an infectious-diseases specialist familiar with postexposure prophylaxis.

Giving Injections

Review the recommended practice for giving injections. Emphasize the fact that although reusing a syringe to give injections to multiple clients may be convenient or reduce costs, it puts clients at risk of infections. If desired, you may conduct the following optional activity.

Optional Activity: Discussion Topic *(Approximate time: 5 minutes)*

Present the following situation to the participants and then ask them the questions below: In clinic A, the injectable contraceptive Depo-Provera comes in multidose vials. Due to the shortage of syringes, the service provider attaches a fresh needle before drawing up the medication for each client, but uses one syringe to give injections to multiple clients. She changes the syringe after every seven clients.

- Is this a safe practice? Why?
- If not, what can be done to address the problem created by the shortage of syringes? *[Possible response: Purchase more syringes on the open market, ask clients to purchase and bring a new, disposable syringe to the clinic, or process reusable syringes so that they can be used again.]*

Use of Multidose Vials

Review the recommended practice for using multidose vials. If desired, you may conduct one or more of the following optional activities. Stress that although leaving one needle inserted in a vial cap for multiple uses may be convenient or reduce costs, it puts clients at risk of infections.

Optional Activity: Video Viewing *(Approximate time: 5–10 minutes)*

Show TDS 10 (length 2:50) from the infection prevention video, which covers multidose vials. Allow for the participants' questions and clarify as needed. When the segment is over, review the material presented with the participants, and allow for questions.

Training Option

The video can be shown either at the beginning of the session to introduce the topic or at the end of the session for review.

Optional Activity: Discussion Topic *(Approximate time: 10 minutes)*

Facilitate a discussion by asking the participants how they use multidose vials at their facilities. Record their responses on a flipchart. Identify the practices presented by the participants that are consistent with the recommended practices. For each practice that is not consistent with the recommended approach, ask the participants to explain why the practice would pose a risk to the client. Ask the participants if there are any reasons why they would not follow the recommended practices; if there are, explore the reasons for problems, and guide the group in a problem-solving discussion. Record their comments on a flipchart and save it for use in developing implementation plans in Module 14: Implementation Plans and Closure.

Giving Injections

To reduce the risk of transmitting infections between clients:

- **Always** use a new or correctly reprocessed hypodermic needle *and* syringe every time an injection is given.
- **Never** change the needle without also changing the syringe between clients. Reusing the same syringe to give injections to multiple clients—even if the needle is changed—is **not** a safe practice.

Before giving an injection:

- If there is visible dirt, wash the injection site with soap and water.
- Wipe the client's skin at the injection site with an antiseptic solution to minimize the number of microorganisms and reduce the risk of infections. Using a fresh swab, wipe in a circular motion from the center outward.
- If alcohol is used, allow the alcohol to dry in order to provide maximum effectiveness in reducing microorganisms.

Unexpected client motion at the time of injections can lead to accidents. Therefore, always warn clients when you are about to give an injection.

To avoid needlestick accidents, follow the instructions on pages 6.4 and 6.5 for proper disposal and decontamination of used needles and syringes.

To avoid transmitting infections when giving IV fluids:

- Unhook the needle or catheter from the IV line, and dispose of it in a sharps-disposal container.
- Throw away the IV line and any remaining fluid. Microorganisms can survive and grow in IV fluids; if the IV line and bag/bottle of fluid are used again, infections can be transmitted to other clients.
- **Never** use the same IV line and fluid bag/bottle with multiple clients.

Use of Multidose Vials

Before filling a syringe from a multidose vial:

- Check the vial to be sure there are no leaks or cracks.
- Check the solution to be sure it is not cloudy and that there is no particulate matter in the vial. (*Note:* Most solutions that come in vials are clear. One exception is the injectable contraceptive Depo-Provera, which is milky.)
- Wipe the top of the vial with a fresh cotton swab soaked with 60–70% alcohol; allow to dry.

To reduce the risk of transmitting infections between clients:

- **Always** use a new or correctly processed hypodermic needle *and* syringe every time medication is withdrawn from a multidose vial. Reusing the same syringe to give injections to multiple clients—even if the needle is changed—is **not** a safe practice.
- **Never** leave one needle inserted in the vial cap for multiple uses. This provides a direct route for microorganisms to enter the vial and contaminate the fluid between each use.

"At My Facility..."

Ask the participants to write their responses to the questions in the space provided. Remind them to answer the questions as honestly as possible. Ask them to think about their response to each question to see if it reflects an appropriate infection prevention practice or if there are issues that need to be addressed. Ask them to write down any problems they identify. Allow 10 minutes for completion.

Optional Activity: Discussion Topic *(Approximate time: 10 minutes)*

Ask for volunteers to share their responses, and allow for discussion.

"At My Facility..."

Think about your clinical setting and write your answers to the following questions in the space provided. At your facility:

- Are sharps—scalpels, in particular—passed from the surgeon to the assistant using a hands-free technique?

- Are sharps disposed of in puncture-resistant containers without recapping, bending, or breaking needles?

- Are a new or correctly processed hypodermic needle *and* syringe used each time an injection is given or medication is withdrawn from a multidose vial?

- Are needles left inserted in the caps of multidose vials between uses?

Do your responses to these questions reflect an understanding or performance of appropriate infection prevention practices at your facility? If, based on your responses, you become aware of some problems or issues that need to be addressed, list them below:

Summary/Self-Assessment Answers

1. No. The number-one cause of occupational exposure to bloodborne pathogens is by needlestick injuries, many of which occur while recapping needles. To reduce the risk of infections to health care workers, needles should not routinely be recapped before disposal.
2. Puncture-resistant sharps-disposal containers should be placed in every room where sharps disposal may be necessary. The uncapped needle and attached syringe should be immediately disposed of in a puncture-resistant container.

Optional Activity: Discussion Topic *(Approximate time: 10 minutes)*

Read aloud the case study, and facilitate a discussion by asking the participants the questions that appear in the Participant's Handbook.

Answers to true/false questions:

3. F
4. T
5. F

Answers to multiple-choice questions:

6. c, d

Summary/Self-Assessment

Answers are provided at the end of this assessment.

Review the following case study, which appeared at the beginning of this module, and answer the questions below:

Your clinic has a special container for disposing of sharps. The container is located in the vaccination room, since that is where most injections are given. Occasionally, clients need to be given injections in the treatment room, which is down the hall from the vaccination room. When this occurs, the nurses recap the hypodermic needles, carry them down the hall to the vaccination room, and dispose of them in the sharps-disposal container.

1. Is this a good approach for reducing the risk of infections? Why?

2. What should be done differently to reduce the risk?

Decide whether each of the following statements is T (true) or F (false). Write your response for each statement in the space provided.

3.____ As long as both the surgeon and assistant are careful, directly passing the scalpel from one to the other is a relatively safe practice. (page 6.3)

4.____ Most occupationally acquired bloodborne infections are the result of preventable accidents with needles or other sharps. (page 6.2)

5.____ Housekeeping staff are rarely at risk of injury or infections caused by sharps, such as hypodermic needles or scalpel blades, because they are not involved directly in client-care activities. (page 6.2)

The following are multiple-choice questions. More than one option may be correct. Please circle the correct response(s).

6. To reduce the risk of infections or injury after giving an injection: (page 6.4)
   a. Always break the needle before disposal
   b. Remove the needle from the syringe and dispose of it in a puncture-resistant container
   c. Dispose of the needle and syringe in a puncture-resistant sharps container as soon as possible after use
   d. Avoid recapping hypodermic needles

7. Which of the following viruses is most easily transmitted after an injury with a contaminated hypodermic needle? (page 6.2)

   a. Hepatitis B
   b. Hepatitis C
   c. HIV
   d. All of these viruses are transmitted at the same rate

8. Which of the following are appropriate infection prevention practices? (page 6.7)

   a. Changing the needle, but not the syringe, between injections
   b. Leaving a hypodermic needle inserted through the stopper of a multidose vial
   c. Using a new or properly processed needle and syringe to draw up medication from a multidose vial
   d. Using the same IV line and bag of fluids on multiple clients until the bag is empty

Answers: 1. No. The number-one cause of occupational exposure to bloodborne pathogens is by needlestick injuries, many of which occur while recapping needles. To reduce the risk of infections to health care workers, needles should not routinely be recapped before disposal; 2. Puncture-resistant sharps-disposal containers should be placed in every room where sharps disposal may be necessary. The uncapped needle and attached syringe should be immediately disposed of in a puncture-resistant container; 3. F; 4. T; 5. F; 6. c, d; 7. a; 8. c

MODULE 7 Introduction to Processing of Instruments and Other Items

Trainer's Notes for Module 7

This portion of the infection prevention curriculum (Modules 7–11) covers the processing of instruments and other items for reuse. The next four modules discuss decontamination (Module 8), cleaning (Module 9), sterilization (Module 10), and high-level disinfection (Module 11). This module provides an introduction to this content.

Audience **The content of this portion of the curriculum (Modules 7–11) is geared toward all levels of staff, depending on their responsibilities. While doctors most likely will not be performing most of the processing activities themselves, they may be supervising those who do. Similarly, nurses and midwives may or may not be performing these activities, but may be supervising them. Therefore, service providers should be familiar with all of the content in these modules.**

Ancillary staff may perform some or all of these activities, depending on their specific job duties. For example, a housekeeper or cleaner may prepare the decontamination solution, clean the instruments and other items, and even run the autoclave. Therefore, teaching of this content should focus on what the staff members need to know to perform their duties properly.

The content of this introductory module is useful to all levels of staff. Specific suggestions regarding the training audience are provided in the trainer's notes for each module.

☞ Training Tip

If ancillary staff are responsible for processing instruments and other items, it is important to spend time working with them to ensure that they understand and are able to properly perform all of the tasks presented in Modules 8–11. This is particularly important with low-literate/illiterate staff, who may be unable to easily use the Participant's Handbook and other materials, such as wall charts, for reference. When training is conducted on-site, be sure to allocate enough time for demonstrating and practicing the procedures presented in these modules, as well as for assisting in resolving any problems that may exist.

Training Time

25 minutes to 1½ hours, depending on which training activities are used.

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MODULE 7 Introduction to Processing of Instruments and Other Items

Materials and Supplies

- ✓ Transparencies for Module 7 (optional)
- ✓ Overhead projector (optional)
- ✓ Supplies for drawing floor plans (paper, colored pencils or pens)
- ✓ Flipchart paper, masking tape, and colored markers

Advance Preparation

- Determine which training activities will be used to present the content of this module. For on-site training, review the activities presented in Appendix E: On-Site Training Activities. Prepare or gather any supplies needed for the activities you will be conducting.
- Create transparencies or flipcharts, as needed.

Introduction

Introduce this module by reviewing the purpose and objectives that appear in the Participant's Handbook. If desired, you may conduct the following optional activity.

Optional Activity: Case Study *(Approximate time: 5 minutes)*

Read aloud the introductory case study, and direct the participants to the instructions that appear in their handbook.

MODULE 7 Introduction to Processing of Instruments and Other Items

Introduction

Purpose and Objectives

This portion of the infection prevention curriculum covers the processing of instruments and other items for reuse. The next four modules discuss decontamination (Module 8), cleaning (Module 9), sterilization (Module 10), and high-level disinfection (Module 11). This module provides an introduction to this content. Upon completion of this module, you should be able to:

- Briefly define the following steps of processing instruments and other items: *decontamination*, *cleaning*, *sterilization*, and *high-level disinfection*
- List the appropriate order for conducting the steps of processing instruments and other items and explain the importance of carrying out the steps in the correct order
- Identify how to appropriately organize an area of the facility for processing instruments and other items

Read the following case study, and try to keep it in mind as you learn the content of this module. See if you can determine whether the situation presents a risk of infection transmission and, if so, what should be done differently to reduce the risk. Questions about the case study appear in the Summary/Self-Assessment at the end of this module.

Nurse Wafula, who assists the surgical team of a large hospital, is responsible for cleaning the instruments and other items used during surgery. To make sure that she is always available to assist the team, Nurse Wafula cleans the instruments and other items used during the prior surgery in the operating theater while the next surgery is going on. The new head nurse asks her to discontinue cleaning instruments and other items in the operating theater.

Directions for Independent Study

If you are preparing for this module independently, you should:

- Study this module.
- Answer the "At My Facility..." questions for this module.
- Answer the Summary/Self-Assessment questions at the end of this module.
- Write down any questions you have about this module for later discussion with the trainer.

Overview

Review the information in the Participant's Handbook. If desired, you may conduct the following optional activity. Emphasize that appropriate processing of instruments and other items is essential for providing safe services to clients and protecting health care workers.

Optional Activity: Discussion Topic *(Approximate time: 10 minutes)*

Facilitate a discussion by asking the participants to review some of the ways that infections can be transmitted to health care workers during the processing of instruments and other items. This should be a review of the content presented in previous modules.

Overview

Properly processing instruments and other items before reuse is critical to reducing the transmission of infections during clinical procedures. It is important to keep in mind that staff involved in processing instruments and other items are themselves at high risk of infections and need to take appropriate steps to reduce this risk.

Definition

The term ***instruments and other items***, as used in this curriculum, includes:

- Instruments used during surgery or other clinical procedures, such as pelvic examination, insertion of IUD or Norplant implants, childbirth, manual vacuum aspiration (MVA), and collection of samples for testing for sexually transmitted diseases
- Other items that are reused during the delivery of health services, such as pickups (lifters or cheatle forceps), instrument pans and trays, reusable hypodermic needles and syringes, reusable gloves, and linen

When processing instruments and other items, staff are at risk of exposure to blood or other body fluids through:

- Open cuts on the hands or forearms; chapped or cracked hands
- Injuries from needlesticks or other sharp instruments (such as scalpel blades)
- Splashing of blood or other body fluids contained on the instruments or other items onto mucous membranes (such as the eyes)

Measures to protect health care workers who handle used instruments and other items focus on:

- Destroying many harmful microorganisms early in the processing regimen
- Preventing blood and other body fluids from coming in contact with the skin or mucous membranes

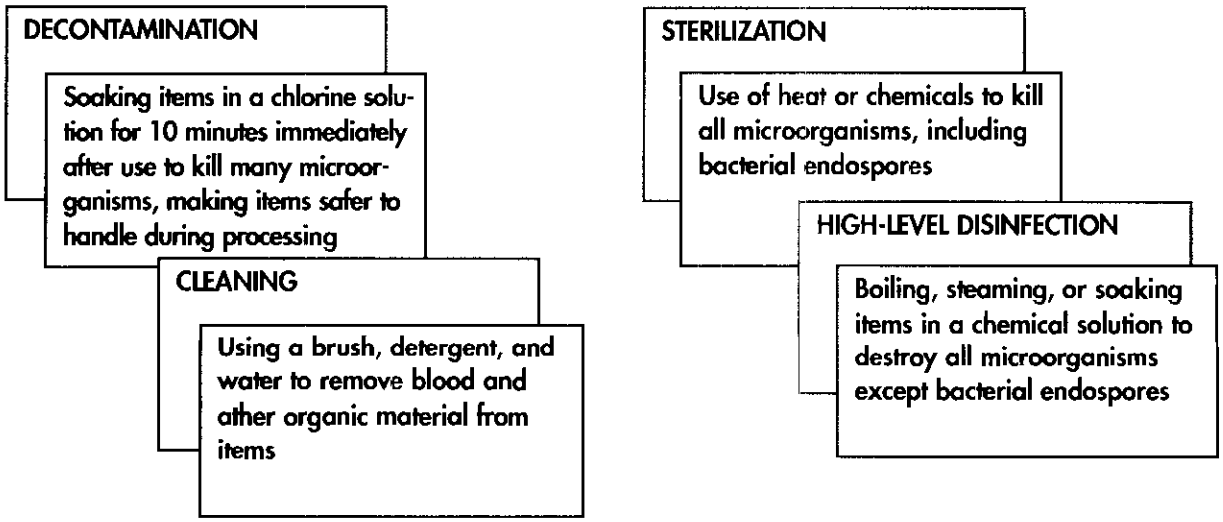
Remember: Always wear gloves (preferably heavy utility gloves) when handling potentially contaminated instruments and other items.

Steps of Processing Instruments and Other Items

Review the steps of processing instruments and other items. If desired, you may conduct the following optional activity.

Optional Activity: Large-Group Exercise *(Approximate time: 15 minutes)*

Prepare small pieces of paper or index cards, as shown below, showing either the name of an instrument-processing step or the brief definition of a step:



Fold the pieces of paper/index cards and place them in a bowl or bag. Ask the participants to pick the pieces of paper/index cards until all have been selected and then find the partner for their term or definition by posting their terms and matching definitions on the wall. When all the matches are made, lead the participants in confirming the accuracy of the matches. Read aloud the expanded definitions of the terms that appear in the Participant's Handbook.

Training Option

This activity may be conducted in several different ways, depending on the number of participants in the group. If there are fewer than eight participants, instruct each participant to pick more than one piece of paper/index card. If there are more than eight participants, either ask for eight volunteers to participate in the activity, or break the participants into groups and ask one member of each group to pick a piece of paper/index card.

Note that performing the steps of processing instruments and other items is necessary to protect clients and health care workers from the risk of infections. Even though most items will be sterilized or high-level disinfected, decontamination and cleaning must be performed first in order to make the items safer for handling by staff and to ensure that sterilization or HLD can be achieved.

Highlight the fact that sterilization is preferred over high-level disinfection for instruments or other items that will come in contact with the bloodstream or tissues under the skin. When sterilization is not available, high-level disinfection is the **only** acceptable alternative.

Steps of Processing Instruments and Other Items

Processing instruments and other items involves several steps that reduce the risk of transmitting infections from used instruments and other items to health care workers and clients: decontamination, cleaning, and either sterilization or high-level disinfection.

Definitions

1. *Decontamination:* the first step in processing instruments and other items for reuse. Decontamination kills viruses (such as hepatitis B, other hepatitis viruses, and HIV) and many other microorganisms, making these instruments and other items safer to handle by staff who clean them. In addition, decontamination makes instruments and other items easier to clean by preventing blood, other body fluids, and tissue from drying on them. Decontamination is performed by soaking instruments and other items in a 0.5% chlorine solution for 10 minutes immediately after use.

2. *Cleaning:* scrubbing with a brush, detergent, and water before instruments and other items are sterilized or high-level disinfected to remove blood, other body fluids, organic material, tissue, and dirt. In addition, cleaning greatly reduces the number of microorganisms (including bacterial endospores) on instruments and other items and is a crucial step in processing instruments and other items. If instruments and other items have not first been cleaned, sterilization and high-level disinfection (HLD) may not be effective, because: (1) microorganisms trapped in organic material may be protected and survive the sterilization or HLD process; and (2) organic material and dirt can make the chemicals used in chemical sterilization and HLD less effective.

3. *Sterilization:* the process that eliminates **all** microorganisms (bacteria, viruses, fungi, and parasites), including bacterial endospores. Sterilization is recommended for instruments and other items that will come in contact with the bloodstream or tissues under the skin. Sterilization can be performed using steam under pressure (autoclaving or moist heat), dry heat, or chemicals.

or

High-level disinfection (HLD): the process that eliminates all microorganisms (including bacteria, viruses, fungi, and parasites), but does **not** reliably kill all bacterial endospores, which cause diseases such as tetanus and gas gangrene. HLD is suitable for instruments and other items that will come in contact with broken skin or intact mucous membranes. HLD can be performed by boiling, use of chemicals, or steaming.

Because sterilization kills **all** microorganisms, including bacterial endospores, it is preferable to HLD for instruments and other items that will come in contact with the bloodstream or tissues under the skin. If sterilization is not available or feasible, HLD is the **only** acceptable alternative for these instruments/items. In settings in which tetanus is common, all attempts should be made to sterilize such instruments and other items.

Proper Order of the Steps of Processing

Direct the participants' attention to Figure 7-1, which portrays the steps of processing instruments and other items, and review the proper order of the steps. If desired, you may conduct one or more of the following optional activities. Mention that to avoid contaminating instruments and other items, storing them properly after sterilization or high-level disinfection is as important as processing them properly.

Optional Activity: Discussion Topic *(Approximate time: 10–15 minutes)*

Facilitate a discussion by asking the participants:

- Are all of the steps of processing performed at your institution? If not, which steps are performed?
- Why is it important to perform the steps in the order shown?
- Why is it important to process instruments and other items?

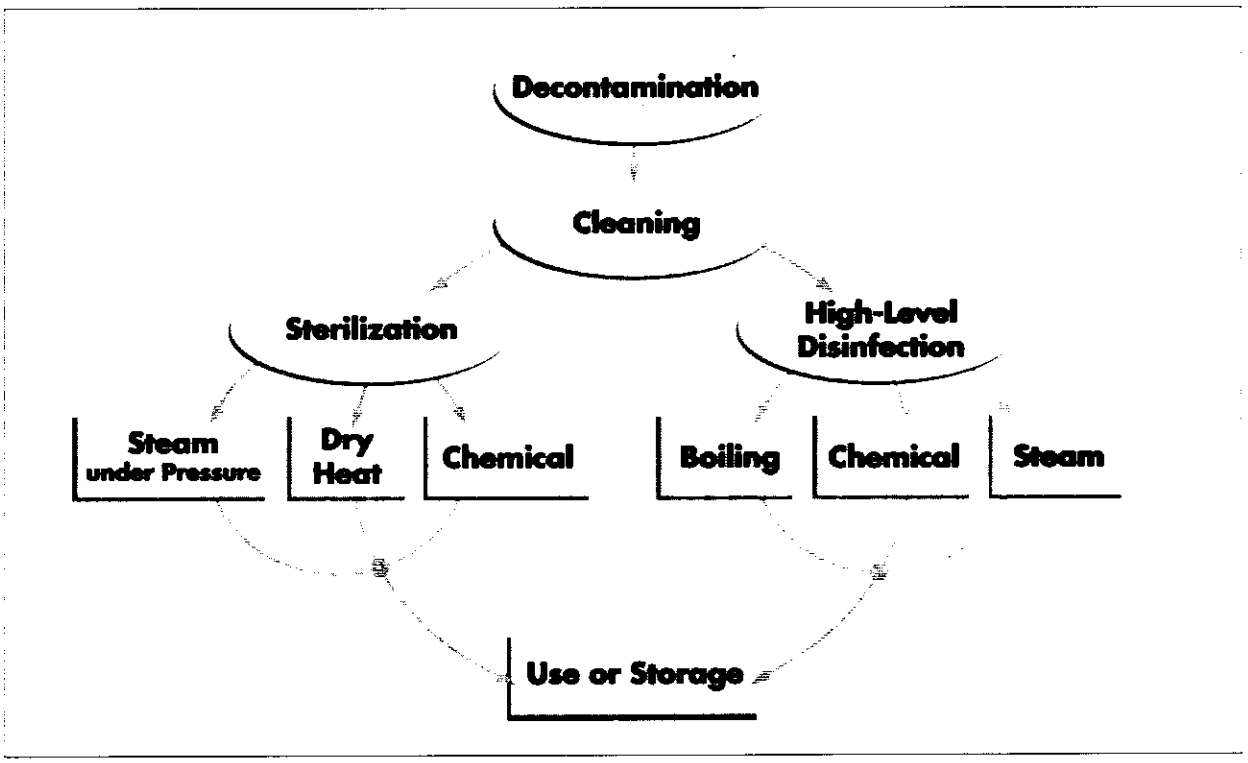
Optional Activity: Large-Group Exercise *(Approximate time: 30 minutes)*

Ask the participants to turn to Exercise 7-1: Instrument Processing Bingo, which appears on page 7.5 of their handbook. *Instructions for this exercise appear on page 244.*

Proper Order of the Steps of Processing

Figure 7-1, below, shows the steps of processing instruments and other items in the order in which they should be performed:

Figure 7-1. The Steps of Processing Instruments and Other Items



It is important to perform these steps in the appropriate order for several reasons:

- Decontamination should always be performed *first*, because it kills viruses, such as hepatitis B, other hepatitis viruses, and HIV, thus making instruments and other items safer to handle by staff who clean them.
- Cleaning should always be performed *before* sterilization or high-level disinfection (HLD), because it removes blood, other body fluids, dirt, and organic material that can interfere with the sterilization or HLD process. In addition, cleaning greatly reduces the number of microorganisms and bacterial endospores on instruments and other items.

To avoid contaminating instruments and other items after sterilization or HLD, proper storage is as critical as properly processing the items. (Storage is covered in detail in Module 10: Sterilization and Storage and Module 11: High-Level Disinfection and Storage.)

Exercise 7-1: Instrument Processing Bingo

Read the following instructions aloud. As you read them, display a transparency of the grid, if possible, and point to the appropriate spot on the grid.

1. **The grid is divided into 16 blocks. Each block consists of a column across the top (letters A–D) and a row along the left-hand side (numbers 1–4). Each row consists of 4 lines across. For example, the first line of row 1 going across is *decontamination, cleaning, sterilization,* and *HLD.***
2. **I will call out a block on the grid (e.g., B3), and then read a sentence about an infection prevention procedure. Listen carefully to the sentence as it is read.**
3. **After I read the sentence, select the correct infection prevention procedure from the four choices in that block, and circle the correct term. For example, for B3, the sentence is "This procedure involves the use of detergent and warm water." From the four choices in that block, the correct answer is "cleaning," so you would circle it.**
4. **As I continue calling out blocks and reading sentences, you should continue selecting the correct infection prevention procedure from the four choices in each block.**
5. **As you play the game and circle the answers, you may notice that you have circled several answers in one line of a row. When you have circled four terms in a line going across, call out "Bingo."**
6. **We will then review the "winner's" answers to make sure they are correct and to clarify them, if needed.**

Read the following sentences, either in the order in which they are presented or in random order. The blocks containing the correct answers in a horizontal row are A4, B4, C4, and D4. Therefore, one of these sentences should be read *last* to ensure that all the sentences have been read. *Note:* The answers appear after the sentences. Remember *not* to read the answers when reading the sentences.

Sentences

B3. This procedure involves the use of detergent and warm water. CLEANING

A1. This procedure requires soaking instruments and other items in a 0.5% chlorine solution for 10 minutes. DECONTAMINATION

B2. This procedure can be done by soaking in chemicals or by using moist or dry heat. STERILIZATION

C4. This procedure requires the use of a brush to remove organic material from instruments and other items. CLEANING

C1. One example of this procedure is rinsing gloved hands in a basin of 0.5% chlorine solution, making used gloves safe for further processing. DECONTAMINATION

D3. If this procedure is not done, sterilization and HLD may not be effective. CLEANING

A2. This procedure physically reduces the number of endospores on instruments and other items. CLEANING

A4. This procedure kills all microorganisms *except* some bacterial endospores. HLD

B4. This procedure makes instruments and other items safer to handle for further processing by rapidly killing microorganisms such as hepatitis B and HIV. DECONTAMINATION

C2. Steaming gloves is an example of this procedure. HLD

D1. This procedure uses a 0.5% chlorine solution as the first step in processing instruments and other items. DECONTAMINATION

A3. This procedure kills all microorganisms, including bacterial endospores. STERILIZATION

D2. This procedure can be achieved by soaking instruments and other items in chemicals or by boiling or steaming. HLD

B1. This is the only acceptable alternative for instruments and other items that will come in contact with the bloodstream when sterilization is not available. HLD

C3. This procedure can be performed by using moist or dry heat. STERILIZATION

D4. This procedure is used for instruments and other items that will come in contact with the bloodstream or tissues under the skin. STERILIZATION

Exercise 7-1: Instrument Processing Bingo

This exercise is a matching game that the trainer(s) may conduct during this training course. If so, follow the instructions for play, which the trainer(s) will read aloud.

	COLUMNS			
	A	**B**	**C**	**D**
ROW **1**	**Decontamination**	**Cleaning**	**Sterilization**	**HLD**
	Cleaning	**Sterilization**	**HLD**	**Decontamination**
	Sterilization	**HLD**	**Decontamination**	**Cleaning**
	HLD	**Decontamination**	**Cleaning**	**Sterilization**
ROW **2**	Decontamination	Cleaning	Sterilization	HLD
	Cleaning	Sterilization	HLD	Decontamination
	Sterilization	HLD	Decontamination	Cleaning
	HLD	Decontamination	Cleaning	Sterilization
ROW **3**	**Decontamination**	**Cleaning**	**Sterilization**	**HLD**
	Cleaning	**Sterilization**	**HLD**	**Decontamination**
	Sterilization	**HLD**	**Decontamination**	**Cleaning**
	HLD	**Decontamination**	**Cleaning**	**Sterilization**
ROW **4**	Decontamination	Cleaning	Sterilization	HLD
	Cleaning	Sterilization	HLD	Decontamination
	Sterilization	HLD	Decontamination	Cleaning
	HLD	Decontamination	Cleaning	Sterilization

Organizing an Area for Processing Instruments and Other Items

It is crucial that the participants understand the concept discussed in this session—the importance of preventing sterile or high-level disinfected (HLD) items from becoming contaminated. It is not enough that instruments and other items be properly processed and stored, and that a sterile or HLD field be achieved. The sterility or HLD status of the instruments and other items *must* be maintained.

Review the material in the Participant's Handbook, and conduct the following training activity. Make sure to explain that in many low-resource settings, all processing activities may occur in a single room that has only one sink. Therefore, it is imperative that the room be organized in a way in which activities can be conducted efficiently while keeping clean and soiled items separated. Direct the participants to Figures 7-2 and 7-3, which appear on pages 7.7 and 7.8 of their handbook.

Training Activity: Individual Exercise *(Approximate time: 20–30 minutes)*

Ask the participants to draw a floor plan of the room(s) at their facility in which instrument processing is done, labeling all sinks, countertops, work areas, storage areas, waste areas, and equipment contained there. Allow 10 minutes for completion. Have the participants put the drawings aside for use later in the session.

Later, after reviewing the information in the Participant's Handbook, ask the participants to look at their floor plans and think about how their facility is set up in relation to the guidelines presented in their handbook and Figures 7-2 and 7-3. Ask them what changes, if any, are needed to minimize the level of contamination in areas where "clean" activities take place in their facilities.

Next, ask the participants to use a different color pencil or pen and mark any changes that could be made on their floor plans to improve the flow of movement in the instrument processing area(s) to prevent contamination—that is, how the room(s) might be rearranged and which areas/items might be moved. Ask for volunteers to share their changes with the group. Check all of the participants' work to ensure that their changes will be sufficient to prevent contamination.

Training Option

If several of the participants are from the same facility, have them work together on drawing and critiquing the floor plans.

Organizing an Area for Processing Instruments and Other Items

One goal of infection prevention is to minimize the level of contamination in areas in which "clean" activities take place.

Areas in which "clean" activities take place include:

- Operating theaters
- Procedure rooms
- Work areas for sterilizing, high-level disinfecting, and storing instruments and other items

Areas in which "dirty" activities take place include rooms where instruments and other items are washed. ("Dirty" activities also take place in toilets, latrines, sluice rooms, and waste-storage sites, but these are not areas in which instruments and other items are processed.)

Contamination of a "clean" area can be minimized by:

- Reducing the number of people permitted in the area. It is important to restrict the number of people in the clean area to only those involved in the activities being carried out.
- Defining the movement of people and activities within the area. When processing instruments and other items, the flow of movement of soiled instruments and other items should be organized in a way in which clean or sterile/high-level disinfected items do not become contaminated. To minimize the likelihood of contamination, activity patterns should be established so that soiled objects never cross paths with clean, sterilized, or high-level disinfected instruments and other items.
- Separating areas where clean and dirty activities take place, and limiting the type of activities that take place in the clean area.

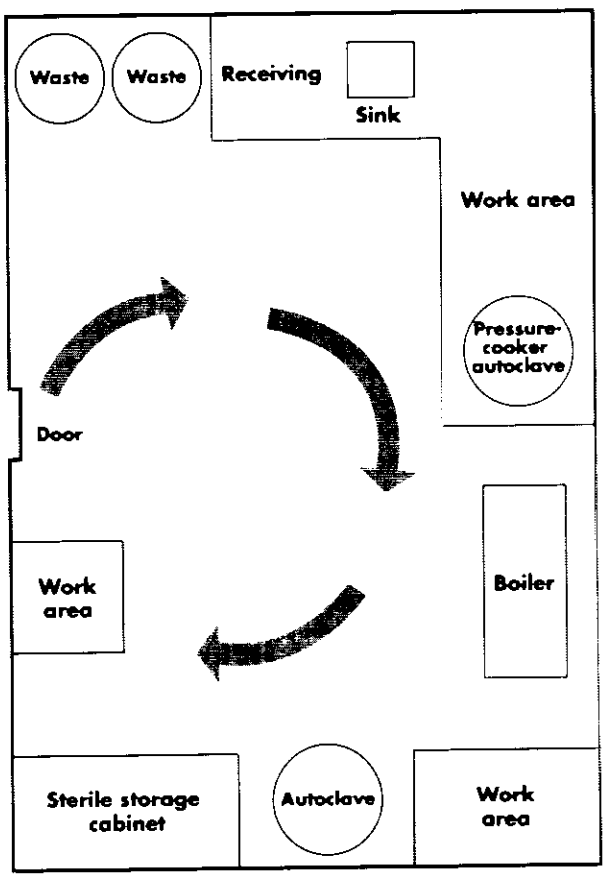
It is ideal to have separate rooms—one for receiving and cleaning instruments and other items, and another for final processing (sterilization or high-level disinfection) and storage. However, in many settings, this is not possible. When only one room is available for processing instruments and other items, it should be arranged so that activities and objects flow in an organized fashion from receiving used items to storing sterilized or high-level disinfected items. In either case, it is necessary to have at least one sink (two is preferable), sufficient countertop space for receiving dirty items and for drying and packaging clean items, and storage space (preferably closed cabinets). See Figures 7-2 and 7-3, which appear on the next two pages, for examples of ways to organize areas for processing instruments and other items.

To minimize contamination:

- Educate staff about which are the clean and dirty areas
- Designate and label processing areas, particularly when only one room is available for these activities
- Enclose processing rooms to minimize dust and eliminate flies
- If possible, ensure access to two sinks or basins with a clean water supply (one for cleaning and one for rinsing)

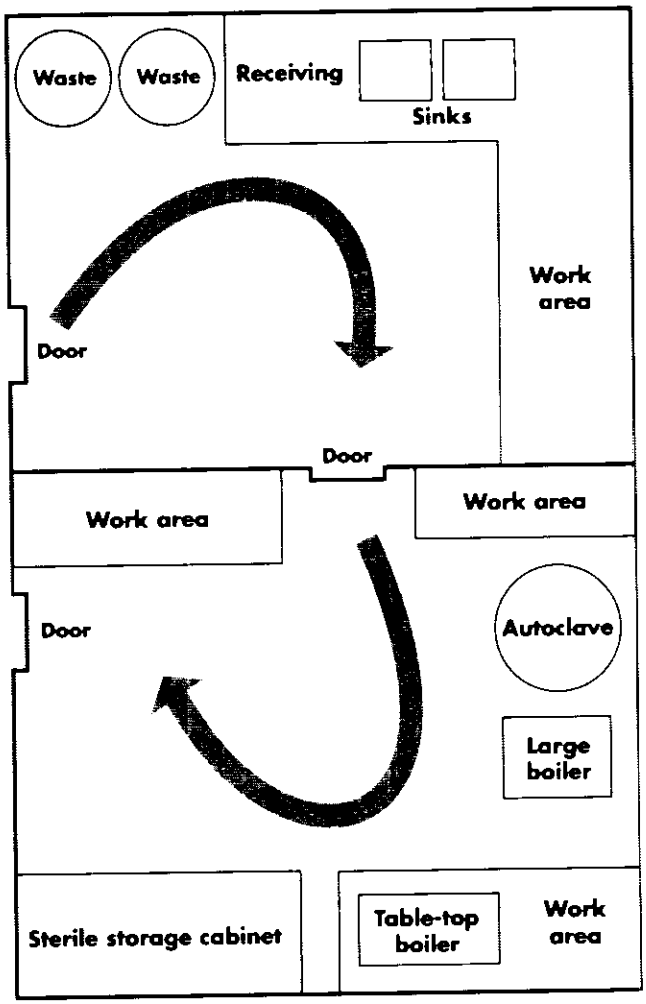
- Store clean, sterile, and high-level disinfected instruments and other items on shelves with doors to minimize the amount of dust and debris falling onto the packaging; avoid storing them on the floor
- Avoid using cardboard boxes for storage, as they can harbor insects and shed dust and debris
- Remove supplies from all shipping cartons and boxes before bringing supplies into an operating theater, procedure room, or clean work area

Figure 7-2. Single Room for Processing Instruments and Other Items



Note: Waste is placed in two different containers to separate the different kinds of waste generated in health care facilities. (This is covered in detail in Module 13: Waste Disposal.)

Figure 7-3. Separate Rooms for Processing Instruments and Other Items



Note: Waste is placed in two different containers to separate the different kinds of waste generated in health care facilities. (This is covered in detail in Module 13: Waste Disposal.)

"At My Facility..."

Ask the participants to write their responses to the questions in the space provided. Remind them to answer the questions as honestly as possible. Ask them to think about their response to each question to see if it reflects an appropriate infection prevention practice or if there are issues that need to be addressed. Ask them to write down any problems they identify. Allow 10 minutes for completion.

Optional Activity: Discussion Topic *(Approximate time: 10 minutes)*

Ask for volunteers to share their responses, and allow for discussion.

In addition, ask the participants to keep the material they generated during the session "Organizing an Area for Processing Instruments and Other Items" as a possible resource for their implementation plan for improving infection prevention practices, which they will develop in Module 14: Implementation Plans and Closure.

"At My Facility..."

Think about your clinical setting and write your answers to the following questions in the space provided. In addition, keep the material you generated during the session "Organizing an Area for Processing Instruments and Other Items" for possible use while developing your implementation plan for improving infection prevention practices at your facility in Module 14: Implementation Plans and Closure.

At your facility:

- Are instruments and other items decontaminated immediately after use?

- Do staff wear utility gloves when handling and cleaning potentially contaminated instruments and other items?

- Are all instruments and other items thoroughly cleaned before sterilization or high-level disinfection?

- Do staff understand the importance of keeping clean, sterile, and high-level disinfected items separate from dirty ones in order to reduce the risk of contamination?

- If you prepared one or more floor plans of the processing area(s) at your facility, make a few notes about how they resemble the suggested room layouts in Figures 7-2 and 7-3. Note any improvements that could be made.

Do your responses to these questions reflect an understanding or performance of appropriate infection prevention practices at your facility? If, based on your responses, you become aware of some problems or issues that need to be addressed, list them below:

Summary/Self-Assessment Answers

1. The operating theater is considered a "clean" area, and cleaning used instruments and other items is considered a "dirty" procedure. In this situation, it would be very easy to contaminate the instruments, other items, and sterile field by cleaning the instruments and other items from the prior surgery during the next surgery.
2. Dirty procedures should not be performed in clean areas; the instruments and other items should be cleaned in another room. In addition, a new client should not be brought into the operating theater until all instruments and other items used in a prior case have been removed and any potentially contaminated surfaces have been cleaned.

Optional Activity: Discussion Topic *(Approximate time: 10 minutes)*

Read aloud the case study and facilitate a discussion by asking the participants the questions that appear in the Participant's Handbook.

Answers to true/false questions:

3. F
4. T
5. T
6. T
7. F
8. T

Summary/Self-Assessment

Answers are provided at the end of this assessment.

Review the following case study, which appeared at the beginning of this module, and answer the questions below:

Nurse Wafula, who assists the surgical team of a large hospital, is responsible for cleaning the instruments and other items used during surgery. To make sure that she is always available to assist the team, Nurse Wafula cleans the instruments and other items used during the prior surgery in the operating theater while the next surgery is going on. The new head nurse asks her to discontinue cleaning instruments and other items in the operating theater.

1. Why would the new head nurse ask Nurse Wafula to discontinue this practice?

2. What should be done differently to reduce the risk of infections?

Decide whether each of the following statements is T (true) or F (false). Write your response for each statement in the space provided.

3. ____ If instruments and other items are very bloody, it is best to rinse them before putting them in the decontamination solution. (page 7.3)

4. ____ High-level disinfection kills all microorganisms, with the exception of some bacterial endospores. (page 7.3)

5. ____ Cleaning is critical in order for sterilization and high-level disinfection to be effective. (page 7.3)

6. ____ Boiling is one way of high-level disinfecting instruments and other items. (page 7.3)

7. ____ High-level disinfection is preferable to sterilization for instruments and other items that will come in contact with the bloodstream or tissues under the skin. (page 7.3)

8. ____ When processing instruments and other items, sterile and high-level disinfected instruments and other items should never cross paths with dirty ones. (page 7.6)

Answers to multiple-choice questions:

9. a, b, d
10. a, b, c, d

The following are multiple-choice questions. More than one option may be correct. Please circle the correct response(s).

9. Which of the following are methods of sterilization? (page 7.3)

   a. Moist heat
   b. Soaking in chemicals
   c. Boiling
   d. Dry heat

10. Decontamination: (page 7.3)

   a. Is important because it protects health care workers from potentially fatal infections
   b. Is performed by soaking instruments and other items in a chlorine solution
   c. Leads to rapid killing of HIV and the hepatitis viruses
   d. Makes instruments and other items easier to clean

Answers: 1. The operating theater is considered a "clean" area, and washing used instruments and other items is considered a "dirty" procedure. In this situation, it would be very easy to contaminate the instruments, other items, and sterile field by cleaning the instruments and other items from the prior surgery during the next surgery; 2. Dirty procedures should not be performed in clean areas; the instruments and other items should be cleaned in another room. In addition, a new client should not be brought into the operating theater until all instruments and other items used in a prior case have been removed and any potentially contaminated surfaces have been cleaned; 3. F; 4. T; 5. T; 6. T; 7. F; 8. T; 9. a, b, d; 10. a, b, c, d

MODULE 8 Decontamination and Preparation of Chlorine Solutions

Trainer's Notes for Module 8

This module covers decontamination, the first step in processing instruments and other items for reuse. Decontamination minimizes the risk of infection transmission to health care workers, including cleaning and housekeeping staff, who handle used instruments or other items that may be contaminated with clients' blood or other body fluids.

Audience **The content of this module is geared toward anyone who is involved in providing services to clients, preparing chlorine solutions, and processing instruments and other items, as well as those who supervise (and perhaps train) the staff who perform these activities. This includes doctors, nurses, midwives, medical/surgical assistants, and, depending on their duties, housekeepers and cleaners.**

☞ Training Tip

If most of the participants are doctors, who may not recognize or acknowledge the need to cover this material, emphasize that it is important for them to know how to decontaminate instruments and other items by placing them in the decontamination bucket without splashing, and to remember to always rinse their gloves in a decontamination solution before removing them. These service providers may also play a role in supervision or in making decisions regarding supplies, and thus need to understand the importance of decontamination, how to prepare solutions, and what the decontamination process involves.

Training Time

40 minutes to 1 hour, depending on which training activities are used.

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MODULE 8 Decontamination and Preparation of Chlorine Solutions

Materials and Supplies

- ✓ Transparencies for Module 8 (optional)
- ✓ Overhead projector (optional)
- ✓ Television and videocassette recorder (optional)
- ✓ *Infection Prevention for Family Planning Service Programs*, AVSC International/FHRIGO video, TDS 4 and 8 (optional)
- ✓ Samples of locally available bleach (liquid, powder, or tablets)
- ✓ Supplies for preparing a chlorine solution (bleach, water, a bucket or other container for mixing the solution, and a container for measuring)
- ✓ Flipchart paper, marking tape, and colored markers

Advance Preparation

- Determine which training activities will be used to present the content of this module. For on-site training, review the activities presented in Appendix E: On-Site Training Activities. Prepare or gather any supplies needed for the activities you will be conducting.
- Set up an area to demonstrate preparing a chlorine solution.
- Find out what types of bleach are easily available in the participants' locale and prepare the answer key for Exercise 8-1: Calculation Exercises (on page 269) by calculating how to make a 0.5% chlorine solution from the various locally available bleach products.
- Cue the video to TDS 8, if used.
- Create transparencies or flipcharts, as needed.

Introduction

Introduce this module by reviewing the purpose and objectives that appear in the Participant's Handbook. If desired, you may conduct the following optional activity.

Optional Activity: Case Study *(Approximate time: 5 minutes)*

Read aloud the introductory case study, and direct the participants to the instructions that appear in their handbook.

MODULE 8 Decontamination and Preparation of Chlorine Solutions

Introduction

Purpose and Objectives

This module covers decontamination, the first step in processing instruments and other items for reuse, and prepares you to correctly decontaminate instruments and other items. Upon completion of this module, you should be able to:

- Define *decontamination*
- Calculate how to make a 0.5% chlorine solution from locally available bleach (liquid, powder, or tablets)
- Describe the steps of the decontamination process
- Identify special considerations for decontaminating the following:
  - reusable needles and syringes
  - gloves
  - linen
  - storage containers for instruments and other items
  - laparoscopes
  - instruments used during manual vacuum aspiration (MVA)

Read the following case study, and try to keep it in mind as you learn the content of this module. See if you can determine whether the situation presents a risk of infection transmission and, if so, what should be done differently to reduce the risk. Questions about the case study appear in the Summary/Self-Assessment at the end of this module.

After surgery, Mr. John, the cleaner, takes the bloody instruments and other items to the sink and rinses off most of the blood before putting them in the bucket of decontamination solution. He is concerned that if he does not rinse the instruments and other items first, the decontamination solution will become bloody after just a few procedures and he will have to replace it.

Directions for Independent Study

If you are preparing for this module independently, you should:

- Study this module.
- Investigate the type and concentration of bleach that is currently used at your facility or, if bleach is not currently being used, is locally available.
- Complete Exercise 8-1: Calculation Exercises.
- Complete Exercise 8-2: Case Studies.
- Answer the "At My Facility..." questions for this module.
- Answer the Summary/Self-Assessment questions at the end of this module.
- Write down any questions you have about this module for later discussion with the trainer.

Definition and Importance of Decontamination

Review the definition of *decontamination,* and conduct the following training activity. Highlight the fact that decontamination is primarily performed to make used/soiled instruments and other items safer for handling by staff responsible for cleaning.

Training Activity: Discussion Topic *(Approximate time: 10–15 minutes)*

Facilitate a discussion on decontamination by asking the participants:

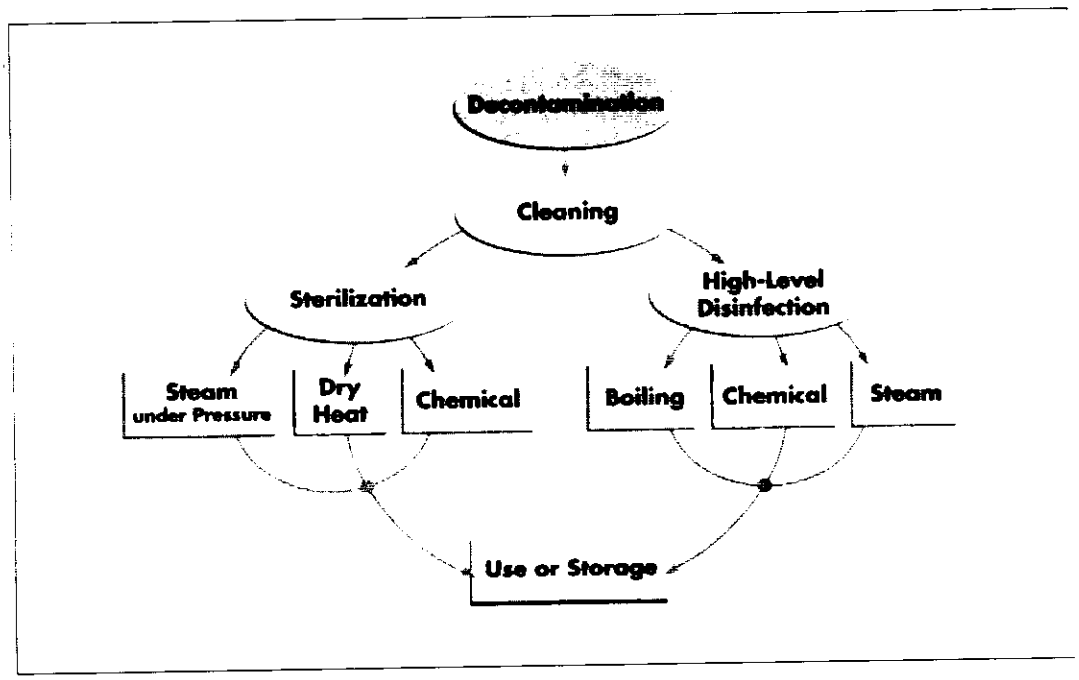
- Are instruments and other items decontaminated at your facility as part of the procedure for processing instruments and other items?
- If so, how is it performed?

Definition and Importance of Decontamination

Definition

Decontamination: the first step in processing instruments and other items for reuse. Decontamination kills viruses (such as hepatitis B, other hepatitis viruses, and HIV) and many other microorganisms, making instruments and other items safer to handle by staff who clean them. In addition, decontamination makes instruments and other items easier to clean by preventing blood, other body fluids, and tissue from drying on them. Decontamination is performed by soaking instruments and other items in a 0.5% chlorine solution for 10 minutes immediately after use.

As shown in the figure below, decontamination is the first step in processing instruments and other items for reuse.



Preparing a Chlorine Solution

Review the material on page 8.3 of the Participant's Handbook. If desired, you may conduct one or more of the following optional activities. Discuss the role that products containing chlorine have played in health care settings, as well as the fact that these solutions are ideal for decontamination. Bleach—usually locally available in liquid or powdered form—is a chlorine-containing compound suitable for decontamination. Note that it is the "active" (or available) chlorine in the bleach that kills microorganisms. Point out that a 0.5% chlorine solution should be used for decontamination.

Optional Activity: Video Viewing *(Approximate time: 10–15 minutes)*

Show TDS 8 (length 4:39) from the infection prevention video, which demonstrates how to prepare a chlorine solution. When the segment is over, review the material presented with the participants and allow for questions.

Training Option

The video can be shown either at the beginning of the session to introduce the topic or at the end of the session for review.

Optional Activity: Discussion Topic *(Approximate time: 5–10 minutes)*

Ask the participants what problems can arise if chlorine solutions are mixed improperly, so that they are too weak or too strong (which is a common problem). Important points include:

- A solution that is too weak (less than 0.5% active chlorine) may not adequately kill microorganisms during the recommended time for soaking. As a result, staff will be at risk of infections from instruments, other items, and environmental surfaces.
- A solution that is too strong (more than 0.5% active chlorine) may increase the cost of supplies by using more bleach than necessary and may damage instruments, other items, and environmental surfaces.

Preparing a Chlorine Solution

Chlorine is one of the oldest and most widely used products for preventing infections in health care settings because:

- It is a proven and powerful killer of microorganisms
- It deodorizes
- It is economical to use
- It leaves no poisonous residue and is not poisonous to people in the concentrations in which it is used

A chlorine solution can be made from liquid household bleach (sodium hypochlorite) or from chlorine compounds available in powder (calcium hypochlorite, chloramine, or chlorinated lime) or tablet (sodium dichloroisocyanurate) form. *Because of their low cost and wide availability, chlorine solutions prepared from liquid or powdered bleach are recommended for decontamination.*

Liquid bleach and compounds containing chlorine are described as having a certain percentage of "active" (or available) chlorine. It is the active chlorine in these products that kills microorganisms. The amount of active chlorine is usually described as a percentage, and differs from one product to another. It is important to know this amount so that a chlorine solution with the appropriate percentage of active chlorine can be prepared. With liquid bleach, this information is often noted on the bottle. If it is not, you may need to contact the manufacturer or use an alternate product. If the bleach is not in its original container or is in powdered form, you may need to check with central stores or the pharmacy to find out the amount of active chlorine in the product.

Solutions used for decontamination should be 0.5% active chlorine.

Figure 8-1, which appears on the next page, explains how to prepare a dilute chlorine solution using liquid bleach, bleach powder, or chlorine-releasing tablets.

Review Figure 8-1 on page 8.4 of the Participant's Handbook, which shows how to calculate the correct amount of bleach and water needed to make a 0.5% chlorine solution for decontamination. Review only those calculations appropriate for the setting in which the participants work. For example, there is no need to review the calculations for bleach powder if only liquid bleach is available, nor for converting degrees chlorum to percentage of active chlorine if French products are not available. Highlight the fact that "parts" can be used for any unit of measure (e.g., ounce, liter, or gallon) or any container used for measuring, such as a pitcher.

Be sure to explain to the participants that once the bleach/water calculation has been made, they do not need to recalculate it unless they switch to a new bleach product with a different percentage of active chlorine. In fact, even measuring the amount of liquid or the weight of the powder does not need to be repeated each time the solution is prepared. Once the bucket and the container used for measuring the bleach have been marked to show the levels at which they will be filled once the proper amounts of water and bleach have been added, it will only be necessary to fill the bucket with water up to the marking, fill the container with bleach up to the marking, and pour the bleach into the bucket.

Conduct the following training activity and, if desired, the following optional activity.

Training Activity: Individual Exercise *(Approximate time: 15–20 minutes)*

Ask the participants to complete Exercise 8-1: Calculation Exercises, which appears on page 8.5 of their handbook. *Instructions for this exercise appear on page 268.*

Training Option

If ancillary staff are participating in the training, ask the service providers to assist them with the calculations, if necessary.

Optional Activity: Demonstration *(Approximate time: 15 minutes)*

Set up practice areas with buckets, water, containers, and liquid or powdered bleach. Divide the participants into small groups, and ask for a volunteer in each group to perform the measuring activity, while the other participants watch, as follows:

- Fill a bucket with 10 liters of water (or measure the number of liters of water needed to nearly fill the bucket), and mark the bucket at the level of the water.
- Measure the appropriate amount of bleach into a small container, and mark the container at the level of the bleach.

Training Option

If all of the participants are service providers or other staff who are not directly responsible for decontamination, simulate preparing a 0.5% chlorine solution using a bucket and a small container as "props." Point to the bucket and container, respectively, and say, "Adding 10 liters of water to the bucket (or the number of liters needed to nearly fill the bucket) comes up to here, so mark the bucket here. Adding the appropriate amount of bleach to the small container comes up to here, so mark the container here."

Figure 8-1. Preparing a Dilute Chlorine Solution

Using Liquid Bleach

Chlorine in liquid bleach comes in different concentrations. You can use any concentration to make a dilute chlorine solution by using the following formula:

$$\left[\frac{\%\text{ chlorine in liquid bleach}}{\%\text{ chlorine desired}}\right] - 1 = \text{Total parts of water for each part bleach*}$$

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

$$\left[\frac{3.5\%}{0.5\%}\right] - 1 = [7] - 1 = 6 \text{ parts water for each part bleach}$$

Therefore, you must add 1 part bleach to 6 parts water to make a 0.5% chlorine solution.

* "Parts" can be used for any unit of measure (e.g., ounce, liter, or gallon) or any container used for measuring, such as a pitcher.

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

Using Bleach Powder

If using bleach powder,* calculate the ratio of bleach to water by using the following formula:

$$\left[\frac{\%\text{ chlorine desired}}{\%\text{ chlorine in bleach powder}}\right] \times 1{,}000 = \text{Number of grams of powder for each liter of water}$$

Example: To make a 0.5% chlorine solution from calcium hypochlorite powder containing 35% active chlorine:

$$\left[\frac{0.5\%}{35\%}\right] \times 1{,}000 = 0.0143 \times 1{,}000 = 14.3$$

Therefore, you must dissolve 14.3 grams of calcium hypochlorite powder in each liter of water used to make a 0.5% chlorine solution.

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

Using Chlorine-Releasing Tablets

Follow the manufacturer's instructions, since the percentage of active chlorine in these products varies. If the instructions are not available with the tablets received from central supply, ask for the product's instruction sheet.

Exercise 8-1: Calculation Exercises

Using the table(s) that are appropriate for the setting in which the participants work, ask the participants to calculate the amounts of bleach and water needed to make a 0.5% chlorine solution. After they perform these practice calculations, ask them to calculate the amounts for locally available products (if different from the brands listed in the tables). The last two rows of each table may be used to write in the product names, percentage of active chlorine, degrees chlorum (if applicable), and amounts of bleach and water needed. Allow 10 minutes for completion. Ask for volunteers to share their answers with the group and explain how the calculations were done. Validate or correct their answers, as necessary. Answers appear on page 8.6 of the Participant's Handbook.

Training Options

- As the participants call out their answers, fill in the correct ones on a transparency of the incomplete table.
- Before this training session, ask the participants to collect a variety of bleach products and bring them to the session. Calculate how to make a 0.5% chlorine solution from each of the products based on their percentage of active chlorine. Use the blank space in the table to create an answer key for future use. Have the participants fill in the blank on their table as a reference for themselves. Be sure to check their calculations to make sure they have the correct answers.
- If ancillary staff are participating in the training, ask the service providers to assist them with the calculations, if necessary.

Exercise 8-1: Calculation Exercises

Instructions: Using the table(s) appropriate for your clinical setting, calculate the amounts of bleach and water needed to make a 0.5% chlorine solution. Then calculate the amounts for locally available products (if different from the brands listed in the tables). Answers appear on the next page. *Note:* In some cases, the numbers have been rounded up or down to the nearest whole number. This does not affect the effectiveness of the decontamination solution.

Liquid Bleach

Brand of bleach	% active chlorine	Amount of bleach and water needed to make a 0.5% chlorine solution
JIK (Kenya), Ajax (Jamaica)	3.5%	____ parts bleach, ____ parts water
Household bleach (U.S., Indonesia, Turkey, Canada)	5%	____ parts bleach, ____ parts water
Blanquedor (Mexico), Lavindina (Bolivia)	8%	____ parts bleach, ____ parts water
(Locally available bleach) _____	___%	____ parts bleach, ____ parts water

Bleach Powder

Type of bleach	% active chlorine	Amount of bleach needed per liter of water to make a 0.5% chlorine solution
Calcium hypochlorite	70%	____ grams
Calcium hypochlorite	35%	____ grams
(Locally available bleach) _____	___%	____ grams

In Countries Where French Products Are Used

Brand of bleach	Degrees chlorum*	% active chlorine	Amount of bleach and water needed to make a 0.5% chlorine solution
Eau de Javel (France)	15°	5%	____ parts bleach, ____ parts water
La Croix Eau (Guinea)	48°	14%	____ parts bleach, ____ parts water
Bref Javel (Senegal)	12°	4%	____ parts bleach, ____ parts water
(Locally available bleach) _____	___°	___%	____ parts bleach, ____ parts water

* One degree chlorum is equivalent to 0.3% active chlorine.

Answers to Exercise 8-1: Calculation Exercises

Liquid Bleach

Brand of bleach	% active chlorine	Amount of bleach and water needed to make a 0.5% chlorine solution
JIK (Kenya), Ajax (Jamaica)	3.5%	**1 part bleach, 6 parts water**
Household bleach (U.S., Indonesia, Turkey, Canada)	5%	**1 part bleach, 9 parts water**
Blanquedor (Mexico), Lavindina (Bolivia)	8%	**1 part bleach, 15 parts water**

Bleach Powder

Type of Bleach	% active chlorine	Amount of bleach needed per liter of water to make a 0.5% chlorine solution
Calcium hypochlorite	70%	**7 grams**
Calcium hypochlorite	35%	**14 grams**

In Countries Where French Products Are Used

Brand of bleach	Degrees chlorum*	% active chlorine	Amount of bleach and water needed to make a 0.5% chlorine solution
Eau de Javel (France)	15°	5%	**1 part bleach, 9 parts water**
La Croix Eau (Guinea)	48°	14%	**1 part bleach, 27 parts water**
Bref Javel (Senegal)	12°	4%	**1 part bleach, 7 parts water**

Note: In some cases, the numbers have been rounded up or down to the nearest whole number. This does not affect the effectiveness of the decontamination solution.

The Decontamination Process

Review the general procedure for decontaminating instruments and other items, as well as the specific decontamination procedures for reusable needles and syringes, gloves, linen, storage containers for instruments and other items, laparoscopes, and instruments used during manual vacuum aspiration. If desired, you may conduct the following optional activity.

Optional Activity: Video Viewing *(Approximate time: 5–10 minutes)*

Show TDS 4 (length 2:49) from the infection prevention video, which presents decontamination. When the segment is over, review the material presented with the participants and allow for questions.

Training Option

The video can be shown either at the beginning of the session to introduce the topic or at the end of the session for review.

The Decontamination Process

Steps of Decontaminating Instruments and Other Items

1 Immediately after use, decontaminate instruments and other items by placing them in a plastic container of 0.5% chlorine solution. Let them soak for 10 minutes. A container of this solution should be kept in every operating theater and procedure room so that used items can be placed directly into the bucket. Service providers should put instruments and other items in the chlorine solution as soon as they are finished using each instrument or item.

2 After 10 minutes, remove the items from the chlorine solution and either rinse with water or clean immediately. Do not leave items in the solution for more than 10 minutes, since excessive soaking in the solution can damage instruments and other items. Always wear utility gloves when removing instruments and other items from a chlorine solution.

Prepare a new chlorine solution at the beginning of each day or when the solution looks as though it needs to be changed, such as when it becomes heavily contaminated with blood or other body fluids or becomes cloudy. (*Note*: When bleach powder is used, the solution is likely to look cloudy at the start.)

It may be useful to set up a bucket of tap water next to the bucket of decontamination solution in which instruments and other items are soaking. In this way, when the instruments and other items are ready to be removed from the decontamination solution, they can be placed in the water until the appropriate staff member is ready to clean them.

Remember: Wear utility gloves whenever you handle chlorine and used instruments or other items.

Figure 8-2, which appears on the next page, lists the special considerations to be taken when decontaminating reusable needles and syringes, gloves, linen, storage containers for instruments and other items, laparoscopes, and instruments used during manual vacuum aspiration (MVA).

Figure 8-2. Special Considerations for Decontamination

The following items require special attention. To decontaminate them, follow the procedures listed below.

Item	Decontamination Procedure
Reusable needles and syringes	Fill the assembled needles and syringes with a 0.5% chlorine solution, flush (draw in and expel the solution) several times, drop the needle and syringe into a container of 0.5% chlorine solution, and soak for 10 minutes before cleaning. Rinse by flushing three times with clean water, or clean immediately. Remember to use pickups (lifters, cheatle forceps) and wear utility gloves when removing needles and syringes from the solution.
Gloves	Before removing contaminated gloves, dip hands in a 0.5% chlorine solution to rinse the outer surfaces and remove blood or other body fluids. Carefully remove gloves without touching the outer surface with bare hands or snapping the gloves. (See the illustrations on page 5.10 demonstrating the proper way to remove gloves.) If the gloves are disposable or are not intact, dispose of them properly. If they are to be processed for reuse, place them in a container of 0.5% chlorine solution and soak for 10 minutes before cleaning. Rinse or clean immediately. To avoid tearing and puncturing gloves during decontamination, place them in a different container than the one used to decontaminate instruments and other items, if possible.
Linen (caps, gowns, masks, and surgical drapes)	While soiled linen can be the source of large numbers of potentially infectious microorganisms, the actual risk of transmission is small. The greatest risk of injury or transmission of infections from used linen occurs when sharp objects, such as needles and surgical instruments, are inadvertently left in or on the linen. Decontamination of linen is impractical and is not recommended. Handle, transport, and process linen soiled with blood, other body fluids, secretions, and excretions in a way that prevents exposure to skin and mucous membranes, contamination of clothing, and transfer of microorganisms to clients or the environment. Place linen in leakproof bags or containers or fold the linen so that the portions that are contaminated with blood or other body fluids are on the inside, surrounded by dry linen, and transport the linen to the site where it will be washed. Always wear heavy utility gloves when handling, transporting, and processing used linen, and wash hands immediately after removing gloves. If linen will be processed outside the facility, the person who transports it to the processing site should wear utility gloves when handling the linen.

continued

Figure 8-2 continued

Item	Decontamination Procedure
Storage containers for instruments and other items	Fill containers with a 0.5% chlorine solution and soak for 10 minutes before cleaning. Rinse or clean immediately.
Laparoscopes	There is no effective way to decontaminate laparascopes and cables. They cannot be soaked in chlorine solution, since chlorine can damage the laparoscope and cable. In addition, alcohol should not be used, as it can fog the lens or dissolve the cement holding the lens in place. When handling laparoscopes for cleaning, always wear utility gloves.
Instruments used during manual vacuum aspiration (MVA)	In some facilities, cannulae are discarded after a single use. However, if processing is performed according to the following instructions, as well as those given on pages 9.5, 10.21, and 11.12, MVA cannulae may be reused. Proper processing is essential for reuse of MVA cannulae. Leave the cannula attached to the syringe and flush the syringe with a 0.5% chlorine solution (draw up and expel the 0.5% chlorine solution into and out of the syringe) one or two times; this will help remove any blood and tissue remaining in the cannula. Drop the assembled cannula and syringe into the 0.5% chlorine solution and soak for 10 minutes before cleaning. Rinse by flushing the assembled cannula and syringe three times with clean water, or clean immediately.

Exercise 8-2: Case Studies

Use the following cases (or use case histories of your own) to help the participants think through the issues involved in decontamination. Divide the participants into small groups and assign two cases to each group. Allow 10 minutes for completion. Bring the groups together and review each case, asking for a volunteer from each group to present the group's work. Allow for discussion; give feedback and validate or correct the participants' responses, as necessary.

Training Options

- After dividing the participants into small groups, ask each group to complete all of the cases. When the groups are brought together, ask for a volunteer from each group to report the group's responses to only one of the cases.
- Read the cases aloud, and ask for volunteers to respond to the questions. (This works well with low-literate/illiterate staff or when time is short.)
- Ask the participants to write their responses in their handbooks, and ask for volunteers to read them aloud. Alternatively, ask the participants to switch books with another participant and correct the other's responses.

Possible responses:

Case Study 1

No. The purpose of decontaminating instruments is to protect health care workers from blood-borne viruses. Instruments and other items should be placed in the chlorine solution immediately after use. A bucket containing a 0.5% chlorine solution should be kept in every operating theater and procedure room. The bucket may then be transported to the processing room. After 10 minutes, the instruments should be removed and rinsed. They should not be left soaking in the solution for extended periods of time because chlorine can damage the instruments.

Case Study 2

No. Different brands of bleach powder and liquid bleach may have different percentages of "active" (available) chlorine. The amount of water and bleach powder or liquid needed to make a 0.5% solution varies, depending on the percentage of active chlorine. Whenever a new bleach product is used, the label must be checked to determine the active percentage of chlorine, and the amounts of water and bleach needed must be corrected, if necessary. If information about the percentage of active chlorine is missing, the manufacturer should be contacted.

Case Study 3

No. Chlorine loses its effectiveness over time. A new solution should be made at the beginning of each day or when the solution looks as though it needs to be changed, such as when it becomes heavily contaminated with blood or other body fluids or becomes cloudy. (*Note*: When bleach powder is used, the solution is likely to look cloudy at the start.)

Exercise 8-2: Case Studies

Read the following case studies and answer the questions below. Possible responses appear on the next page.

Case Study 1

Midwife Juarez gathers the instruments and gloves used during a recent delivery. She takes them out of the delivery room and carries them down the hall to the instrument processing room, where she places them in a bucket of 0.5% chlorine solution and lets them soak for several hours before cleaning them.

Is this an appropriate practice? Why?

Case Study 2

For the past year, all of the departments in a 150-bed hospital had been decontaminating used instruments and other items in a 0.5% chlorine solution. One morning, Mr. Otieno, the cleaner in the operating theater, prepares the chlorine solution using the bleach powder and the premeasured, marked plastic cup and bucket. As he is mixing the powder and water together, he notices that the label on the container of bleach powder is a different color than it used to be. He guesses that either the hospital supply agent changed brands, or the company changed the look of the label. Whatever the reason, he thinks, it does not matter because it is still bleach powder and the measurements will remain the same.

Is the cleaner's reasoning correct? Why?

Case Study 3

Each morning, Mr. Ivanov, a technician in the operating theater of a district hospital, prepares the 0.5% chlorine solution for each of the three operating theaters. This morning, however, he decides to prepare only enough solution for two of the rooms because yesterday no surgeries were performed in the third room, and the bucket of chlorine solution he prepared for the third room remained unused. He figures that this bucket of solution can be used today.

Is this an appropriate practice? Why?

Answers to Exercise 8-2: Case Studies

Possible responses:

Case Study 1

No. The purpose of decontaminating instruments is to protect health care workers from blood-borne viruses. Instruments and other items should be placed in the chlorine solution immediately after use. A bucket containing a 0.5% chlorine solution should be kept in every operating theater and procedure room. The bucket may then be transported to the processing room. After 10 minutes, the instruments should be removed and rinsed. They should not be left soaking in the solution for extended periods of time because chlorine can damage the instruments.

Case Study 2

No. Different brands of bleach powder and liquid bleach may have different percentages of "active" (available) chlorine. The amount of water and bleach powder or liquid needed to make a 0.5% solution varies, depending on the percentage of active chlorine. Whenever a new bleach product is used, the label must be checked to determine the active percentage of chlorine, and the amounts of water and bleach needed must be corrected, if necessary. If information about the percentage of active chlorine is missing, the manufacturer should be contacted.

Case Study 3

No. Chlorine loses its effectiveness over time. A new solution should be made at the beginning of each day or when the solution looks as though it needs to be changed, such as when it becomes heavily contaminated with blood or other body fluids or becomes cloudy. (*Note*: When bleach powder is used, the solution is likely to look cloudy at the start.)

"At My Facility..."

Ask the participants to write their responses to the questions in the space provided. Remind them to answer the questions as honestly as possible. Ask them to think about their response to each question to see if it reflects an appropriate infection prevention practice or if there are issues that need to be addressed. Ask them to write down any problems they identify. Allow 10 minutes for completion.

Optional Activity: Discussion Topic *(Approximate time: 10 minutes)*

Ask for volunteers to share their responses, and allow for discussion.

"At My Facility..."

Think about your clinical setting and write your answers to the following questions in the space provided. At your facility:

- Are instruments and other items decontaminated immediately after use? If so, is a 0.5% chlorine solution used? If a 0.5% chlorine solution is not used, what kind of solution is used?

- Are instruments and other items routinely soaked for no longer than 10 minutes? If they are routinely left soaking for more than 10 minutes, what could you do to help ensure that they are removed after 10 minutes?

- Do staff members wear utility gloves when preparing chlorine solutions and removing instruments and other items from a chlorine solution?

- Do staff understand that different commercial products have different amounts of chlorine, and that certain aspects of preparing of a 0.5% chlorine solution may vary from one product to another?

Do your responses to these questions reflect an understanding or performance of appropriate infection prevention practices at your facility? If, based on your responses, you become aware of some problems or issues that need to be addressed, list them below:

Summary/Self-Assessment Answers

1. No. Any handling of used instruments and other items before they are decontaminated increases the staff member's risk of infections.
2. No. It is natural for the decontamination solution to become contaminated during use. The solution can be used throughout the day, but if there are many cases or the instruments and other items are very bloody, the solution will need to be replaced more frequently.
3. Mr. John is most at risk in this situation.
4. All instruments and other items should be placed in the decontamination solution immediately after the procedure.

Optional Activity: Discussion Topic *(Approximate time: 10 minutes)*

Read aloud the case study, and facilitate a discussion by asking the participants the questions that appear in the Participant's Handbook.

Answers to true/false questions:

5. F
6. T
7. T
8. F
9. F

Summary/Self-Assessment

Answers are provided at the end of this self-assessment.

Review the following case study, which appeared at the beginning of this module, and answer the questions below:

After surgery, Mr. John, the cleaner, takes the bloody instruments and other items to the sink and rinses off most of the blood before putting them in the bucket of decontamination solution. He is concerned that if he does not rinse the instruments and other items first, the decontamination solution will become bloody after just a few procedures and he will have to replace it.

1. Is this the proper practice for processing instruments and other items? Why?

2. Should Mr. John be concerned about having to replace the decontamination solution very often?

3. Who is the person most at risk of infections in this situation?

4. What should be done differently to reduce the risk of infections?

Decide whether each of the following statements is T (true) or F (false). Write your response for each statement in the space provided.

5. ____ Decontamination kills all microorganisms on soiled instruments and other items. (page 8.2)

6. ____ Instruments and other items should be decontaminated immediately after a procedure is completed. (page 8.7)

7. ____ When preparing a chlorine solution for decontamination, it is important to know the amount of active chlorine in the commercial product being used. (page 8.3)

8. ____ Although soaking items in a chlorine solution for 10 minutes is adequate, it is all right to leave them in the solution all day if the facility is busy. (page 8.7)

9. ____ A chlorine solution prepared for decontamination on Monday can be used throughout the week. (page 8.7)

10. T
11. T
12. T

Answers to multiple-choice questions:

13. c
14. b

10. ____ Decontaminating reusable gloves in a separate container from instruments and other items prevents gloves from being damaged. (page 8.8)

11. ____ It is neither practical nor necessary to decontaminate soiled linen. (page 8.8)

12. ____ Flushing an MVA syringe with a 0.5% chlorine solution before placing it in the chlorine solution for decontamination helps remove blood and tissue from the cannula, making it easier to clean. (page 8.9)

The following are multiple-choice questions. More than one option may be correct. Please circle the correct response(s).

13. Decontamination is performed by: (page 8.7)
    a. Scrubbing with detergent and water to remove organic matter from instruments and other items
    b. Using heat or chemicals to remove all microorganisms from used instruments and other items
    c. Soaking instruments and other items in a chlorine solution for 10 minutes immediately after use
    d. Boiling instruments and other items to remove all microorganisms except bacterial endospores

14. The appropriate concentration of chlorine in a decontamination solution is: (page 8.3)
    a. 5%
    b. 0.5%
    c. 0.05%
    d. 1%

Answers: 1. No. Any handling of used instruments and other items before they are decontaminated increases the staff member's risk of infections; 2. No. It is natural for the decontamination solution to become contaminated during use. The solution can be used throughout the day, but if there are many cases or the instruments and other items are very bloody, the solution will need to be replaced more frequently; 3. The cleaner is most at risk in this situation; 4. All instruments and other items should be placed in the decontamination solution immediately after the procedure; 5. F; 6. T; 7. T; 8. F; 9. F; 10. T; 11. T; 12. T; 13. c; 14. b

MODULE 9 Cleaning Instruments and Other Items

Trainer's Notes for Module 9

This module covers cleaning, the second step in processing instruments and other items for reuse. Cleaning instruments and other items removes organic material, dirt, and foreign matter that can interfere with sterilization or high-level disinfection. Cleaning also drastically reduces the number of microorganisms, including bacterial endospores, on instruments and other items.

Audience [illegible]

Training Option

If all of the participants are doctors or other staff who are not directly involved in cleaning instruments and other items, or if they all are experienced in processing instruments and other items, the content in this module can be presented by discussing each objective, answering the discussion questions presented throughout the module, reviewing the case studies, and answering the Summary/Self-Assessment questions. Explain to the participants that it is important for those who supervise the staff involved in cleaning instruments and other items, as well as those who make decisions about cleaning practices and purchasing, to have a thorough understanding of this content.

Training Time [illegible]

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MODULE 9 Cleaning Instruments and Other Items

Materials and Supplies

- ✓ Transparencies for Module 9 (optional)
- ✓ Overhead projector (optional)
- ✓ Television and videocassette recorder (optional)
- ✓ *Infection Prevention for Family Planning Service Programs*, AVSC International/JHPIEGO video, TDS 5 (optional)
- ✓ Brushes (e.g., toothbrushes)
- ✓ Flipchart paper, masking tape, and colored markers

Advance Preparation

- Determine which training activities will be used to present the content of this module. For on-site training, review the activities presented in Appendix E: On-Site Training Activities. Prepare or gather any supplies needed for the activities you will be conducting.
- Find out what types of detergent are available in the participants' locale, if possible.
- Cue the video to TDS 5, if used.
- Create transparencies or flipcharts, as needed.

Introduction

Introduce this module by reviewing the purpose and objectives that appear in the Participant's Handbook. If desired, you may conduct the following optional activity.

Optional Activity: Case Study *(Approximate time: 5 minutes)*

Read aloud the introductory case study, and direct the participants to the instructions that appear in their handbook.

MODULE 9 Cleaning Instruments and Other Items

Introduction

Purpose and Objectives

This module covers cleaning, the second step in processing instruments and other items for reuse. The module will prepare you to correctly clean instruments and other items in preparation for sterilization or high-level disinfection. Upon completion of this module, you should be able to:

- Define *cleaning* and explain the importance of cleaning as the second step in processing instruments and other items for reuse
- Explain the rationale for using detergent in cleaning instruments and other items
- Describe the steps of the cleaning process
- Identify the special considerations for cleaning the following:
  - reusable needles and syringes
  - gloves
  - linen
  - environmental surfaces
  - instruments used during manual vacuum aspiration (MVA)

Read the following case study, and try to keep it in mind as you learn the content of this module. See if you can determine whether the situation presents a risk of infection transmission and, if so, what should be done differently to reduce the risk. Questions about the case study appear in the Summary/Self-Assessment at the end of this module.

Doctor Parra is a surgeon at a small, rural hospital. Frequently, he notices that the instruments and other items he uses during surgery have some spots of dried blood or bits of dried tissue on them. Because these instruments and other items are always autoclaved each morning before surgery, he is not concerned about this dried material.

Directions for Independent Study

If you are preparing for this module independently, you should:

- Study this module.
- Complete Exercise 9-1: Case Studies.
- Answer the "At My Facility..." questions for this module.
- Answer the Summary/Self-Assessment questions at the end of this module.
- Write down any questions you have about this module for later discussion with the trainer.

Definition and Importance of Cleaning

Review the definition of and key points about *cleaning*, and conduct the following training activity. If desired, you may also conduct the following optional activity.

Training Activity: Discussion Topic *(Approximate time: 10 minutes)*

Facilitate a discussion on cleaning by asking the participants: What is the importance of cleaning instruments and other items before further processing for reuse? Correct any misinformation they present, and add any reasons they omit.

Optional Activity: Video Viewing *(Approximate time: 5–10 minutes)*

Show TDS 5 (length 1:29) from the infection prevention video, which provides an overview of cleaning. Draw the participants' attention to the fact that during cleaning, health care workers can be protected by wearing masks and protective eyewear to avoid being splashed by contaminated materials. When the segment is over, review the material presented with the participants and allow for questions.

Training Option

The video can be shown either at the beginning of the session to introduce the topic or at the end of the session for review.

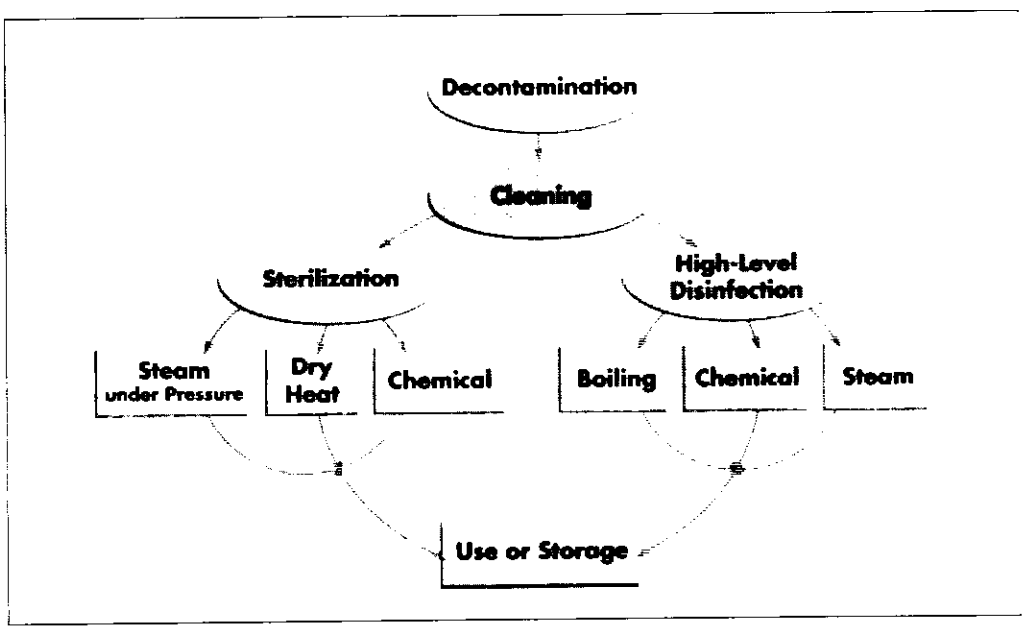
Definition and Importance of Cleaning

While decontamination makes instruments and other items safer for staff to handle, cleaning physically removes organic matter, such as blood and other body fluids, tissue, dirt, and other foreign material that could make any further processing ineffective, putting clients and staff at risk of infections.

Definition

Cleaning: **scrubbing with a brush, detergent, and water before instruments and other items are sterilized or high-level disinfected to remove blood, other body fluids, organic material, tissue, and dirt. In addition, cleaning greatly reduces the number of microorganisms (including bacterial endospores) on instruments and other items and is a crucial step in processing instruments and other items. If instruments and other items have not first been cleaned, sterilization and high-level disinfection (HLD) may not be effective, because: (1) microorganisms trapped in organic material may be protected and survive the sterilization or HLD process; and (2) organic material and dirt can make the chemicals used in chemical sterilization and HLD less effective.**

As shown in the figure below, cleaning is the second step in processing instruments and other items for reuse.



Remember: Thorough cleaning drastically reduces the number of bacterial endospores on instruments and other items and helps minimize the risk of infections due to bacterial endospores, which can survive the high-level disinfection process.

The Cleaning Process

Review the material in the Participant's Handbook. If desired, you may conduct the following optional activity.

Optional Activity: Discussion Topic *(Approximate time: 10–15 minutes)*

Facilitate a discussion on the use of detergent in cleaning by asking the participants one or more of the following questions:

- Why should detergent be used for cleaning, and why is it preferable to hand soap when cleaning instruments and other items?
- What is the purpose of wearing gloves when cleaning instruments and other items?
- Why are abrasive cleansers not recommended, even though their scrubbing action could be effective?
- Why should instruments and other items be held under the water when being scrubbed? How should jointed instruments and other items be cleaned?

Highlight the following key points:

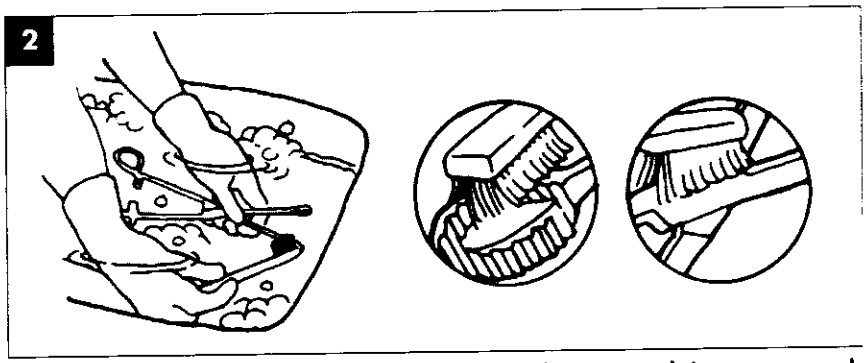
- Detergent is important for effective cleaning, since water alone will not remove protein, oils, and grease. Detergent breaks up and dissolves or suspends grease, oil, and other foreign matter in solution so that they can be removed easily by the cleaning process.
- Avoid using hand soap; the fatty acid contained in it will react with the minerals of hard water, leaving a residue or scum that is difficult to remove.
- Avoid using steel wool or abrasive cleansers such as Vim or Comet; these products can scratch or pit metal or stainless steel, resulting in grooves that can become a nesting place for microorganisms and increasing the potential for corrosion of the instruments and other items.
- When cleaning instruments and other items, use a brush to loosen material from them and hold them under the water to prevent splashing.

The Cleaning Process

Steps of Cleaning

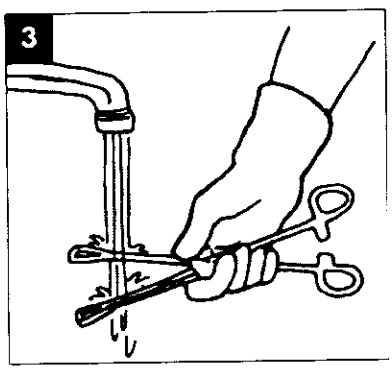
1 Wear utility gloves, goggles, a mask, and protective eyewear when cleaning instruments and other items.

2



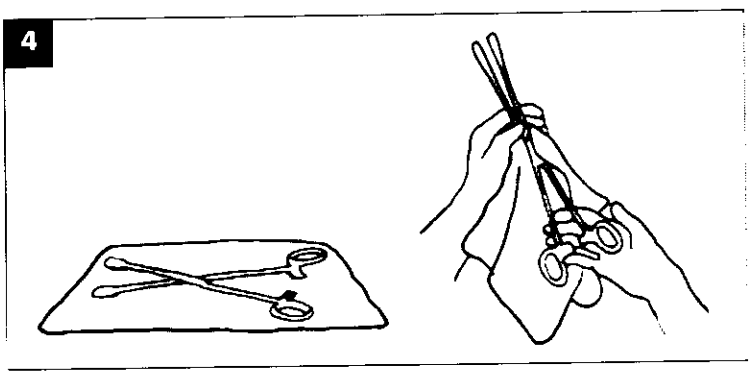
Using a soft brush or old toothbrush, detergent, and water, scrub instruments and other items vigorously to completely remove all blood, other body fluids, tissue, and other foreign matter. Hold instruments and other items under the surface of the water while scrubbing and cleaning to avoid splashing. Disassemble instruments and other items with multiple parts, and be sure to brush in the grooves, teeth, and joints of instruments and other items, where organic material can collect and stick.

3



Rinse instruments and other items thoroughly with clean water to remove all detergent.

4



Allow instruments and other items to air-dry, or dry with a clean towel. (Instruments and other items should be dry before chemical high-level disinfection to avoid diluting the chemicals, which may decrease their effectiveness.) *Note:* Instruments and other items to be high-level disinfected by boiling or steaming do *not* need to be dried first.

Remember:

- Thorough rinsing after cleaning is important, particularly with chemical sterilization or high-level disinfection (HLD), because detergent can reduce the effectiveness of these chemicals.
- It is important to dry instruments and other items after cleaning them. The water from wet instruments and other items dilutes the chemicals used for chemical sterilization or HLD, making that process ineffective. If instruments and other items will be high-level disinfected by boiling or steaming, drying is not necessary.

Use of Detergent

Detergent is important for effective cleaning, since water alone cannot remove protein, oils, or grease:

- When detergent is dissolved in water, it breaks up and dissolves or suspends grease, oil, and other foreign matter, making them easy to remove by cleaning.
- Do **not** use hand soap for cleaning instruments and other items, because the fatty acid contained in the soap will react with the minerals of hard water, leaving a residue or scum that is difficult to remove.
- Avoid using steel wool or abrasive cleansers such as Vim or Comet; these products can scratch or pit metal or stainless steel, resulting in grooves that can become a nesting place for microorganisms. This also increases the potential for corrosion of the instruments and other items.

Figure 9-1, which appears on the next page, lists the special considerations to be taken when cleaning reusable needles and syringes, gloves, linen, environmental surfaces, and instruments used during manual vacuum aspiration (MVA).

Figure 9-1. Special Considerations for Cleaning

The following items require special attention. To clean them, follow the procedures listed below.

Item	Cleaning Procedure
Reusable needles and syringes	*Always handle needles carefully to avoid injury.* Disassemble the needle and syringe, then wash with detergent and warm water to remove all particles. If a stylet or wire is available, insert it through the needle to make sure the needle is not clogged. Reassemble and rinse with clean water by flushing with water (drawing in and expelling the water) at least three times. Detach the needle and inspect it to make sure the hub area is clean, the needle is not bent, and the tip is not damaged. Check the syringe to make sure the seal is good and the markings are readable. Air-dry needles; air- or towel-dry syringes.
Gloves	*To avoid tearing gloves, handle with care, do **not** scrub with a brush, and always wash separately from instruments and other items.* Wash with detergent and warm water. Rinse in clean water until all detergent is gone. Check for holes by inflating the gloves with air and holding them underwater; air bubbles will appear if there are holes in the gloves. Alternatively, fill the glove with water and see if any water leaks out. Towel-dry inside and out or air-dry by hanging gloves in an area of low activity.
Linen (caps, gowns, masks, and surgical drapes)	*Handle soiled linen as little as possible. Utility gloves should be worn when handling or washing soiled linen.* Wash with detergent and hot water, and rinse with clean water. Air- or machine-dry. To reduce the risk of exposure to infectious material, machine washing is recommended, where possible. When machine washing is not possible, staff who wash linen by hand should wear protective gear, such as gloves, waterproof aprons, and goggles/masks or face shields to reduce the likelihood of exposure to blood and other body fluids.
Environmental surfaces	Examination couches, tabletops, operating tables, walls, and other surfaces that may have been contaminated by blood or other body fluids should be cleaned after each client. Wipe these surfaces with a cloth dampened with a disinfectant cleaning solution. (Cleaning of environmental surfaces is covered in detail in Module 13: Housekeeping.)
Instruments used during manual vacuum aspiration (MVA)	Disassemble the syringe completely, including removing the collar stop and the O-ring on the plunger. (On a double-valve syringe, also remove the O-ring from inside the valve.) Wash the parts of the syringe and the cannula with detergent and water. Scrub the syringe with a soft brush (e.g., a toothbrush). Do **not** use brushes or other objects to try to remove blood or tissue from the inside of the tip of the cannula; this may cause scratches, which can trap material and microorganisms or may damage the tip, increasing the risk of breakage. Try to dislodge material in the tip by flushing the cannula with water (drawing up and expelling water in and out) or flicking the top of the cannula with the fingertips. Rinse with clean water and air-dry. (Drying is not necessary if the cannula will be boiled or steamed.) Dry the syringe thoroughly before reassembling it.

Exercise 9-1: Case Studies

Use the following cases (or use case histories of your own) to help the participants think through the issues involved in cleaning. Divide the participants into small groups and assign two cases to each group. Allow 10 minutes for completion. Bring the groups together and review each case, asking for a volunteer from each group to present the group's work. Allow for discussion; give feedback and validate or correct the participants' responses, as necessary.

Training Options

- After dividing the participants into small groups, ask each group to complete all of the cases. When the groups are brought together, ask for a volunteer from each group to report the group's responses to only one of the cases.
- Read the cases aloud, and ask for volunteers to respond to the questions. (This works well with low-literate/illiterate staff or when time is short.)
- Ask the participants to write their responses in their handbooks, and ask for volunteers to read them aloud. Alternatively, ask the participants to switch books with another participant and correct the other's responses.

Possible responses:

Case Study 1

No. All reusable instruments and other items must be carefully and thoroughly cleaned, since proper cleaning removes organic debris, which may protect microorganisms or interfere with the sterilization or high-level disinfection process. In addition, cleaning significantly reduces the number of microorganisms, including bacterial endospores. Rubbing an instrument or item with your fingers under running water is not sufficient. Instruments and other items should be disassembled, and hinged instruments or instruments with ports and valves should be opened before cleaning in a detergent-and-water solution using a soft brush or toothbrush. Instruments and other items must then be rinsed thoroughly under running water and, if they will be wrapped or processed using chemicals, dried.

Case Study 2

No. Hand soap is not a good substitute for detergent when cleaning reusable instruments and other items. Soap has fatty acids in it that will react with the minerals in water, leaving a residue on the instruments and other items that is difficult to remove.

Case Study 3

No. Detergent can reduce the effectiveness of the chemicals used for sterilization and high-level disinfection. Instruments and other items should always be rinsed well and dried before they are soaked in a chemical solution.

Exercise 9-1: Case Studies

Read the following case studies and answer the questions below. Possible responses appear on the next page.

Case Study 1

Nurse Fedorov works in a busy family planning clinic. Unfortunately, there is a shortage of instruments, and she is constantly trying to keep up with the demand. After each clinical procedure, she soaks the used instruments in a 0.5% chlorine solution for 10 minutes and then quickly rinses them under running water. She always wears gloves, and sometimes she rubs her fingers over the instruments to remove some visible debris. Because the instruments have been decontaminated and are going to be either sterilized or high-level disinfected, she does not think she needs to spend a lot of time cleaning them.

Is this an appropriate practice? Why?

Case Study 2

Mr. Kamau, a cleaner in the operating theater, generally cleans used instruments and gloves in a solution of detergent and water. Yesterday, he discovered that the supply of detergent was low. Since he saw many bars of hand soap in the supply area, he decided that instead of ordering more detergent, he would just use soap to clean the instruments and other items from then on.

Is this an appropriate practice? Why?

Case Study 3

Mrs. Mutua is responsible for cleaning instruments and other items at a rural health clinic, where water is scarce. To save water, she does not rinse the items after cleaning them with a detergent solution, since they are going to be soaked in chemicals and then rinsed.

Is this an appropriate practice? Why?

Answers to Exercise 9-1: Case Studies

Possible responses:

Case Study 1

No. All reusable instruments and other items must be carefully and thoroughly cleaned, since proper cleaning removes organic debris, which may protect microorganisms or interfere with the sterilization or high-level disinfection process. In addition, cleaning significantly reduces the number of microorganisms, including bacterial endospores. Rubbing an instrument or item with your fingers under running water is not sufficient. Instruments and other items should be disassembled, and hinged instruments or instruments with ports and valves should be opened before cleaning in a detergent-and-water solution using a soft brush or toothbrush. Instruments and other items must then be rinsed thoroughly under running water and, if they will be wrapped or processed using chemicals, dried.

Case Study 2

No. Hand soap is not a good substitute for detergent when cleaning reusable instruments and other items. Soap has fatty acids in it that will react with the minerals in water, leaving a residue on the instruments and other items that is difficult to remove.

Case Study 3

No. Detergent can reduce the effectiveness of the chemicals used for sterilization and high-level disinfection. Instruments and other items should always be rinsed well and dried before they are soaked in a chemical solution.

"At My Facility..."

Ask the participants to write their responses to the questions in the space provided. Remind them to answer the questions as honestly as possible. Ask them to think about their response to each question to see if it reflects an appropriate infection prevention practice or if there are issues that need to be addressed. Ask them to write down any problems they identify. Allow 5–10 minutes for completion.

Optional Activity: Discussion Topic *(Approximate time: 10 minutes)*

Ask for volunteers to share their responses, and allow for discussion.

"At My Facility..."

Think about your clinical setting and write your answers to the following questions in the space provided. At your facility:

- Is cleaning, as described in this module, performed as a step of processing reusable instruments and other items?

- If so, is detergent used?

- Is a soft brush or old toothbrush used to scrub the instruments and other items and their joints and grooves?

- Are gloves (preferably, utility gloves) worn during cleaning?

Do your responses to these questions reflect an understanding or performance of appropriate infection prevention practices at your facility? If, based on your responses, you become aware of some problems or issues that need to be addressed, list them below:

Summary/Self-Assessment Answers

1. Microorganisms on used instruments and other items may be protected by blood and other body fluids and survive the sterilization or high-level disinfection process.
2. Instruments and other items should be thoroughly cleaned to ensure that sterilization or high-level disinfection can be achieved. Instruments or other items containing spots of dried blood or bits of dried tissue should not be used.

Optional Activity: Discussion Topic *(Approximate time: 10 minutes)*

Read aloud the case study, and facilitate a discussion by asking the participants the questions that appear in the Participant's Handbook.

Answers to true/false questions:

3. F
4. T
5. F
6. T
7. T

Summary/Self-Assessment

Answers are provided at the end of this assessment.

Review the following case study, which appeared at the beginning of this module, and answer the questions below:

Doctor Parra is a surgeon at a small, rural hospital. Frequently, he notices that the instruments and other items he uses during surgery have some spots of dried blood or bits of dried tissue on them. Because these instruments and other items are always autoclaved each morning before surgery, he is not concerned about this dried material.

1. What is the problem regarding infection transmission in this situation?

2. What should be done differently to reduce the risk of infections?

Decide whether each of the following statements is T (true) or F (false). Write your response for each statement in the space provided.

3. ____ Hand soap is preferable to detergent for cleaning instruments and other items. (page 9.4)

4. ____ Scrubbing instruments and other items with a brush is an important part of the cleaning process. (page 9.3)

5. ____ Abrasive cleansers or steel wool should be used to clean instruments and other items because they remove foreign material easily. (page 9.4)

6. ____ It is important to dry instruments and other items after cleaning them, because the water from the wet instruments and other items dilutes the chemicals used for sterilization or high-level disinfection, making that process ineffective. (page 9.3)

7. ____ After gloves have been cleaned, they should always be checked carefully for tears or holes. (page 9.5)

Answers to multiple-choice questions:

8. a, c, d
9. b

The following are multiple-choice questions. More than one option may be correct. Please circle the correct response(s).

8. Cleaning: (page 9.2)
   a. Is important to remove blood, other body fluids, and other foreign material from instruments and other items
   b. Is not necessary if instruments and other items will be sterilized
   c. Is important to reduce the number of bacterial endospores on instruments and other items
   d. Can help ensure that sterilization or high-level disinfection can be achieved

9. When cleaning MVA instruments: (page 9.5)
   a. Do not use detergent
   b. Do not use a brush or other small object inside the tip of the cannula
   c. Do not use a brush on the syringe
   d. Cleaning is not necessary as long as the instruments will be sterilized or high-level disinfected

Answers: 1. Microorganisms on used instruments and other items may be protected by blood and other body fluids and survive the sterilization or high-level disinfection process; 2. Instruments and other items should be thoroughly cleaned to ensure that sterilization or high-level disinfection can be achieved. Instruments or other items containing spots of dried blood or bits of dried tissue should not be used; 3. F; 4. T; 5. F; 6. T; 7. T; 8. a, c, d; 9. b

MODULE 10 Sterilization and Storage

Trainer's Notes for Module 10

This module covers sterilization and proper storage of sterilized instruments and other items. Sterilization ensures that instruments and other items are free of **all** microorganisms, including bacterial endospores, which can cause infections in clients during procedures in which instruments and other items will come in contact with the bloodstream or tissues under the skin.

If possible, find out in advance of this session which method of sterilization, if any, is currently practiced at the participants' facilities, and tailor the content to fit the participants' needs. This content does not have to be covered if the participants practice only high-level disinfection (HLD) (unless they have the capability of practicing sterilization but have never done so because they do not know how). In addition, stress the importance of having an alternate method of sterilization or HLD available in case the method they are currently using becomes unavailable (e.g., the autoclave breaks).

Audience **The content of this module is geared toward anyone who is involved in providing services to clients and processing instruments and other items. It is also important for those who supervise (and perhaps train) the staff who perform these activities—such as doctors, nurses, midwives, medical/surgical assistants—as well as those who make decisions about sterilization purchasing and practices, to have a thorough understanding of this material.**

Training Option

If all of the participants are doctors or other staff who are not directly involved in sterilizing instruments and other items, or if they all are experienced in processing instruments and other items, review this module by discussing each objective, answering the discussion questions presented throughout the module, reviewing the case studies, and answering the Summary/Self-Assessment questions. Alternatively, the Summary/Self-Assessment questions can be used as an individual exercise at the beginning of the session to determine the depth to which this content should be covered. You might also assign this module for advance reading, and then divide the participants into small groups to discuss how one can tell if instruments and other items have been correctly sterilized and what the service provider's (or administrator's) role is in supporting correct sterilization practices.

Training Time

30 minutes to 2¼ hours, depending on which training activities are used.

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MODULE 10 Sterilization and Storage

Materials and Supplies

- ✓ Transparencies for Module 10 (optional)
- ✓ Overhead projector (optional)
- ✓ Television and videocassette recorder (optional)
- ✓ *Infection Prevention for Family Planning Service Programs,* AVSC International/ JHPIEGO video, TDS 6 (optional)
- ✓ Supplies needed for wrapping (wrappers [paper, newsprint, muslin or cotton fabric], instruments or other items, gloves, tape)
- ✓ Flipchart paper, masking tape, and colored markers

Advance Preparation

- Determine which training activities will be used to present the content of this module. For on-site training, review the activities presented in Appendix E: On-Site Training Activities. Prepare or gather any supplies needed for the activities you will be conducting.
- Set up practice stations for wrapping instruments, other items, and gloves.
- Cue the video to TDS 6, if used.
- Create transparencies or flipcharts, as needed.

Introduction

Introduce this module by reviewing the purpose and objectives that appear in the Participant's Handbook. If desired, you may conduct the following optional activity.

Optional Activity: Case Study *(Approximate time: 5 minutes)*

Read aloud the introductory case study, and direct participants to the instructions that appear in their handbook.

MODULE 10 Sterilization and Storage

Introduction

Purpose and Objectives

This module covers sterilization and proper storage of sterilized instruments and other items. The module will prepare you to correctly sterilize instruments and other items that will be used during procedures in which they will come in contact with the bloodstream and tissues under the skin. Upon completion of this module, you should be able to:

- Define *sterilization*
- Explain the steps of steam, dry-heat, and chemical sterilization, including proper storage of sterilized instruments and other items
- Demonstrate how to wrap instruments, other items, and gloves for steam sterilization
- Describe how to maintain autoclave functioning
- Describe how to monitor the effectiveness of sterilization
- Identify the special considerations for sterilization of the following:
  - reusable needles and syringes
  - gloves
  - linen
  - instruments used during manual vacuum aspiration (MVA)

Read the following case study, and try to keep it in mind as you learn the content of this module. See if you can determine whether the situation presents a risk of infection transmission and, if so, what should be done differently to reduce the risk. Questions about the case study appear in the Summary/Self-Assessment at the end of this module.

Instruments and other items that will be needed for the next day's surgery are sterilized unwrapped the evening before scheduled cases. After the instruments and other items are sterilized, they are placed on a piece of sterile gauze on an instrument tray in the operating theater and covered with another piece of sterile gauze, ready for use in the morning. The doctors prefer this approach so that they do not need to worry about any delays in the morning.

Directions for Independent Study

If you are preparing for this module independently, you should:

- Study this module.
- Complete the skills practices on wrapping instruments and other items and on wrapping gloves.
- Complete Exercise 10-1: Case Studies.
- Answer the "At My Facility..." questions for this module.
- Answer the Summary/Self-Assessment questions at the end of this module.
- Write down any questions you have about this module for later discussion with the trainer.

Definition and Importance of Sterilization

Review the definition of and key points about *sterilization*. If desired, you may conduct the following optional activity.

Highlight the following points:

- Sterilization kills **all** microorganisms, including bacterial endospores.
- Decontamination and cleaning **must** be done **before** sterilization.
- It is preferable to sterilize, rather than high-level disinfect, instruments and other items that will come in contact with the bloodstream and tissues under the skin.
- The three methods of sterilization are steam (moist heat under pressure), dry heat, and use of chemicals ("cold" sterilization). *Boiling is **not** a method of sterilization.* Flaming is also **not** an effective sterilization technique because it does not kill all microorganisms.

Optional Activity: Discussion Topic *(Approximate time: 10–15 minutes)*

Facilitate a discussion on sterilization by asking the participants:

- Do decontamination and cleaning need to be performed before sterilization? If so, why?
- Why should you sterilize, rather than high-level disinfect, instruments and other items that will come in contact with the bloodstream or tissues under the skin?
- What are some examples of instruments and other items that fall into this category?
- What are the three methods of sterilization?
- Should high-level disinfection be performed before sterilization?

Validate or correct the participants' answers or direct them to the correct answers in their handbook. Allow for questions.

Training Tip

If not already known, before going on to the next session, ask the participants which sterilization method(s) is/are used at their facilities, and list them on a flipchart. Depending on which methods are used or available, it may not be necessary to cover all three methods of sterilization in detail.

Training Option

To assess the participants' knowledge of the steps of the sterilization method(s) performed at their facilities, ask them to recite the steps of the method(s), and list them on a flipchart. Set the flipcharts aside to refer back to later.

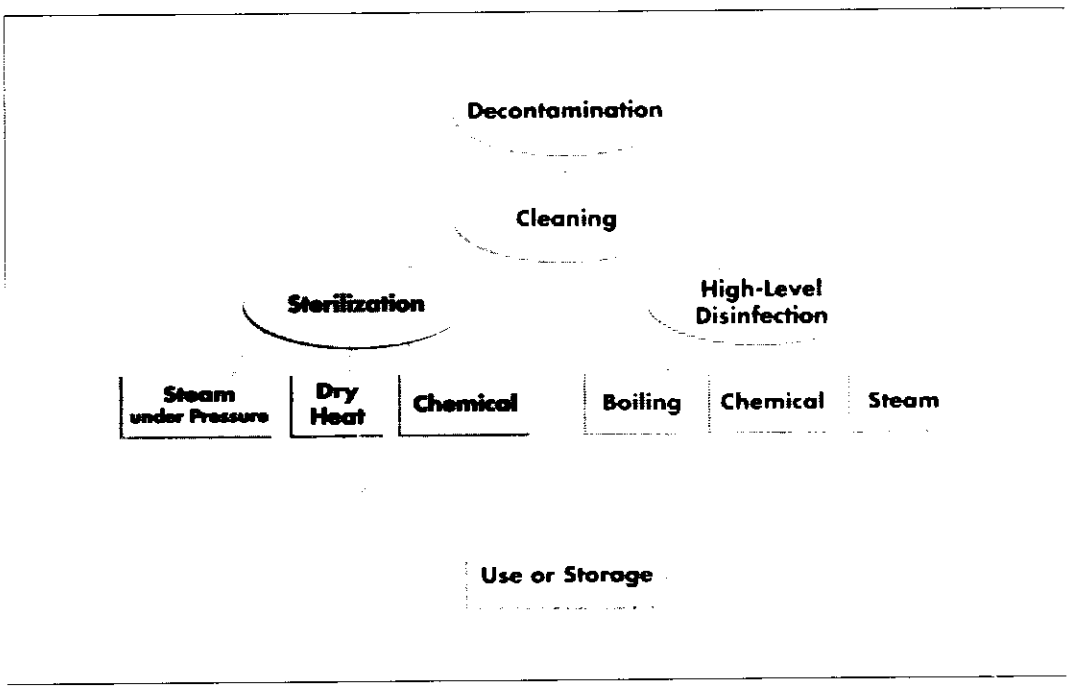
Definition and Importance of Sterilization

Definition

Sterilization: the process that eliminates **all** microorganisms (bacteria, viruses, fungi, and parasites), including bacterial endospores. Sterilization is recommended for instruments and other items that will come in contact with the bloodstream or tissues under the skin. Sterilization can be performed using steam under pressure (autoclaving or moist heat), dry heat, or chemicals.

Because sterilization is the **only** procedure that kills all microorganisms, including bacterial endospores, it is preferable to high-level disinfection (HLD) for instruments and other items that will come in contact with the bloodstream or tissues under the skin. If sterilization is not possible or feasible, HLD is the **only** acceptable alternative for these instruments/items. (High-level disinfection is covered in detail in Module 11: High-Level Disinfection and Storage.)

As shown in the figure below, sterilization is the third step in processing instruments and other items for reuse.



Sterilization can be accomplished by any of these three methods:

1. Steam sterilization (often known as autoclaving or moist heat under pressure)
2. Dry heat
3. Soaking in chemicals (sometimes referred to as "cold" sterilization)

Boiling and flaming are **not** effective sterilization techniques because they do not effectively kill all microorganisms.

The effectiveness of sterilization depends on both:

- The amount and type of microorganisms, organic material (blood, other body fluids, tissue), and other matter (such as dirt) present on the instrument or other item
- The amount of protection the instrument or other item gives the microorganisms (such as how many grooves the instrument or other item has in which microorganisms can hide)

Therefore, it is important to thoroughly clean instruments and other items **before** sterilization to: (a) reduce the number of microorganisms; (b) eliminate blood, other body fluids, or tissue remains; and (c) remove contaminants that can collect in joints, grooves, and teeth of instruments and other items.

Remember: Sterilization is preferable to high-level disinfection for instruments and other items that will come in contact with the bloodstream and tissues under the skin, because it kills all microorganisms, including bacterial endospores.

Steam Sterilization (Autoclaving)

Steam sterilization is one of the most common forms of sterilization used in health care facilities. Review the process of steam sterilization. If desired, you may conduct one or more of the following optional activities. During the course of the session, highlight the following points:

- Steam must contact all surfaces. Before sterilization, open or disassemble instruments and other items, pack loosely, and use open containers or open drum holes.
- In general, the temperature must be 121°C (250°F), and the pressure must be 106 kPa (15 lb/in^2).
- Sterilize wrapped instruments and other items for 30 minutes, unwrapped instruments and other items for 20 minutes.
- Packs must be dry before being removed from the autoclave.
- Proper storage is as important as the sterilization process itself.
- All instruments and other items should be stored dry. Never store instruments or other items—including suture needles, scissors, pickups (lifters, cheatle forceps)—soaking in fluid, such as Savlon, Lysol, or Betadine.

Optional Activity: Video Viewing *(Approximate time: 5–10 minutes)*

Show the first part of TDS 6 from the infection prevention video, which presents the steps of steam and chemical sterilization. *Stop the video* after the portion on steam sterilization. When the segment is over, review the material presented with the participants and allow for questions.

Training Option

The video can be shown either at the beginning of the session to introduce the topic or at the end of the session for review.

Optional Activity: Discussion Topic *(Approximate time: 10 minutes)*

Ask for volunteers to list the steps of steam sterilization in the correct order. Record their responses on a flipchart. Validate or correct their responses, as necessary.

Review the guidelines for using pressure cooker–type autoclaves and the material on sterilization of liquids, which appear on page 10.6 of the Participant's Handbook. Highlight the fact that liquids can be sterilized only by steam sterilization, not by dry-heat or chemical sterilization.

Review the chart comparing autoclaves and dry-heat ovens, which appears on page 10.7 of the Participant's Handbook.

Steam Sterilization (Autoclaving)

Definition

Steam sterilization (autoclaving): the method of sterilization that requires moist heat under pressure. For steam to be produced, there must be sources of both water and heat. A heat source is necessary to maintain the required temperature and pressure. Heat can be provided by electricity or any other fuel source (e.g., electric stove, kerosene burner), depending on the type of autoclave in use.

Note: The temperatures required for steam sterilization are lower than those for dry-heat sterilization, because moist heat under pressure allows for more efficient destruction of microorganisms.

Steps of Steam Sterilization

1. Decontaminate, clean, and dry all instruments and other items to be sterilized.
2. Open or unlock all jointed instruments and other items, such as hemostats and scissors, and disassemble those with sliding or multiple parts; this allows steam to reach all surfaces of the item. Avoid arranging the instruments and other items together tightly, because this prevents steam from reaching all surfaces. Do *not* wrap gloves into tight balls.
3. If instruments and other items are to be wrapped before steam sterilization, use two layers of paper, newsprint, or cotton or muslin fabric (do *not* use canvas). (Wrapping instruments and other items for steam sterilization is covered in detail on page 10.8.) Instruments and other items should *not* be placed in a closed container; if drums are being used, make sure the holes of the drums are open.
4. Arrange all packs, drums, or unwrapped items in the chamber of the autoclave in a way that allows steam to circulate freely.
5. *Because there are many types of autoclaves in use around the world, it is difficult to provide guidance on the specific instructions for operating them. Follow the manufacturer's instructions whenever possible.* In general, sterilize wrapped items for 30 minutes and unwrapped items for 20 minutes at 121°C (250°F) and 106 kPa (15 lb/in^2) pressure.
   Note: The units of pressure marked on an autoclave's pressure gauge may vary from one autoclave to another. The following amounts of pressure (which are approximately equivalent) are the desired pressure for autoclaving:

   15 lb/in^2 (15 pounds per square inch)
   106 kPa (106 kilopascals)
   1 atm (1 atmosphere)
   1 kgf/cm^2 (1 kilogram of force per square centimeter)
   776 torr
   776 mm Hg (776 millimeters of mercury)

   Time with a clock, watch, or timer. It is best to use a timer, which helps ensure that the appropriate timing is achieved. *Note:* Do not begin timing until the autoclave reaches the desired temperature and pressure.

continued

Steps of Steam Sterilization continued

6 If the autoclave is automatic, the heat will shut off and the pressure will begin to fall once the sterilization cycle is complete. If the autoclave is not automatic, turn off the heat or remove the autoclave from the heat source after 30 minutes, if items are wrapped, or after 20 minutes, if items are unwrapped. Wait until the pressure gauge reads "zero" to open the autoclave. Open the lid or door to allow the remaining steam to escape. Leave instrument packs or items in the autoclave until they dry completely, which could take up to 30 minutes. *(Once removed from the autoclave, damp packs draw microorganisms from the environment and should be considered contaminated.)*

7 Remove the packs, drums, or unwrapped items (using sterile pickups) from the autoclave. To prevent condensation after removing packs or drums from the autoclave, place them on a surface padded with paper or fabric until they are cool. Wait until the packs, drums, or items reach room temperature (which may take up to several hours) before storing.

8 *Storage:* Proper storage is as important as the sterilization process itself.

- *Wrapped items* – Shelf-life—the length of time a wrapped, sterile item is considered sterile—depends on whether or not a contaminating event occurs, not necessarily how long an item has been stored. Shelf-life is affected by a number of factors, including the type of packing material used; the number of times the pack is handled; the number of people who handle the pack; the cleanliness, humidity, and temperature of the storage area; whether packs are stored on open versus closed shelves; and whether dust covers (e.g., sealed plastic bags) are used. Storage time and handling of sterile packs should be kept to a minimum, since the likelihood of handling and contamination increases over time.

  Because shelf-life is not time-dependent, the previous recommendation of storing wrapped items for no more than one week no longer applies. *Under optimal storage conditions and with minimal handling, properly wrapped items can be considered sterile as long as they remain intact and dry.* For optimal storage, place sterile packs in closed cabinets in areas that are not heavily trafficked, have moderate temperature, and are dry or of low humidity. When in doubt about the sterility of a pack, the pack should be considered contaminated and the items should be resterilized before use.

- *Unwrapped items* – Unwrapped items should be used immediately after removal from the autoclave. They can also be kept in a covered, sterile container for up to one week.

Special considerations to be taken when sterilizing reusable needles and syringes, gloves, linen, and instruments used during manual vacuum aspiration (MVA) appear on pages 10.20 and 10.21.

Remember: Do not store instruments or other items, such as scalpel blades and suture needles, in solutions—always store them dry. Microorganisms can live and multiply in both antiseptic and disinfectant solutions, which can contaminate instruments and other items, leading to infections. In addition, antiseptic solutions are made for killing microorganisms on the skin and mucous membranes, not on objects.

Because pressure cooker–type autoclaves are commonly used (especially in rural areas) and often do not come with instructions, the following information is provided.

When using a pressure cooker–type autoclave:

- Put water in the bottom of the autoclave—up to the ridge located on the inner wall.
- Place items in the autoclave and arrange loosely, so that steam can circulate around them.
- Place the autoclave over the heat source (e.g. electric stove, kerosene burner) and turn to high heat. Once steam is emitted from the pressure valve, begin timing the 20-minute sterilization cycle. (For this type of autoclave, 20 minutes is suggested, regardless of whether items are wrapped or unwrapped.)
- Turn the heat down, but make sure that steam continues to come out of the pressure valve. This will reduce the amount of fuel used.
- After 20 minutes, remove the autoclave from the heat source, open the pressure valve to release the steam, and allow the autoclave to cool for 15–30 minutes before opening it.
- Before using the autoclave each time, check the gaskets, gauges, and pressure and safety valves for defects to ensure that they are working properly. Clean the chamber and cover regularly.

Sterilization of Liquids

Liquids (such as water) can be sterilized **only** by steam sterilization (autoclaving), not by dry-heat or chemical sterilization.

Special procedures that must be followed to safely and properly sterilize liquids:

- Liquids must be sterilized separately from other items, such as instruments or linen.
- Place liquids in heat-resistant glass bottles (e.g., Pyrex) with self-sealing caps, and autoclave at the same temperature and pressure used to autoclave other items: temperature, 121°C (250°F); pressure, 106 kPa (15 lb/in^2). (See page 10.4 for equivalent measures of pressure.)
- The time necessary to autoclave liquids depends on many factors, the most important of which is the volume of liquid being autoclaved. In general, the suggested times are as follows:

Volume of Liquid	Autoclave Time*
75–100 mL	20 minutes
250–500 mL	25 minutes
1,000 mL	30 minutes
1,500 mL	35 minutes
2,000 mL	40 minutes

* Do **not** begin timing until the appropriate temperature has been reached.

- Once sterilization is complete, the chamber pressure must be released slowly—over a period of at least 10–15 minutes. Rapid release of the pressure will cause the liquids to boil violently, which may cause the bottle caps to blow off or the bottles to burst. Open the autoclave door slightly and allow the liquids to cool for approximately 30 minutes before removing the bottles.

Important Differences between Autoclaves and Dry-Heat Ovens

It is important to know whether you are using an autoclave (steam sterilizer) or a dry-heat oven, since different procedures are used with each type of sterilizer.

Autoclave	Dry-Heat Oven
Uses moist heat under pressure, which requires a source of water (either the machine is hooked up directly to a water source, or water is put into the machine before the cycle begins) and a pressure gauge	Does not use water or have pressure gauges
The door must be secured tightly to maintain the high pressure necessary for sterilization to be achieved	The door does **not** need to be secured tightly

Wrapping Instruments and Other Items for Steam Sterilization

Review the procedures for wrapping instruments and other items, referring the participants to the illustrations of the steps. Conduct the following training activity, and, if desired, the following optional activity.

Training Activity: Demonstration *(Approximate time: 10–15 minutes)*

Demonstrate wrapping an instrument pack for sterilization while verbalizing the steps. Then repeat the demonstration without verbalizing the steps to mimic the way that the procedure would actually be performed. Invite the participants to ask questions about the demonstration. Then ask: Why are packs folded with a point?

Optional Activity: Skills Practice *(Approximate time: 15–30 minutes)*

Direct the participants to the Skills Practice Checklist on wrapping instruments and other items, which appears on page 10.9 of their handbook. *Instructions for this skills practice appear on page 328.*

Training Option

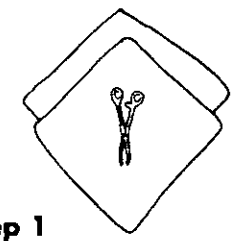
If the participants are experienced in or are not responsible for sterilizing instruments and other items, briefly review the general rationale for wrapping instruments and other items for sterilization (it helps decrease the chances of the instruments or other items becoming contaminated before use). Those who have direct supervisory responsibility for staff who wrap instruments and other items for sterilization—even if they themselves are not directly responsible for sterilization—need to have a thorough understanding of how to wrap instruments and other items.

Wrapping Instruments and Other Items for Steam Sterilization

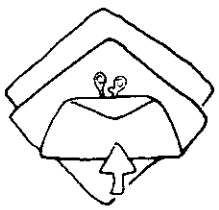
Wrapping instruments and other items before steam sterilization helps decrease the likelihood that, after sterilization, they will become contaminated before use.

To wrap instruments and other items for steam sterilization, use two layers of paper, newsprint, or muslin or cotton fabric. Do **not** use canvas; it is difficult for steam to go through canvas. Make points while wrapping the instruments and other items so that the packs can be easily opened without contaminating their contents.

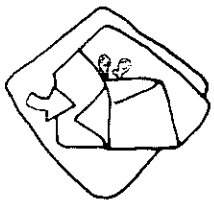
Steps of Wrapping Instruments and Other Items for Steam Sterilization



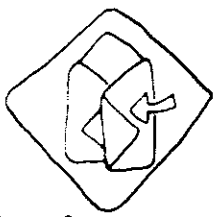
Step 1
Place the instrument or other item in the center of the top wrapper. The wrapper should be positioned so that the points —not the flat edges—are at the top, bottom, and sides.



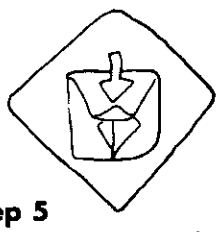
Step 2
Fold the bottom section of the *top* wrapper to the center, and fold back the point.



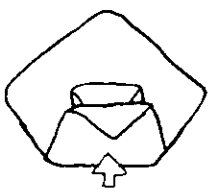
Step 3
Fold the left section to the center, and fold back the point.



Step 4
Fold the right section to the center, and fold back the point.

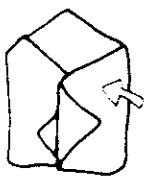


Step 5
Fold the top section to the center, and fold back the point.

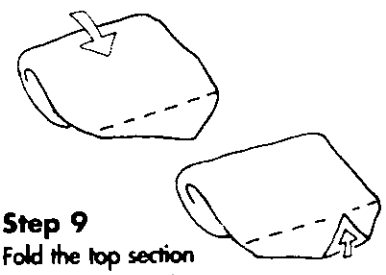


Step 6
Fold the bottom section of the *bottom* wrapper to the center, and fold back the point.

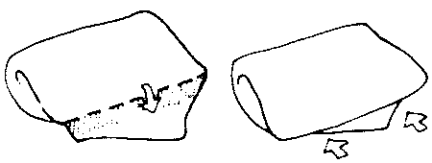
Step 7
Fold the left section to the center, and fold back the point.



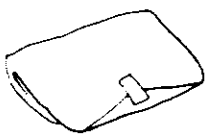
Step 8
Fold the right section to the center, and fold back the point.



Step 9
Fold the top section to the center, and fold back the point.



Step 10
Tuck the point under the right and left sections.



Step 11
Fasten the folds securely, using autoclave tape, if available.

Skills Practice Checklist: Wrapping Instruments and Other Items

Review the checklist with the participants, and divide them into small groups to take turns practicing wrapping packs according to the standards on the checklist. Make sure each practice station is equipped with wrappers (paper, newsprint, muslin or cotton fabric), instruments or other items, and tape. Guide the participants who are observing in giving feedback to the participants who are practicing. Observe all the groups to assess the accuracy of the practice and the constructiveness of the comments given by colleagues. Give feedback on what you observe. Bring the group together to discuss any difficulties or observations and to share comments.

Skills Practice Checklist: Wrapping Instruments and Other Items

Instructions: Take turns observing other participants practice wrapping instruments and other items according to the standards on the checklist. As you observe the other participants perform each action, place a check in the "Yes" box if the action was performed as described in the "Action" column, and place a check in the "No" box if the action was not performed as described in the "Action" column. If you did not observe the action, make a note in the "Comments" column. The "Comments" column can also be used to note any actions that were performed that are not described in the "Action" column or that need to be corrected.

Action	Yes	No	Comments
Places the instrument or other item in the center of the top wrapper, which is positioned with the points at the top, bottom, and sides.			
Folds the bottom section of the top wrapper to the center and folds back the point.			
Folds the left section to the center and folds back the point.			
Folds the right section to the center and folds back the point.			
Folds the top section to the center and folds back the point.			
Folds the bottom section of the bottom wrapper to the center and folds back the point.			
Folds the left section to the center and folds back the point.			
Folds the right section to the center and folds back the point.			
Folds the top section to the center and folds back the point.			
Tucks the point under the right and left sections.			
Fastens the folds securely, using autoclave tape, if available.			

Wrapping Gloves for Steam Sterilization

Ask the participants whether they use disposable or reusable gloves at their facilities. If they use reusable gloves, review the information on wrapping gloves. *Otherwise, it is not necessary to cover this content.*

Explain that because gloves are difficult to process properly, it is best to use single-use disposable gloves. However, if disposable gloves are unavailable, the participants must pay particular attention to appropriate processing. Review the procedures for wrapping gloves, referring the participants to the illustrations of the steps. Conduct the following training activity, and, if desired, the following optional activity.

Training Activity: Demonstration *(Approximate time: 10–15 minutes)*

Demonstrate wrapping gloves for sterilization while verbalizing the steps. Then repeat the demonstration without verbalizing the steps to mimic the way that the procedure would actually be performed. Invite the participants to ask questions about the demonstration. Then ask:

- Why are gloves cuffed before they are wrapped?
- Why is it important to avoid rolling gloves into balls when sterilizing them?

Optional Activity: Skills Practice *(Approximate time: 15–30 minutes)*

Direct the participants to the Skills Practice Checklist on wrapping gloves, which appears on page 10.11 of their handbook. *Instructions for this skills practice appear on page 332.*

Training Option

If the participants are experienced in or are not responsible for sterilizing gloves, briefly review the general rationale for wrapping gloves for sterilization (it helps decrease the chances of the gloves becoming contaminated before use) and the rationale for making cuffs when wrapping gloves (to allow the provider to put gloves on easily without contaminating them). Those who have direct supervisory responsibility for staff who wrap gloves for sterilization—even if they themselves are not directly responsible for sterilization—need to have a thorough understanding of how to wrap gloves.

Wrapping Gloves for Steam Sterilization

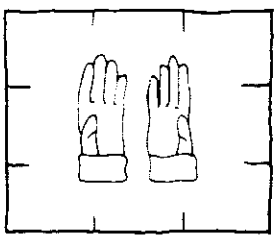
Wrapping gloves before steam sterilization helps decrease the likelihood that, after sterilization, they will become contaminated before use.

Note: Surgical gloves are extremely difficult to process properly. Therefore, it is best to use single-use, disposable surgical gloves that arrive from the manufacturer in a sterile package and are thrown away after use.

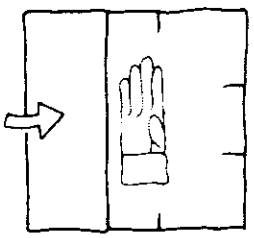
To wrap gloves for steam sterilization, use paper, newsprint, or muslin or cotton fabric. Do **not** use canvas; it is difficult for steam to go through canvas. Wrap gloves with a cuff so that they can be easily put on without contaminating them.

Do **not** roll gloves into balls before steam sterilization. This makes it difficult for steam to reach all surfaces of the gloves, making sterilization ineffective.

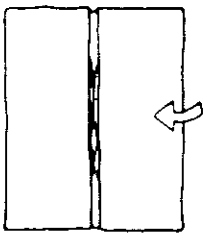
Steps of Wrapping Gloves for Steam Sterilization



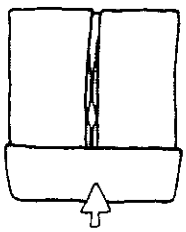
Step 1
Place one pair of gloves in the center of the wrapper. The wrapper should be positioned so that the flat edges—not the points—are at the top, bottom, and sides.



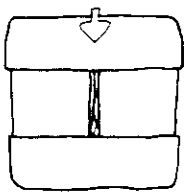
Step 2
Fold the left section to the center.



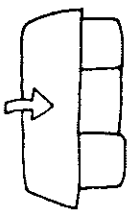
Step 3
Fold the right section to the center.



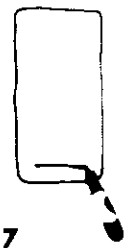
Step 4
Fold the bottom section halfway to the center (one-quarter of the way up).



Step 5
Fold the top section halfway to the center (one-quarter of the way up).



Step 6
Fold the packet in half vertically, either from left to right or from right to left.



Step 7
Mark on the outside of the wrapper the end at which the gloves' cuffs are positioned. (This will help ensure that the gloves will be in the correct position when the provider opens the pack to put them on.)

Skills Practice Checklist: Wrapping Gloves

Review the checklist with the participants, and divide them into small groups to take turns practicing wrapping gloves according to the standards on the checklist. Make sure each practice station is equipped with wrappers (paper, newsprint, muslin or cotton fabric), gloves, and tape. Guide the participants who are observing in giving feedback to the participants who are practicing. Observe all the groups to assess the accuracy of the practice and the constructiveness of the comments given by colleagues. Give feedback on what you observe. Bring the group together to discuss any difficulties or observations and to share comments.

Use of Powder

Gloves may be powdered before steam sterilization to prevent them from sticking together. (It is also easier to put on gloves that have been powdered.) However, powder has been shown to lead to inflammatory reactions in clients, with subsequent granuloma or adhesion formation, and may cause increased development of latex allergies or dermatitis in health care workers.

If powder must be used, be sure to use only absorbable powders, such as starch. Do **not** use talcum powder, which is nonabsorbable. Coat all surfaces of the glove with powder.

To reduce the risk of inflammatory reactions in clients, staff should rinse gloved hands with sterile water or saline solution:

- After putting on gloves that have been powdered, *and*
- Before handling instruments or other items or performing a clinical procedure

Skills Practice Checklist: Wrapping Gloves

Instructions: Take turns observing other participants practice wrapping gloves according to the standards on the checklist. As you observe the other participants perform each action, place a check in the "Yes" box if the action was performed as described in the "Action" column, and place a check in the "No" box if the action was not performed as described in the "Action" column. If you did not observe the action, make a note in the "Comments" column. The "Comments" column can also be used to note any actions that were performed that are not described in the "Action" column or that need to be corrected.

Action	Yes	No	Comments
Places one pair of gloves in the center of the wrapper, which is positioned with the flat edges at the top, bottom, and sides.			
Folds the left section to the center.			
Folds the right section to the center.			
Folds the bottom section halfway to the center (one-quarter of the way up).			
Folds the top section halfway to the center (one-quarter of the way up).			
Folds the packet in half vertically.			
Marks on the outside of the wrapper the end at which the cuffs are positioned.			

Autoclave Maintenance

Review the information on autoclave maintenance, and conduct the following training activity. Highlight the fact that the autoclave is not working correctly if:

- Steam comes out of the safety valve instead of the pressure valve
- Steam comes out from under the lid or around the door

Training Activity: Discussion Topic *(Approximate time: 5–10 minutes)*

Facilitate a discussion on autoclave maintenance by asking the participants:

- Is the autoclave at your facility ever checked to see if it is working properly?
- If so, what measures are taken to check it, and how often is it checked?

Validate or correct the participants' responses, as necessary.

Encourage the participants to post the autoclave manufacturer's maintenance instructions on a wall near the unit, if available. Suggest that they also post the box on page 10.13 of the Participant's Handbook that shows the daily and weekly maintenance tasks. Remind the participants that they should check and follow the autoclave manufacturer's recommendations/instructions for daily/weekly maintenance.

Autoclave Maintenance

The autoclave should be checked each time it is used to make sure that it is functioning properly.

The autoclave is *not* working correctly if:

- Steam comes out of the safety valve instead of the pressure valve. If this happens, the pressure valve must be cleaned and inspected.
- Steam comes out from under the lid or around the door. If this happens, the gasket must be cleaned and dried or replaced.

If repairs are necessary, they should be made before the autoclave is used again.

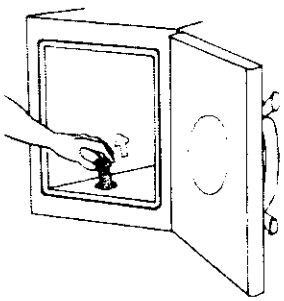
To ensure that the autoclave is properly maintained:

- Routine maintenance should become standard procedure; someone should be assigned to be responsible for this task.
- Follow the manufacturer's instructions whenever possible, since autoclave maintenance varies depending on the type of autoclave.
- Post the autoclave manufacturer's maintenance instructions and/or a copy of the guidelines on the next page on a wall near the unit(s).

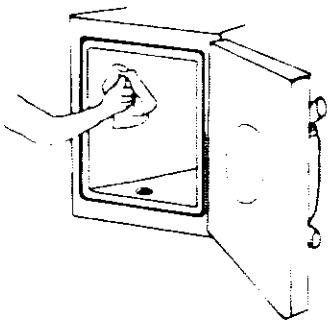
General Guidelines for Routine Maintenance That Are Likely to Apply to Many Autoclaves

Daily

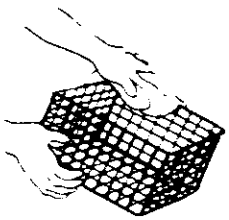
- Remove the outlet screen, and clean with detergent and a brush under running water.



- Clean the chamber using a cloth. Do *not* use abrasive cleansers or steel wool; they will scratch the surface and increase corrosion.

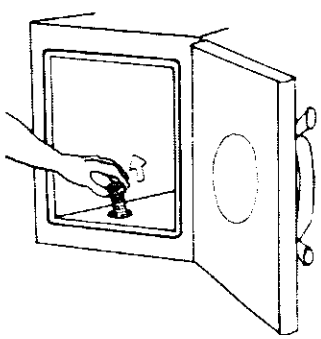


- Clean the door or lid gaskets with a cloth and check for defects. Replace defective gaskets.
- Clean the shelves in the autoclave or the basket or cart that holds packs (including the wheels of the cart) with detergent and a cloth.

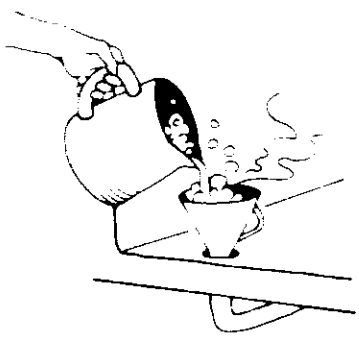


Weekly

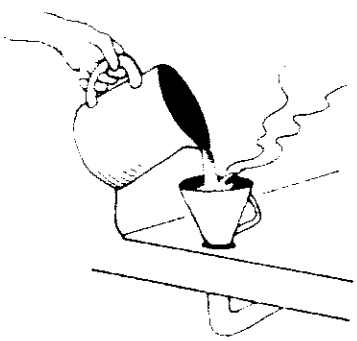
Check the manufacturer's instructions for maintenance of the exhaust line. If the instructions are unavailable, flush the exhaust line or chamber drain to keep it free of material that may interfere with air and steam leaving the chamber, as follows:



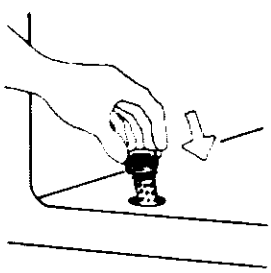
1 Remove the screen.



2 Pour 1 liter of detergent and hot water solution down the drain with a funnel.



3 Pour 1 liter of hot water down the drain to rinse out the detergent solution.



4 Replace the screen.

Dry-Heat Sterilization

Review the process of dry-heat sterilization. If desired, you may conduct the following optional activity. During the course of the session, highlight the following points:

- It is not necessary to open or disassemble instruments and other items; they may be placed in closed containers.
- Do not start timing until the oven has reached the desired temperature.
- The proper temperature for dry-heat sterilization is: 170°C (340°F) for 1 hour, 160°C (320°F) for 2 hours, 150°C (300°F) for 2½ hours, or 140°C (285°F) for 3 hours.
- High temperatures can dull sharps, so use the lower temperatures (160°C or lower) for items such as suture needles, scalpel blades, and scissors.
- Proper storage is as important as the sterilization process itself.
- All instruments and other items should be stored dry. Never store instruments or other items—including suture needles, scissors, pickups (lifters, cheatle forceps)—soaking in fluid, such as Savlon, Lysol, or Betadine.

Optional Activity: Discussion Topic *(Approximate time: 10 minutes)*

Ask for volunteers to list the steps of dry-heat sterilization in the correct order. Record their responses on a flipchart. Validate or correct their responses, as necessary.

Encourage the participants to post the manufacturer's instructions for maintenance of dry-heat ovens on a wall near the dry-heat oven, if possible.

Review the chart comparing autoclaves and dry-heat ovens, which appears on page 10.15 of the Participant's Handbook.

Dry-Heat Sterilization

Definition

Dry-heat sterilization (electric oven): the method of sterilization that requires heat for a specific period of time. For dry-heat sterilization to be achieved, a constant supply of electricity is necessary. **Only** glass or metal objects can be sterilized by this method, because high temperatures are necessary. Do **not** use this method of sterilization for other items, such as surgical gloves, which may melt or burn.

Steps of Dry-Heat Sterilization

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

2 Either (1) wrap the instruments and other items (using foil or double-layered cotton or muslin fabric), (2) put unwrapped instruments and other items on a tray or shelf, or (3) place instruments and other items in a metal, lidded container. *Note:* Because dry-heat sterilization works by raising the temperature of the entire item to the designated temperature, it is *not* necessary to open or unlock hinged instruments or other items or to disassemble those with sliding or multiple parts. In addition, instruments and other items can be placed in closed containers.

3 Place instruments and other items in the oven, and heat to the designated temperature. (*Note:* The oven must have a thermometer or temperature gauge to make sure the designated temperature is reached.) Use the chart below to determine the appropriate amount of time to sterilize instruments and other items for different temperatures. Do *not* begin timing until the oven reaches the desired temperature. *Note:* Because dry heat can dull sharp instruments and needles, these items should *not* be sterilized at temperatures higher than 160°C.

Temperature	Time*
170°C (340°F)	1 hour
160°C (320°F)	2 hours
150°C (300°F)	2½ hours
140°C (285°F)	3 hours

* This is the amount of time that instruments and other items must be kept at the desired temperature to ensure that sterilization is achieved. Keep in mind that the total cycle time—which includes heating the oven to the desired temperature, the sterilization time, and cooling time—is usually twice as long as the time noted above.

4 Leave instruments and other items in the oven to cool before removing. When they are cool, remove instruments and other items (using sterile pickups for unwrapped items), and use immediately or store.

5 *Storage:* Proper storage is as important as the sterilization process itself.

- *Wrapped items* – Storage time and handling of sterile packs should be kept to a minimum, since the likelihood of contamination increases with time and handling. Under optimal storage conditions and with minimal handling, properly wrapped items can be considered sterile as long as they remain intact and dry. When in doubt, the pack should be considered contaminated and the items resterilized before use. (See page 10.5 for more information on storage of wrapped sterilized items.)
- *Unwrapped items* – Unwrapped items can be kept in a covered, dry, sterile container for up to one week.

Remember: Do not store instruments or other items, such as scalpel blades and suture needles, in solutions—always store them dry. Microorganisms can live and multiply in both antiseptic and disinfectant solutions, which can contaminate instruments and other items, leading to infections. In addition, antiseptic solutions are made for killing microorganisms on the skin and mucous membranes, not on objects.

Maintenance of Dry-Heat Ovens

Dry-heat ovens should be checked to make sure that they are functioning properly. Staff should:

- Keep the oven clean.
- Check that the temperature gauge is working correctly on a regular basis—every few weeks is sufficient. To check the temperature gauge, put a thermometer in the oven and compare the temperature reading with the one on the gauge.

Important Differences between Autoclaves and Dry-Heat Ovens

It is important to know whether you are using an autoclave (steam sterilizer) or a dry-heat oven, because different procedures are used with each type of sterilizer. (This chart also appears on page 10.7.)

Autoclave	Dry-Heat Oven
Uses moist heat under pressure, which requires a source of water (either the machine is hooked up directly to a water source, or water is put into the machine before the cycle begins) and a pressure gauge	Does not use water or have pressure gauges
The door must be secured tightly to maintain the high pressure necessary for sterilization to be achieved	The door does **not** need to be secured tightly

Chemical Sterilization

Review the process of chemical sterilization. If desired, you may conduct one or more of the following optional activities.

During the course of the session, highlight the following important points:

- Formaldehyde is no longer recommended, because the liquid and the fumes irritate the skin, eyes, nose, and respiratory tract. Formaldehyde may also cause cancer.
- Chemicals must contact all surfaces; open or disassemble instruments and other items.
- Follow the manufacturer's instructions regarding the amount of time to soak instruments and other items (in general, 10 hours for products containing glutaraldehyde).
- Do not add or remove any instruments or other items to or from the container once timing has started.
- Because chemicals are toxic, all instruments and other items must be rinsed with sterile water. Boiled water should not be used, since it is not sterile.
- Proper storage is as important as the sterilization process itself.
- Unwrapped instruments and other items that are kept in sterile, covered containers are considered sterile for up to one week.
- All instruments and other items should be stored dry. Never store instruments or other items—including suture needles, scissors, pickups (lifters, cheatle forceps), MVA cannulae—soaking in fluid, such as Savlon, Lysol, or Betadine.

Optional Activity: Video Viewing *(Approximate time: 5–10 minutes)*

Show the second part of TDS 6 (length 9:21) from the infection prevention video, which presents the steps of chemical sterilization. *Pick up where you left off from the portion on steam sterilization.* When the segment is over, review the material presented with the participants and allow for questions.

Training Option

The video can be shown either at the beginning of the session to introduce the topic or at the end of the session for review.

Optional Activity: Discussion Topic *(Approximate time: 10 minutes)*

Ask for volunteers to list the steps of chemical sterilization in the correct order. Record their responses on a flipchart. Validate or correct their responses, as necessary.

Chemical Sterilization

Definition

Chemical sterilization: **the method of sterilization used for instruments and other items that are heat-sensitive or when heat sterilization is unavailable. Instruments and other items can be sterilized by soaking them in a chemical solution, such as a product containing glutaraldehyde, followed by rinsing them in sterile water.**

Cidex (which contains glutaraldehyde) is a commonly available solution used for sterilization. Other products containing glutaraldehyde or other chemical sterilants may be locally available. *Note:* Glutaraldehyde is irritating to the skin, eyes, and respiratory tract. When using it, wear gloves, limit your exposure time, and keep the area well ventilated.

Note: The length of time that commercially available glutaraldehyde solutions can be used varies, usually from 14–30 days; always follow the manufacturer's instructions. Solutions should be replaced any time they become cloudy.

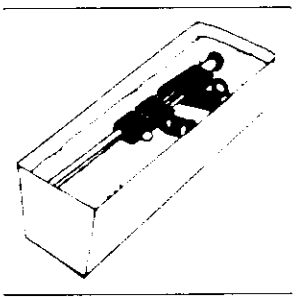
Remember:

- **Formaldehyde is potentially cancer-causing and extremely irritating to the skin, eyes, nose, and respiratory tract. Therefore, routine use of formaldehyde for sterilizing instruments and other items is no longer recommended.**
- **Do not store instruments or other items, such as scalpel blades and suture needles, in solutions—always store them dry. Microorganisms can live and multiply in both antiseptic and disinfectant solutions, which can contaminate instruments and other items, leading to infections. In addition, antiseptic solutions are made for killing microorganisms on the skin and mucous membranes, not on objects.**
- **Always wear gloves when handling chemical solutions.**

Steps of Chemical Sterilization

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

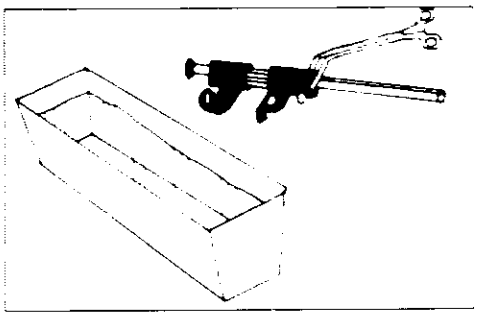
2 Prepare the glutaraldehyde or other chemical solution by following the manufacturer's instructions or use a solution that was prepared previously, as long as it is clear (not cloudy) and has not expired. (Most commercially available glutaraldehyde solutions can be used for at least two weeks after preparation; follow the manufacturer's instructions. Ideally, an indicator strip should be used each time the solution is to be used to determine if the solution is still effective.) After preparing the solution, put it in a clean container with a lid. Always mark the container with the date the solution was prepared and the date it expires.



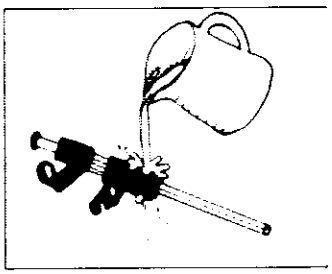
3 Open all hinged instruments and other items and disassemble those with sliding or multiple parts; the solution must contact all surfaces in order for sterilization to be achieved. Completely submerge all instruments and other items in the solution; *all* parts of the instruments and other items should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

4 *Follow the manufacturer's instructions regarding the time necessary for sterilization to be achieved.* In general, if the solution contains glutaraldehyde, cover the container, and allow the instruments and other items to soak for at least 10 hours. Do *not* add or remove any instruments or other items once timing has begun.

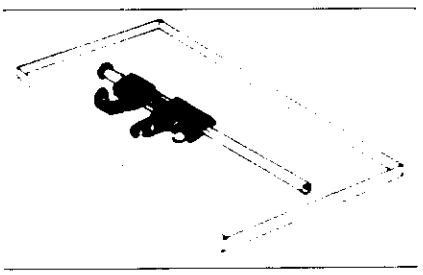
5 Remove the instruments and other items from the solution using large, *sterile* pickups (lifters, cheatle forceps).



6 Rinse thoroughly with *sterile* water to remove the residue that chemical sterilants leave on instruments and other items; this residue is toxic to skin and tissues. *Note: Boiled water is not sterile, because boiling does not guarantee that bacterial endospores have been killed. Therefore, rinsing with boiled water can contaminate sterilized instruments and other items.*



7 *Storage:* Proper storage is as important as the sterilization process itself. Place the instruments and other items on a sterile tray or in a sterile container and allow to air-dry before use or storage. Use the instruments and other items immediately or keep in a covered, dry, sterile container and use within one week.



Monitoring the Effectiveness of Sterilization

Review the information on monitoring the effectiveness of sterilization. Highlight the following points:

- Use a biological indicator on a regular basis to ensure that sterilization is being achieved and that problems are identified as soon as possible.
- Repair nonfunctioning equipment as quickly as possible.
- If sterilizing equipment is not functioning effectively and a back-up sterilizer is not available, high-level disinfection (HLD) is the only acceptable option. HLD should not be used in place of sterilization when sterilization is possible or available. (HLD is covered in detail in Module 11: High-Level Disinfection and Storage.)

Monitoring the Effectiveness of Sterilization

Indicators have been developed to monitor the effectiveness of sterilization by measuring various aspects of the process.

Sterilization can be monitored through:

1. ***Mechanical indicators*** – These indicators, which are part of the autoclave or dry-heat oven itself, record and allow you to observe time, temperature, and/or pressure readings during the sterilization cycle.

2. ***Chemical indicators*** – These include:
   - Tape with lines that change color when the intended temperature has been reached
   - Pellets in glass tubes that melt, indicating that the intended temperature and time have been reached
   - Indicator strips that show that the intended combination of temperature, time, and (in an autoclave) steam has been achieved
   - Indicator strips that show that the chemicals are still effective

3. ***Biological indicators*** – These indicators use heat-resistant bacterial endospores to demonstrate whether or not sterilization has been achieved. If the bacterial endospores have been killed after sterilization, you can assume that all other microorganisms have been killed as well. The advantage of this method is that it directly measures the effectiveness of sterilization. The disadvantage is that this indicator is not immediate, as are mechanical and chemical indicators; bacterial culture results are needed before sterilization effectiveness can be determined.

Recommended Ideal Monitoring System

Perform the following monitoring activities whenever possible.

For steam sterilization:

- If the autoclave has a recording chart, review it after each load. If not, record the temperature, time, and pressure information in a log that is reviewed after each load.
- Place heat- and steam-sensitive chemical indicators, if available, on the inside and outside of each pack.
- Perform testing with biological indicators weekly (or monthly, if testing weekly is not possible).

For dry-heat sterilization:

- If the oven has a recording chart, review it after each load. If not, record the temperature and time information in a log that is reviewed after each load.
- Place heat-sensitive chemical indicators, if available, on the inside and outside of each pack.
- Perform testing with biological indicators weekly (or monthly, if testing weekly is not possible).

For chemical sterilization:

- Record the time information in a log that is reviewed after each load.
- Use an indicator strip, if available, to determine if the solution is still effective.

Correcting Sterilization Failure

If monitoring indicates a failure in sterilization, attempt to determine the cause of the failure and arrange for corrective steps, as follows:

- Immediately check that the autoclave or dry-heat oven is being used correctly or replace the chemical solution.
- If correct use of the unit has been documented and monitoring still indicates a failure in sterilization, discontinue using the unit and have it serviced.
- Any instruments or other items that have been processed in the faulty autoclave or dry-heat oven must be considered nonsterile and must be processed again when the unit is functioning properly.

Special Considerations for Sterilization

Review the chart on sterilizing reusable needles and syringes, gloves, linen, and instruments used during manual vacuum aspiration (MVA). If desired, you may conduct the following optional activity. Note that using disposable needles, syringes, and gloves is preferable to using reusable ones, since these items are difficult to process.

Optional Activity: Discussion Topic *(Approximate time: 10–15 minutes)*

Reinforce the content of this session by asking the participants:

- What is the recommended temperature for sterilizing glass syringes and needles by dry heat?
- When steam-sterilizing needles, what should be done to ensure that all surfaces of the needles will be sterilized?
- What are some special tasks to perform when steam-sterilizing gloves?
- In what position should linen be placed in the autoclave to maximize the effectiveness of sterilization?

Allow for discussion, and validate or correct the participants' responses, as necessary.

Special Considerations for Sterilization

The following items require special attention. To sterilize them, follow the procedures listed below.

Item	Sterilization Procedure
Reusable needles and syringes	*Whenever possible, use disposable needles and syringes, rather than reusable ones, since these items are difficult to process.* *Steam:* Flush needles with boiled water (draw in and expel the water) just before wrapping for steam sterilization. A small amount of water is needed to steam-sterilize instruments and other items with lumens or small openings. *Dry-heat:* Because high temperatures can dull sharp edges, reusable needles should not be sterilized at temperatures higher than 160°C (320°F). Plastic syringes can be autoclaved, but they will melt at temperatures used for dry-heat sterilization. *Chemical:* Not recommended, since it is difficult to adequately rinse off the chemical residue, which may interact with or inactivate the solution being injected.
Gloves	*Whenever possible, use disposable gloves, rather than reusable ones, since gloves are difficult to process.* *Steam:* Sterilize gloves by themselves. Wrap gloves as described on page 10.10. *Never roll gloves up into balls.* Place the glove packs loosely in a wire basket or drum, on their edge with the thumbs up, away from the walls of the autoclave, to help ensure that steam reaches all surfaces. If the autoclave has more than one shelf, place the glove packs on the upper shelves; air inside the autoclave tends to move to the bottom of the unit, and placing gloves on the bottom shelf will speed the rate at which the gloves will deteriorate. Do **not** use gloves for 24–48 hours after steam sterilization to allow elasticity to return and to prevent stickiness; immediately after autoclaving, gloves are very fragile and tear easily. *Dry-heat:* Gloves cannot be sterilized by this method because they will melt. *Chemical:* Impractical, because of the difficulty in rinsing the chemical residue.

continued

Special Considerations for Sterilization continued

Item	Sterilization Procedure
Linen (caps, gowns, masks and surgical drapes)	*Steam:* Packs containing gowns, drapes, and other linen should not be more than 30 x 30 x 50 cm (12 x 12 x 20 in.) or 5 kg (12 lb) to allow for steam to go through the items adequately. Place packs containing sheets, towels, and table covers on their sides to make it easier for the steam to penetrate adequately. It is easier for steam to go through folds than through flat, compressed surfaces. *Dry-heat:* Not recommended, since many fabrics may burn at the high temperatures used. *Chemical:* Impractical, since rinsing with sterile water and drying would be necessary.
Instruments used during manual vacuum aspiration (MVA)	*Note:* Sterilization of the syringe after decontamination and proper cleaning is **not** necessary, because it does not come in contact with the client and is used only as a source of vacuum and as a receptacle for blood/tissue. In addition, sterilization may actually decrease the life of the syringe, since sterilization damages the syringe over time. If your facility requires sterilization of the syringe, it may be sterilized using chemicals. The cannula **should** be sterilized. If sterilization is not possible or available, the cannula may be high-level disinfected. (See page 11.12 for instructions for high-level disinfecting cannulae.) *Steam and dry-heat:* Neither the syringe nor the cannula can withstand either of these methods of sterilization. The syringe value will be destroyed, and the cannula will melt. *Chemical:* Soak the syringe and cannula in a chemical solution, such as glutaraldehyde (e.g., Cidex). (If available, ethylene oxide gas may be used instead.) Be sure that all parts of the syringe are completely submerged and that the barrel is filled with the solution; be sure that the cannula is completely submerged and filled with the solution.

Exercise 10-1: Case Studies

Use the following cases (or use case histories of your own) to help the participants think through the issues involved in sterilization. Divide the participants into small groups and assign two cases to each group. Allow 10 minutes for completion. Bring the groups together and review each case, asking for a volunteer from each group to present the group's work. Allow for discussion; give feedback and validate or correct the participants' responses, as necessary.

Training Options

- After dividing the participants into small groups, ask each group to complete all of the cases. When the groups are brought together, ask for a volunteer from each group to report the group's responses to only one of the cases.
- Read the cases aloud, and ask for volunteers to respond to the questions. (This works well with low-literate/illiterate staff or when time is short.)
- Ask the participants to write their responses in their handbooks, and ask for volunteers to read them aloud. Alternatively, ask the participants to switch books with another participant and correct the other's responses.

Possible responses:

Case Study 1

No. Instruments should be wrapped in a double layer of paper, newsprint, or cotton or muslin fabric; they should not be wrapped in gauze because the material is woven too loosely and does not provide an adequate barrier against contamination after the sterilized instruments are removed from the autoclave. In addition, wrapped instruments must be placed loosely in a drum or tray to allow for adequate passage of steam, and processed for 30 minutes (not 20 minutes) once the temperature and pressure requirements are met.

Case Study 2

No. Even though stringing instruments is an acceptable practice (it keeps the set intact and helps in setting up the sterile field quickly and efficiently), it is not acceptable to steam-sterilize instruments that are closed or locked. Instruments must always be unlocked and opened for steam sterilization, so that steam can contact all surfaces, which is necessary for sterilization to be achieved.

Case Study 3

No. A 0.5% chlorine solution should not be used to sterilize instruments, because chlorine does not reliably kill all bacterial endospores. In addition, long-term exposure to chlorine is caustic to metal and can damage instruments. Nurse Hsu should have used the glutaraldehyde solution she found in the storeroom to sterilize the instruments. Also, instruments or other items soaked in a chemical for sterilization must be thoroughly rinsed with **sterile** water, not boiled water (which is not sterile).

Exercise 10-1: Case Studies

Read the following case studies and answer the questions below. Possible responses are provided on page 10.24.

Case Study 1

A large maternity hospital has a central supply department, which processes all instruments and other items. Instruments are wrapped in one layer of gauze and packed tightly in autoclave drums. The holes in the drums are opened, and the drums are placed in the autoclave and processed for 20 minutes at 121°C and 106 kPa.

Is this an appropriate practice? Why?

Case Study 2

At a local city hospital, after all the instruments are washed and dried, they are closed or locked and assembled by sets. Before placing each set in an autoclave tray, a piece of heavy cotton thread is strung through the instruments and tied so that the set remains together during processing.

Is this an appropriate practice? Why?

Case Study 3

One afternoon, the autoclave at Nurse Hsu's small clinic broke, and she realized that she needed an alternate method of processing the instruments needed for the next day's cases. She decided to chemically sterilize them overnight. The bottle of glutaraldehyde solution in the storeroom had not been opened, so she used a 0.5% chlorine solution instead. The next morning, she removed the instruments from the chlorine solution with sterile forceps, rinsed them in the water from the boiler, and left them to air-dry.

Is this an appropriate practice? Why?

continued

Case Study 4

No. Wrapped instruments and other items are damp after steam sterilization. If they are handled and left to air-dry, microorganisms can move through the damp, porous material and contaminate the instruments and other items. They should remain in the autoclave until dry.

Exercise 10-1: Case Studies continued

Case Study 4

The day before several minilaparotomy procedures are scheduled, Mr. Jimenes, an attendant in the operating theater of a local clinic, processes wrapped instruments for the next day. He has several loads of instruments, gloves, and linen to sterilize. Rather than waiting for the autoclave to dry the items, he removes the packs from the autoclave after sterilization and allows them to dry on the counter overnight.

Is this an appropriate practice? Why?

Answers to Exercise 10-1: Case Studies

Possible responses:

Case Study 1

No. Instruments should be wrapped in a double layer of paper, newsprint, or cotton or muslin fabric; they should not be wrapped in gauze because the material is woven too loosely and does not provide an adequate barrier against contamination after the sterilized instruments are removed from the autoclave. In addition, wrapped instruments must be placed loosely in a drum or tray to allow for adequate passage of steam, and processed for 30 minutes (not 20 minutes) once the temperature and pressure requirements are met.

Case Study 2

No. Even though stringing instruments is an acceptable practice (it keeps the set intact and helps in setting up the sterile field quickly and efficiently), it is not acceptable to steam-sterilize instruments that are closed or locked. Instruments must always be unlocked and opened for steam sterilization, so that steam can contact all surfaces, which is necessary for sterilization to be achieved.

Case Study 3

No. A 0.5% chlorine solution should not be used to sterilize instruments, because chlorine does not reliably kill all bacterial endospores. In addition, long-term exposure to chlorine is caustic to metal and can damage instruments. Nurse Hsu should have used the glutaraldehyde solution she found in the storeroom to sterilize the instruments. Also, instruments or other items soaked in a chemical for sterilization must be thoroughly rinsed with **sterile** water, not boiled water (which is not sterile).

Case Study 4

No. Wrapped instruments and other items are damp after steam sterilization. If they are handled and left to air-dry, microorganisms can move through the damp, porous material and contaminate the instruments and other items. They should remain in the autoclave until dry.

"At My Facility..."

Ask the participants to write their responses to the questions in the space provided. Remind them to answer the questions as honestly as possible. Ask them to think about their response to each question to see if it reflects an appropriate infection prevention practice or if there are issues that need to be addressed. Ask them to write down any problems they identify. Allow 10–15 minutes for completion.

Optional Activity: Discussion Topic *(Approximate time: 10 minutes)*

Ask for volunteers to share their responses, and allow for discussion.

"At My Facility..."

Think about your clinical setting and write your answers to the following questions in the space provided. At your facility:

- Which of the sterilization methods presented in this module are used at your facility?

- For each method of sterilization used at your facility, are the steps followed as they were presented in this module? If not, which aspects of the procedure(s) are different?

- How might the differences affect the quality of sterilization?

- What changes might be made to your facility's sterilization practices?

- What type of sterilization monitoring is conducted regularly to ensure that sterilization is being achieved?

Do your responses to these questions reflect an understanding or performance of appropriate infection prevention practices at your facility? If, based on your responses, you become aware of some problems or issues that need to be addressed, list them below:

Summary/Self-Assessment Answers

1. No. The instruments and other items will become contaminated: (a) by being placed on the gauze, which is too thin and thus allows microorganisms to pass from the instrument tray to the sterile instruments and other items; and (b) by airborne microorganisms that may pass through the gauze covering the instruments and other items during the night.
2. Instruments and other items that are wrapped before sterilization should be wrapped in two layers of paper, newsprint, or cotton or muslin fabric. If instruments and other items are sterilized unwrapped, they should be stored dry in a sterile, covered container until they are used. This example points out that the handling and storage of instruments and other items after sterilization is as important as the sterilization process itself.

Optional Activity: Discussion Topic *(Approximate time: 10 minutes)*

Read aloud the case study, and facilitate a discussion by asking the participants the questions that appear in the Participant's Handbook.

Notes:

- The true/false and multiple-choice questions are grouped by category (general items on sterilization, steam sterilization, dry-heat sterilization, and chemical sterilization) to help direct the participants to those statements that pertain to the type of sterilization used at their facilities.
- The matching exercise should be completed only by nurses, midwives, or other staff who are primarily responsible for sterilizing instruments and other items. *Note:* This exercise can be conducted only if all three methods of sterilization are used/studied.

Answers to true/false questions:

General

3. F
4. T
5. T
6. T

Summary/Self-Assessment

Answers are provided at the end of this assessment.

Review the following case study, which appeared at the beginning of this module, and answer the questions below:

Instruments and other items that will be needed for the next day's surgery are sterilized unwrapped the evening before scheduled cases. After the instruments and other items are sterilized, they are placed on a piece of sterile gauze on an instrument tray in the operating theater and covered with another piece of sterile gauze, ready for use in the morning. The doctors prefer this approach so that they do not need to worry about any delays in the morning.

1. Is this a good system to follow? Why?

2. What might be some alternative approaches?

The following true/false and multiple-choice questions are grouped by category—after general items on sterilization, there are items relating specifically to steam sterilization, dry-heat sterilization, and chemical sterilization.

Decide whether each of the statements is T (true) or F (false). Write your response for each statement in the space provided.

General

3. ____ Unwrapped, sterilized instruments and other items can be moved to a sterile container using boiled pickups (lifters, cheatle forceps). (pages 10.5, 10.14, and 10.17)

4. ____ Wrapped, sterilized instruments and other items can be considered sterile as long as they remain intact and dry. (pages 10.5 and 10.14)

5. ____ Because microorganisms can grow and multiply in disinfectant solutions, sterilized instruments and other items should not be stored soaking in disinfectants. (pages 10.5, 10.14, and 10.16)

6. ____ Dry-heat sterilization requires higher temperatures than autoclaving to achieve sterilization. (page 10.4)

7. T
8. F
9. T
10. T

Steam sterilization

11. T
12. F
13. T
14. T

Dry-heat sterilization

15. F
16. T
17. F
18. T

7. ____ The effectiveness of sterilization can be decreased by the presence of blood and other organic material on instruments and other items. (page 10.3)

8. ____ Making sure instruments and other items are properly sterilized is more important than how they are stored after sterilization. (pages 10.5, 10.14, and 10.17)

9. ____ Regular monitoring of sterilization processes should be performed to ensure that equipment functions properly. (page 10.18)

10. ____ If an MVA syringe has been decontaminated and thoroughly cleaned, it does not need to be sterilized. (page 10.21)

Steam sterilization

11. ____ Reusable surgical gloves should not be rolled into balls for autoclaving. (page 10.10)

12. ____ It is generally not possible to autoclave instruments and other items at facilities in which a constant supply of electricity is not available. (page 10.4)

13. ____ Proper positioning of instruments and other items in the autoclave is important to ensure that sterilization is achieved. (page 10.4)

14. ____ Removing instrument packs from the autoclave when they are wet can compromise their sterility. (page 10.5)

Dry-heat sterilization

15. ____ Decontamination and cleaning are not required before dry-heat sterilization, because the high temperature will burn off any organic matter. (page 10.14)

16. ____ Sterilizing linen using dry heat is not recommended because of the high temperatures used. (page 10.21)

17. ____ The cycle time for dry-heat sterilization begins when the oven is turned on. (page 10.14)

18. ____ Instruments and other items can be placed in closed containers for dry-heat sterilization. (page 10.14)

Chemical sterilization

19. F
20. T
21. T
22. F
23. F

Answers to multiple-choice questions:

General

24. a, b, d
25. b

Chemical sterilization

19. ____ Formaldehyde is recommended for chemical sterilization of instruments and other items. (page 10.16)

20. ____ When using a chemical sterilant, it is important to read the manufacturer's instructions, since soaking times may vary among products. (page 10.17)

21. ____ Instruments and other items that have been sterilized with chemicals can be stored for up to one week in a covered, sterile container. (page 10.17)

22. ____ The ideal method for sterilizing needles and syringes is chemical sterilization. (page 10.20)

23. ____ It is not necessary for an MVA cannula to be completely submerged and filled with glutaraldehyde solution for chemical sterilization to be effective. (page 10.21)

The following are multiple-choice questions. More than one option may be correct. Please circle the correct response(s).

General

24. Which of the following are acceptable methods of sterilization? (page 10.3)

    a. Dry-heat
    b. Soaking in chemicals
    c. Boiling
    d. Autoclaving
    e. Flaming

25. Which of the following methods are acceptable for sterilizing MVA equipment? (page 10.21)

    a. Boiling
    b. Soaking in glutaraldehyde
    c. Autoclaving
    d. Dry heat

Steam sterilization
26. a, b, d

Dry-heat sterilization
27. a, c

Chemical sterilization
28. a, c, d

Steam sterilization

26. Steam sterilization requires: (pages 10.4 and 10.12)

    a. Regular autoclave maintenance
    b. Moist heat under pressure
    c. Sterile water for rinsing instruments and other items before use
    d. Placing instruments and other items in open containers

Dry-heat sterilization

27. Dry-heat sterilization requires: (page 10.14)

    a. A constant supply of electricity
    b. Opening all jointed items
    c. A thermometer or temperature gauge on the oven
    d. A source of water

Chemical sterilization

28. Chemical sterilization requires: (pages 10.16 and 10.17)

    a. Staff to wear gloves to protect themselves from chemicals
    b. Rinsing instruments and other items with boiled water after sterilization
    c. Disassembling instruments and other items with multiple parts
    d. Drying instruments and other items before they are placed in the chemical solution

Answers to matching exercise:

29. Dry heat
30. Dry heat
31. Steam
32. Dry heat
33. Steam
34. Chemical
35. Chemical

Match each sterilization procedure (steam, dry heat, chemical) with the correct description, and write the procedure in the corresponding box.

Procedure	Description
29.	May use a temperature of 170°C (340°F). (page 10.14)
30.	For sharps, the temperature should not be higher than 160°C (320°F). (page 10.14)
31.	Requires a pressure of approximately 106 kPa or 15 lb/in^2. (page 10.4)
32.	At a temperature of 160°C (320°F), takes 2 hours for sterilization to be achieved. (page 10.14)
33.	At a temperature of 121°C (250°F) and 15 lb/in^2, takes 30 minutes for sterilization to be achieved, if instruments are wrapped. (page 10.4)
34.	Requires rinsing with sterile water. (page 10.17)
35.	Requires soaking for at least 10 hours in a glutaraldehyde solution for sterilization to be achieved. (page 10.17)

Answers: 1. No. The instruments and other items will become contaminated: (a) by being placed on the gauze, which is too thin and thus allows microorganisms to pass from the instrument tray to the sterile instruments and other items; and (b) by airborne microorganisms that may pass through the gauze covering the instruments and other items during the night; 2. Instruments and other items that are wrapped before sterilization should be wrapped in two layers of paper, newsprint, or cotton or muslin fabric. If instruments and other items are sterilized unwrapped, they should be stored dry in a sterile, covered container until they are used. This example points out that the handling and storage of instruments and other items after sterilization is as important as the sterilization process itself; 3. F; 4. T; 5. T; 6. T; 7. T; 8. F; 9. T; 10. T; 11. T; 12. F; 13. T; 14. T; 15. F; 16. T; 17. F; 18. T; 19. F; 20. T; 21. T; 22. F; 23. F; 24. a, b, d; 25. b; 26. a, b, d; 27. a, c; 28. a, c, d; 29. Dry heat; 30. Dry heat; 31. Steam; 32. Dry heat; 33. Steam; 34. Chemical; 35. Chemical

MODULE 11 High-Level Disinfection and Storage

Trainer's Notes for Module 11

This module covers high-level disinfection (HLD), a process that kills all microorganisms, except some bacterial endospores. The aim of HLD is to make instruments and other items that will come in contact with broken skin or intact mucous membranes safer. In addition, when sterilization is not available or feasible, HLD is the only acceptable alternative for instruments and other items that will come in contact with the bloodstream or tissues under the skin.

If possible, find out in advance of this session which method of HLD, if any, is currently practiced at the participants' facilities, and tailor the content to fit the participants' needs. In addition, stress the importance of having an alternate method of HLD available in case the method they are currently using becomes unavailable.

Audience

[redacted]

Training Option

If all of the participants are doctors or other staff who are not directly involved in high-level disinfection, or if they all are experienced in processing instruments and other items, this module can be reviewed by discussing each objective, answering the discussion questions presented throughout the module, reviewing the case studies, and answering the Summary/Self-Assessment questions. Alternatively, the Summary/Self-Assessment questions can be used as an individual exercise at the beginning of the session to determine the depth to which this content should be covered.

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MODULE 11 High-Level Disinfection and Storage

Materials and Supplies

- ✓ Transparencies for Module 11 (optional)
- ✓ Overhead projector (optional)
- ✓ Television and videocassette recorder (optional)
- ✓ *Infection Prevention for Family Planning Service Programs*, AVSC International/JHPIEGO video, TDS 7 and 9 (optional)
- ✓ Steamer
- ✓ Flipchart paper, masking tape, index cards, and colored markers

Advance Preparation

- Determine which training activities will be used to present the content of this module. For on-site training, review the activities presented in Appendix E: On-Site Training Activities. Prepare or gather any supplies needed for the activities you will be conducting.
- Find out which chemicals are available for high-level disinfection in the participants' locale, if possible.
- Cue the video to TDS 7, if used.
- Create transparencies or flipcharts, as needed.

Introduction

Introduce this module by reviewing the purpose and objectives that appear in the Participant's Handbook. If desired, you may conduct the following optional activity.

Optional Activity: Case Study *(Approximate time: 5 minutes)*

Read aloud the introductory case study, and direct the participants to the instructions that appear in their handbook.

MODULE 11 High-Level Disinfection and Storage

Introduction

Purpose and Objectives

This module covers high-level disinfection (HLD) and proper storage of high-level disinfected instruments and other items. The module will prepare you to correctly high-level disinfect instruments and other items that will be used during procedures in which they will come in contact with broken skin and/or intact mucous membranes, or, if sterilization is unavailable, during procedures in which they will come in contact with the bloodstream and tissues under the skin. Upon completion of this module, you should be able to:

- Define *high-level disinfection*
- Explain the steps of HLD by boiling, use of chemicals, and steaming, including proper storage of high-level disinfected instruments and other items
- Differentiate between the chemicals that should and should not be used for HLD
- Identify the special considerations for high-level disinfection of the following:
  - reusable needles and syringes
  - linen
  - instruments used during manual vacuum aspiration (MVA)

Read the following case study, and try to keep it in mind as you learn the content of this module. See if you can determine whether the situation presents a risk of infection transmission and, if so, what should be done differently to reduce the risk. Questions about the case study appear in the Summary/Self-Assessment at the end of this module.

At a community health clinic, the specula used for pelvic examinations are processed by boiling. Nurse Diop, who has just started working at the clinic, feels that the specula should be sterilized to reduce the risk of infections in clients. Nurse Mwari, who is responsible for processing the instruments and other items, tells Nurse Diop that the specula are sterile, because the label on the front of the boiler says "instrument sterilizer."

Directions for Independent Study

If you are preparing for this module independently, you should:

- Study this module.
- Complete Exercise 11-1: Recommended Processing Procedures for Selected Instruments and Other Items.
- Complete Exercise 11-2: Case Studies.
- Answer the "At My Facility..." questions for this module.
- Answer the Summary/Self-Assessment questions at the end of this module.
- Write down any questions you have about this module for later discussion with the trainer.

Definition and Importance of High-Level Disinfection

Review the definition of and key points about *high-level disinfection (HLD)* and explain how it differs from sterilization. Conduct the following training activity and, if desired, the following optional activity.

Highlight the following points:

- HLD is the **only** acceptable alternative to sterilization when sterilization is not available or feasible.
- HLD should **not** be used for procedures that require sterile instruments when sterilization is available.

Training Activity: Discussion Topic *(Approximate time: 5 minutes)*

Facilitate a discussion by asking the participants to state the consequences of failing to decontaminate and clean instruments and other items before HLD. *[Possible response: Decontamination protects staff who clean instruments and other items, and cleaning significantly reduces the number of microorganisms and bacterial endospores that can cause infections. Cleaning also removes any organic material that would interfere with the disinfectant's ability to kill microorganisms. Since HLD does not reliably kill all bacterial endospores, cleaning is critical to make HLD as effective as possible.]*

Optional Activity: Individual or Small-Group Exercise *(Approximate time: 20–30 minutes)*

Direct the participants to Exercise 11-1, which appears on page 11.4 of their handbook, and ask them to complete it, based on their knowledge of the definitions and differences between sterilization and HLD. *Instructions for this exercise appear on page 380.*

Training Option

If the ancillary staff have low literacy skills, ask the service providers to assist them with this exercise.

Definition and Importance of High-Level Disinfection

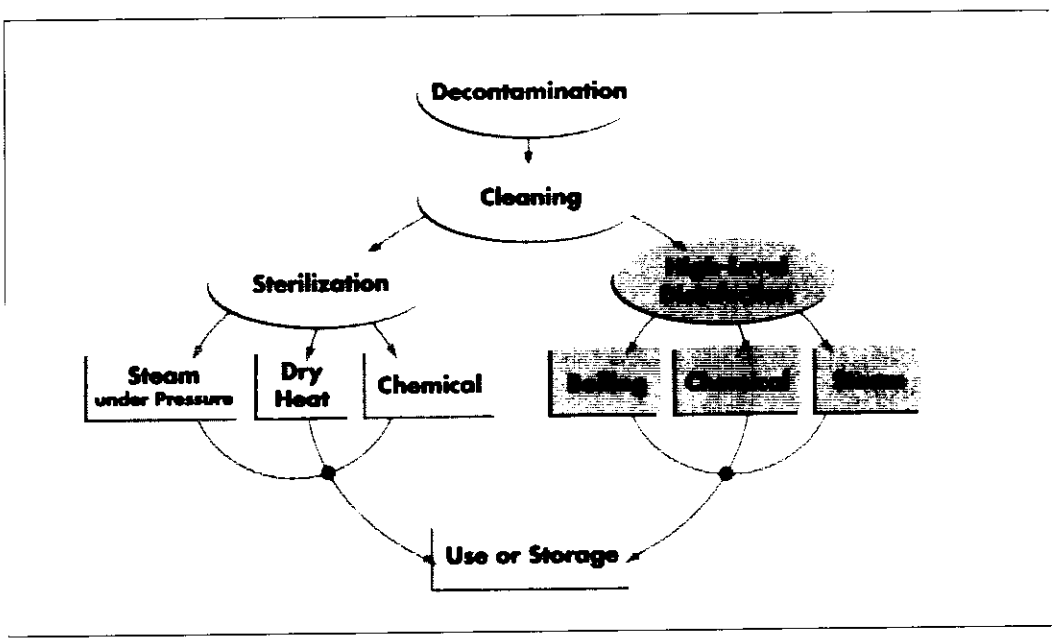
Definition

High-level disinfection (HLD): **the process that eliminates all microorganisms (including bacteria, viruses, fungi, and parasites), but does not reliably kill all bacterial endospores, which cause diseases such as tetanus and gas gangrene. HLD is suitable for instruments and other items that will come in contact with broken skin or intact mucous membranes. HLD can be performed by boiling, use of chemicals, or steaming.**

Because sterilization kills **all** microorganisms, including bacterial endospores, it is preferable to HLD for instruments and other items that will come in contact with the bloodstream or tissues under the skin. If sterilization is not available or feasible, HLD is the **only** acceptable alternative for these instruments/items.

Remember: HLD kills all microorganisms except some bacterial endospores. When sterilization is not available, HLD is the only acceptable alternative for instruments and other items that will come in contact with the bloodstream or tissues under the skin.

As shown in the figure below, high-level disinfection is the third step in processing instruments and other items for reuse.



High-level disinfection can be accomplished by any of these three methods:

1. Boiling
2. Soaking in chemicals
3. Steaming

Boiling is HLD, not sterilization. Flaming is **not** an effective method of HLD, because it does not effectively kill all microorganisms.

The effectiveness of HLD depends on both:

- The amount and type of microorganisms, organic material (blood, other body fluids, tissue), and other matter (such as dirt) present on the instrument or other item
- The amount of protection the instrument or other item gives the microorganisms (such as how many grooves the instrument or other item has in which microorganisms can hide)

Therefore, it is important to thoroughly clean instruments and other items **before** HLD to: (a) reduce the number of microorganisms; (b) eliminate blood, other body fluids, or tissue remains; and (c) remove contaminants that can collect in joints, grooves, and teeth of instruments and other items.

Exercise 11-1: Recommended Processing Procedures for Selected Instruments and Other Items

Ask the participants to complete each box, indicating whether HLD or sterilization is appropriate for each instrument/item and under what conditions. (See "Fitting diaphragms" for an example.) Note that all instruments/items must be decontaminated and cleaned before HLD or sterilization. Tell the participants that the appropriate method of HLD to use for each instrument/item will be covered later in this module. Allow 10 minutes for completion. Ask for volunteers to share and explain their answers. Allow for questions, and validate or correct their answers, as necessary. Answers appear on page 11.5 of the Participant's Handbook.

Training Options

- To conduct this exercise as a small-group exercise, divide the participants into groups, and ask each group to discuss and complete the exercise. Allow 15 minutes for completion. Have each group report their answer for one instrument/item and see if the other groups agree with their answer. Continue until all the boxes have been completed. Validate or correct the participants' responses, as necessary.
- As the participants call out their answers, fill them in on a transparency of the incomplete chart.

Exercise 11-1: Recommended Processing Procedures for Selected Instruments and Other Items

Instructions: For each item, state whether HLD or sterilization is appropriate and under what conditions. See "Fitting diaphragms" for an example. (*Note:* All items must be decontaminated and cleaned before HLD or sterilization.) Answers appear on the next page.

Instrument/Item	Is High-Level Disinfection Appropriate?	Is Sterilization Appropriate?
Fitting diaphragms	Yes, since fitting diaphragms will come in contact with intact mucous	It is not necessary, but fitting diaphragms can be autoclaved.
Surgical gloves for cesarean delivery		
Instruments for pelvic examination and IUD insertion		
Instruments for vasectomy and tubal ligation		
Reusable needles and syringes		
Instruments for insertion of Norplant implants		
Laparoscopes		
MVA syringes		
MVA cannulae		

Answers to Exercise 11-1: Recommended Processing Procedures for Selected Instruments and Other Items

Instrument/Item	Is High-Level Disinfection Appropriate?	Is Sterilization Appropriate?
Fitting diaphragms	Yes, since fitting diaphragms will come in contact with intact mucous membranes.	It is not necessary, but fitting diaphragms can be autoclaved.
Surgical gloves for cesarean delivery	It is acceptable only if sterilization is impractical or not available.	Yes, it is preferable, since gloves will come in contact with tissues under the skin.
Instruments for pelvic examination and IUD insertion	Yes, since the instruments are touching only intact mucous membranes. *Note:* Most IUDs now come in sterile packages.	Yes, but it is not necessary.
Instruments for vasectomy and tubal ligation	It is acceptable only if sterilization is impractical or not available.	Yes, it is preferable, since the instruments will come in contact with tissues under the skin.
Reusable needles and syringes	It is acceptable only if sterilization is impractical or not available.	Yes, it is preferable, since needles and syringes will come in contact with the bloodstream.
Instruments for insertion of Norplant implants	It is acceptable only if sterilization is impractical or not available.	Yes, it is preferable, since the instruments will come in contact with tissues under the skin.
Laparoscopes	Yes, since research has shown that HLD is just as effective as sterilization in reducing the risk of infections with laparoscope use.	It is not necessary, but laparoscopes can be chemically sterilized.
MVA syringes	It is not necessary, but MVA syringes can be high-level disinfected using chemicals.	It is not necessary, but MVA syringes can be chemically sterilized.
MVA cannulae	It is acceptable only if sterilization is impractical or not available.	Yes, it is preferable, but cannulae can be sterilized using chemicals only.

High-Level Disinfection by Boiling

Review the steps of HLD by boiling. If desired, you may conduct one or more of the following optional activities. Highlight "Tips for HLD by Boiling" (on page 11.7 of the Participant's Handbook), which can correct the mistakes most commonly made in HLD.

Optional Activity: Video Viewing *(Approximate time: 5–10 minutes)*

Show the first part of TDS 7 from the infection prevention video, which presents HLD by boiling. *Stop the video* after the portion on boiling. When the segment is over, review the material presented with the participants and allow for questions. *Note:* If you are *not* going to review chemical HLD with the participants, also show TDS 9 (length 3:33) from the video, which presents how to prepare an HLD container by boiling and use of chemicals. (If you *are* going to review chemical HLD with the participants, TDS 9 can be viewed during that session.) When the segment is over, review the material presented with the participants and allow for questions.

Training Option

The video can be shown either at the beginning of the session to introduce the topic or at the end of the session for review.

Optional Activity: Discussion Topic *(Approximate time: 5 minutes)*

Facilitate a discussion on HLD by boiling by asking the participants:

- What are the consequences of **not** boiling instruments and other items long enough during HLD?
- What should you do if you forget to start timing the HLD procedure?

Optional Activity: Discussion Topic *(Approximate time: 10 minutes)*

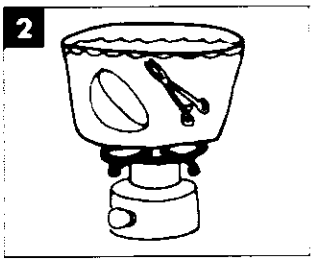
Ask for volunteers to list the steps of HLD by boiling in the correct order. Record their responses on a flipchart. Validate or correct their responses, as necessary.

High-Level Disinfection by Boiling

Steps of HLD by Boiling

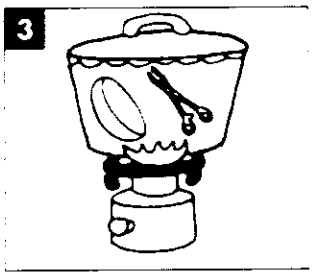
1 Decontaminate and clean all instruments and other items to be high-level disinfected.

2 Because water must touch all surfaces for HLD to be achieved, completely submerge all instruments and other items in the water in the pot or boiler. Open all hinged instruments and other items and disassemble those with sliding or multiple parts. Place any bowls and containers upright, not upside-down, and fill with water.

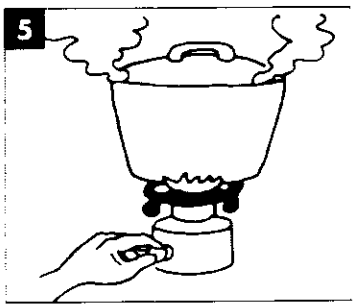


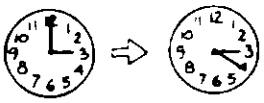
3 Cover the pot or close the lid on the boiler and bring the water to a gentle, *rolling* boil.

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



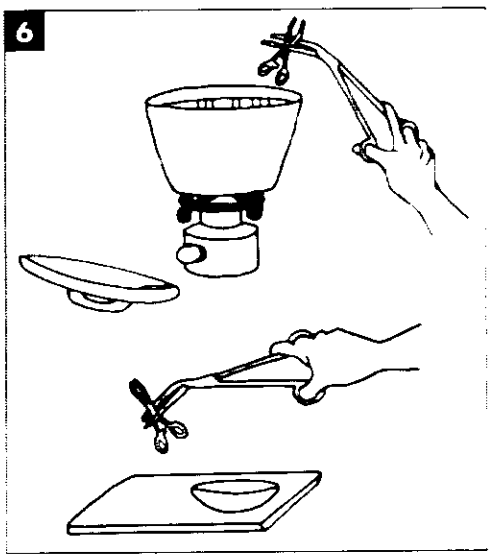
5 Lower the heat to keep the water at a gentle, rolling boil; too vigorous a boil will cause the water to evaporate and may damage the instruments and other items if they bounce around the container and hit the sidewalls and other instruments or items. The lower heat also saves fuel/electricity.





6 After 20 minutes, remove the instruments and other items using dry, high-level disinfected pickups (lifters, cheatle forceps). Place the instruments and other items on a high-level disinfected tray or in a high-level disinfected container, away from insects and dust and in a low-traffic area. Allow to air-dry before use or storage. Never leave boiled instruments and other items in water that has stopped boiling; they can become contaminated as the water cools down.

7 *Storage:* Use instruments and other items immediately or keep in a covered, dry, high-level disinfected container and use within one week.



A high-level disinfected tray or container can be prepared either by:

- Boiling it for 20 minutes, *or*
- Filling it with a 0.5% chlorine solution and letting it soak for 20 minutes, draining the chlorine solution, and rinsing thoroughly with boiled water

Note: A white, scaly deposit may be left on instruments and other items that have been boiled frequently and on the pot/boiler itself; these are lime deposits caused by lime salts in the water. To minimize lime deposits:

- Add some vinegar to the water to remove deposits from instruments, other items, and the inside of the pot/boiler.
- Boil the water for 10 minutes at the beginning of each day that the pot/boiler is used; this will precipitate the lime (make it come out of the water and settle on the bottom or sides of the pot/boiler instead of the instruments or other items) before the instruments or other items are added.
- Use the same water throughout the day, adding only enough to keep the instruments and other items below the surface.
- Drain and clean out the pot/boiler at the end of each day that it is used.

Tips for HLD by Boiling

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

Remember: Do not store instruments or other items, such as scalpel blades and suture needles, in solutions—always store them dry. Microorganisms can live and multiply in both antiseptic and disinfectant solutions, which can contaminate instruments and other items, leading to infections. In addition, antiseptic solutions are made for killing microorganisms on the skin and mucous membranes, not on objects.

High-Level Disinfection Using Chemicals

Review the steps of chemical HLD. If desired, you may conduct one or more of the following optional activities. Highlight "Tips for HLD Using Chemicals" (on page 11.9 of the Participant's Handbook), which can correct the mistakes most commonly made in HLD.

Optional Activity: Video Viewing *(Approximate time: 10 minutes)*

Show the second part of TDS 7 from the infection prevention video, which presents HLD using chemicals. When the segment is over, review the material presented with the participants and allow for questions. Then show TDS 9 (length 3:33) from the video, which presents how to prepare an HLD container by boiling and use of chemicals. When the segment is over, review the material presented with the participants and allow for questions.

Training Option

The video can be shown either at the beginning of the session to introduce the topic or at the end of the session for review.

Optional Activity: Discussion Topic *(Approximate time: 10 minutes)*

Ask for volunteers to list the steps of chemical HLD in the correct order. Record their responses on a flipchart. Validate or correct their responses, as necessary.

Review the difference between antiseptics and disinfectants, which appears on pages 4.2 and 4.3 of the Participant's Handbook. Then review the information on chemicals appropriate for use in HLD, and ask the participants which solutions they use for chemical HLD. Point out any products that are being used inappropriately, if needed, and explain why they are inappropriate. Help the participants determine which locally available products are appropriate for chemical HLD or what alternative methods of HLD are available. If desired, you may conduct the following optional activity.

Highlight the following points about chemicals that should **not** be used for HLD:

- Formaldehyde is no longer recommended for use in HLD.
- Never use antiseptics for HLD; they are for use on the skin.
- Alcohol and iodophors are not considered high-level disinfectants.
- Compounds containing mercury are highly toxic and should never be used in health care services.

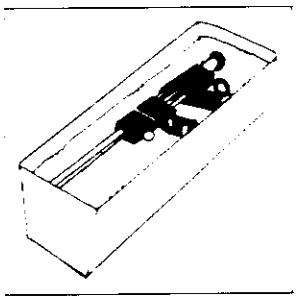
Optional Activity: Large-Group Exercise *(Approximate time: 15–30 minutes)*

Display flipcharts showing the headings "Chemicals Appropriate for Use in HLD" and "Chemicals Not Appropriate for Use in HLD." Distribute pieces of paper or index cards listing the chemicals that would fall under the two headings. Ask for volunteers to match the chemicals with the correct heading. Continue until all the chemicals have been matched. Correct any incorrect answers and allow for questions.

High-Level Disinfection Using Chemicals

Steps of HLD Using Chemicals

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

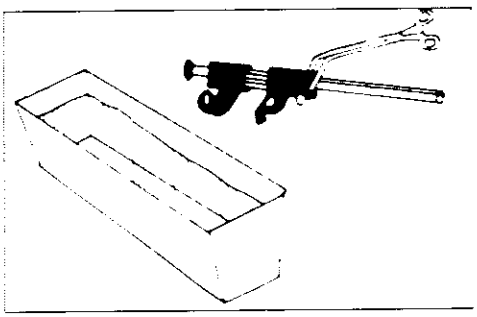


2 – *When using a glutaraldehyde solution:* Prepare the solution by following the manufacturer's instructions or use a solution that was previously prepared, as long as it is clear (not cloudy) and has not expired. (Most commercially available glutaraldehyde solutions can be used for at least two weeks after preparation; follow the manufacturer's instructions. Ideally, an indicator strip should be used each time the solution is to be used to determine if the solution is still effective.) After preparing the solution, put it in a clean container with a lid. Mark the container with the date the solution was prepared and the date it expires.

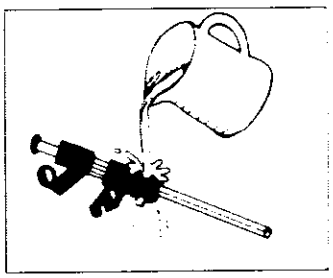
– *When using a chlorine solution:* Follow the instructions on page 8.4. Fresh solution should be made each day (or sooner, if the solution becomes cloudy). Put the solution in a clean container with a lid. *Note:* Chlorine is not for use on laparoscopic equipment.

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

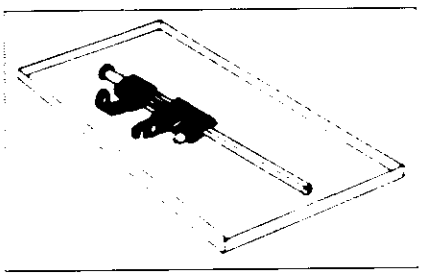
4 Cover the container, and allow the instruments and other items to soak for 20 minutes. Do *not* add or remove any instruments or other items to or from the solution once timing has begun.



5 Remove the instruments and other items from the solution using dry, high-level disinfected pickups (lifters, cheatle forceps).



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



7 *Storage:* Place the instruments and other items on a high-level disinfected tray or in a high-level disinfected container and allow to air-dry before use or storage. Use instruments and other items immediately or keep in a covered, dry, high-level disinfected container and use within one week.

A high-level disinfected tray or container can be prepared either by:

- Boiling it for 20 minutes, *or*
- Filling it with a 0.5% chlorine solution and letting it soak for 20 minutes, draining the chlorine solution, and rinsing thoroughly with boiled water

Tips for HLD Using Chemicals

- Instruments and other items must be **completely** covered with chemical solution. Open all hinged instruments and other items and disassemble those with sliding or multiple parts.
- Soak for 20 minutes. If you forget to start timing the HLD procedure, start timing at the point at which you realize that you did not begin timing.
- Do **not** add or remove **anything** once timing begins.
- Rinse instruments and other items thoroughly with boiled water.

Remember: Do **not** store instruments or other items, such as scalpel blades and suture needles, in solutions—always store them dry. Microorganisms can live and multiply in both antiseptic and disinfectant solutions, which can contaminate instruments and other items, leading to infections. In addition, antiseptic solutions are made for killing microorganisms on the skin and mucous membranes, not on objects.

Appropriate and Inappropriate Chemicals for Use in High-Level Disinfection

In many settings, the only chemicals that are appropriate for use in HLD are chlorine (0.5%) and glutaraldehyde. (For more information about chlorine and glutaraldehyde, see page 4.9.)

Never use the following chemicals for HLD:

- Acridine derivatives (e.g., gentian violet)
- Alcohol
- Benzalkonium chloride (e.g., Zephiran)
- Carbolic acid (e.g., Phenol, Lysol)
- Cetrimide (e.g., Cetavlon)
- Chlorhexidine gluconate (e.g., Hibitane, Hibiclens, Hibiscrub)
- Chlorhexidine gluconate with cetrimide (e.g., Savlon)
- Chlorinated lime and boric acid (e.g., Eusol)
- Formaldehyde
- Hexachlorophene (e.g., pHisoHex)
- Hydrogen peroxide
- Iodophors
- *Para*-chloro-*meta*-xylenol (PCMX, chloroxylenol) (e.g., Dettol)
- Mercury-containing compounds
- Sporicidin

Remember:

- Antiseptics should **never** be used for HLD. They are for use on the skin and mucous membranes, not on inanimate objects.
- Formaldehyde is potentially cancer-causing and extremely irritating to the skin, eyes, and respiratory tract. Therefore, routine use of formaldehyde for processing instruments and other items or for disinfection of environmental surfaces is **not** recommended.
- Disinfectants should always be stored in a cool, dark place; they should **never** be stored in direct light or excessive heat.

High-Level Disinfection by Steaming

Ask the participants whether they use disposable or reusable gloves at their facilities and whether they perform manual vacuum aspiration (MVA). *If they use disposable gloves and do not perform MVA, it is not necessary to cover this content.*

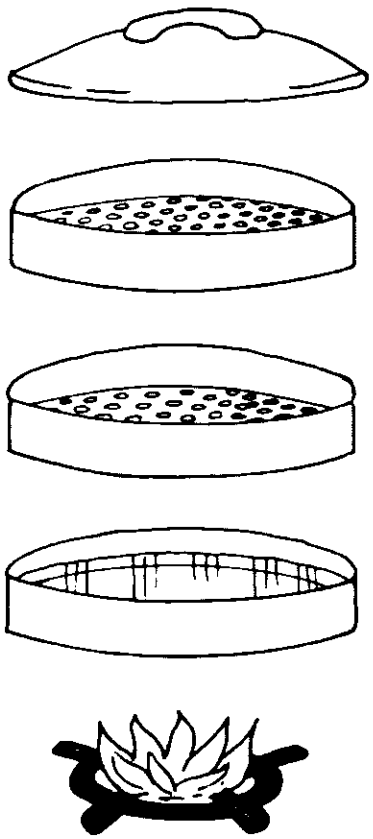
Review the steps of HLD by steaming. Tell the participants that because gloves are difficult to properly process, it is best to use single-use disposable gloves. However, if they are unavailable, particular attention must be given to appropriate processing. If desired, you may conduct the following optional activity.

Optional Activity: Discussion Topic *(Approximate time: 10 minutes)*

Ask for volunteers to list the steps of HLD by steaming in the correct order. Record their responses on a flipchart. Validate or correct their responses, as necessary.

High-Level Disinfection by Steaming

The best method of high-level disinfecting gloves and a useful method of high-level disinfecting cannulae used during manual vacuum aspiration (MVA) is to steam them in a steamer containing one to three tiers of gloves or cannulae.



Two-Tiered Steamer

MVA cannulae may be high-level disinfected or sterilized by other methods. However, high-level disinfection of gloves by other methods is less appropriate, as follows:

- Gloves may be high-level disinfected by boiling, but this is **not** recommended, since it is difficult to dry gloves properly without contaminating them. If it is necessary to high-level disinfect gloves by boiling, the gloves may be worn wet.
- Using chemicals to high-level disinfect gloves is impractical, since it is difficult to adequately rinse off the chemical residue.

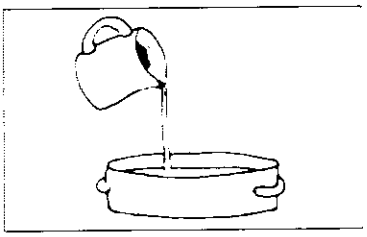
Whenever possible, use disposable gloves, rather than reusable ones, since gloves are difficult to process.

Steps of HLD by Steaming

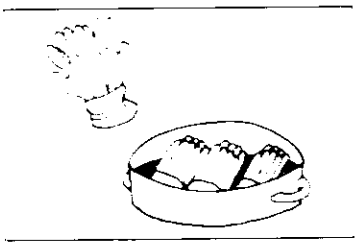
These steps should be followed for steaming gloves and MVA cannulae. Gloves are mentioned and shown in the illustrations as an example.

1 Decontaminate and clean gloves to be high-level disinfected.

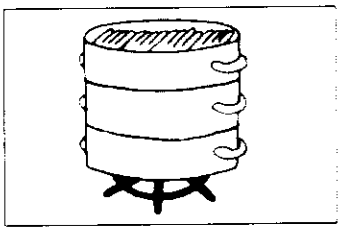
2 Place water in the bottom tray (which has no holes).



3 Fold back the cuffs of the gloves in pairs and place the gloves in the tray(s) that have holes. The number of gloves that will fit in each tray depends on the size of the tray (usually 5–15 pairs). If more than one layer of gloves is being steamed, loosely layer the gloves in a criss-cross design. Gloves should *not* be packed tightly in the tray(s).

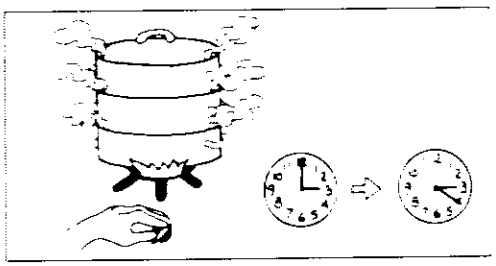


4 Stack the tray(s) of gloves on top of the bottom tray.



5 Place the lid on the top tray and bring the water to a boil. When steam comes out between the trays, the water is boiling. Reduce the heat, but maintain the water at a rolling boil (steam should continue to come out between the trays). High heat wastes fuel and causes the water to evaporate more quickly.

6 Steam the gloves for 20 minutes. Use a timer or make sure to record the time.



7 Remove each tray of gloves, shake off the excess water, and place the tray(s) on a second tray that does not have holes or contain water (a second bottom tray). (Do *not* place the tray containing the gloves directly on the countertop, since this may contaminate the gloves; remember, there are holes in the bottom of the tray.)

8 Use the gloves immediately or allow them to dry for 4–6 hours (drying may be difficult in areas of high humidity).

9 *Storage:* Store the gloves in a covered tray or put them in a high-level disinfected container and use within one week.

More information on high-level disinfection of MVA cannulae is provided on the next page.

A high-level disinfected tray or container can be prepared either by:

- Boiling it for 20 minutes, *or*
- Filling it with a 0.5% chlorine solution and letting it soak for 20 minutes, draining the chlorine solution, and rinsing thoroughly with boiled water

Special Considerations for High-Level Disinfection

Review the chart on high-level disinfection of reusable needles and syringes, linen, and instruments used during manual vacuum aspiration (MVA). Note that using disposable needles and syringes is preferable to using reusable ones, since these items are difficult to process.

Special Considerations for High-Level Disinfection

The following items require special attention. To high-level disinfect them, follow the procedures listed below.

Item	HLD Procedure
Reusable needles and syringes	*Whenever possible, use disposable needles and syringes, rather than reusable ones, since these items are difficult to process.* *Boiling:* Follow the steps on page 11.6. *Chemical:* Not recommended, since it is difficult to adequately rinse off the chemical residue, which may interact with or inactivate the solution being injected.
Linen (caps, gowns, masks, and surgical drapes)	*HLD of linen is impractical. HLD by boiling is impractical, since drying would be necessary, and HLD using chemicals is impractical, since rinsing with boiled water and drying would be necessary.* Linen should be steam-sterilized. (See page 10.21 for instructions for sterilizing linen.)
Instruments used during manual vacuum aspiration (MVA)	*Syringe:* HLD of the syringe after decontamination and proper cleaning is **not** necessary, because it does not come in contact with the client and is used only as a source of vacuum and as a receptacle for blood/tissue. In addition, HLD may actually decrease the life of the syringe, since HLD damages the syringe over time. If your facility requires HLD of the syringe, soak it in a chemical solution, such as glutaraldehyde (e.g., Cidex) or a 0.5% chlorine solution. Be sure that all parts of the syringe are completely submerged and that the barrel is filled with the solution. *Cannula:* If sterilization of the cannula is not possible, it may be high-level disinfected by boiling, soaking in chemicals, or steaming. • *Boiling:* Research has shown that the cannula does **not** need to be submerged in the water for HLD by boiling to be effective. However, the pot/boiler must be kept covered. • *Chemical:* Completely fill and submerge the cannula in a solution that contains glutaraldehyde or in a 0.5% chlorine solution. • *Steaming:* Follow the steps on page 11.11.

Exercise 11-2: Case Studies

Use the following cases (or use case histories of your own) to help the participants think through the issues involved in high-level disinfection. Divide the participants into small groups and assign two cases to each group. Allow 10–30 minutes for completion. Bring the groups together and review each case, asking for a volunteer from each group to present the group's work. Allow for discussion; give feedback and validate or correct the participants' responses, as necessary.

Training Options

- After dividing the participants into small groups, ask each group to complete all of the cases. When the groups are brought together, ask for a volunteer from each group to report the group's responses to only one of the cases.
- Read the cases aloud, and ask for volunteers to respond to the questions. (This works well with low-literate/illiterate staff or when time is short.)
- Ask the participants to write their responses in their handbooks, and ask for volunteers to read them aloud. Alternatively, ask the participants to switch books with another participant and correct the other's responses.

Possible responses:

Case Study 1

No. Once instruments and other items have been placed in boiling water and the timing begins, no other instruments, other items, or additional water should be added. It does not matter if the instruments can be differentiated or not. Adding anything will contaminate the water and its contents, and timing must begin again for HLD to be achieved. In addition, Mr. Ramirez should not rely on memory for timing the instruments. He should either write down the time on paper or use a timer.

Case Study 2

No. Nurse Touré should not roll the gloves into balls for either steam sterilization or HLD by steaming. In order for steam to work (either for sterilization or HLD), it must have contact with all surfaces. Gloves that are to be steamed should be placed in pairs with the cuffs folded back and loosely layered in a criss-cross design. After processing, trays should not be placed directly on a surface such as the counter, because the holes in the tray can allow microorganisms to contaminate the gloves. If at all possible, gloves should be allowed to dry for 4–6 hours before use.

Case Study 3

No. The instruments should first be decontaminated in a 0.5% chlorine solution (except for the laparoscope and cable, which may be damaged by the chlorine). All items should then be cleaned with soap and water, rinsed, and dried before soaking in the glutaraldehyde solution for 20 minutes. All ports and valves should be opened, and items should be completely submerged in the solution. After soaking, they should be thoroughly rinsed with boiled water.

Exercise 11-2: Case Studies

Read the following case studies and answer the questions below. Possible responses appear on the next page.

Case Study 1

Mr. Ramirez, who cleans instruments and other items used in the operating theater, has just finished washing and rinsing a set of minilaparotomy instruments and adds them to the boiler. He looks at the clock and mentally takes note of the time. The boiler already contains a set of IUD instruments, which have to remain in the boiler for 5 more minutes before they can be removed. Mr. Ramirez is not concerned about noting the time that the IUD instruments need to be removed from the boiler; he thinks he will be able to keep track of when each set of instruments needs to be removed because the two sets are different from each other.

Is this an appropriate practice? Why?

Case Study 2

Because of the constant electricity outages at the clinic, Nurse Touré does not rely on the autoclave to sterilize surgical gloves; she always high-level disinfects gloves by steaming. Before HLD, she prepares the gloves as she would for the autoclave, by rolling them into balls. Ten pairs of gloves fit neatly but snuggly into each of two steamer trays, and she is able to process all 20 pairs at one time. After steaming, she places the two steamer trays on the counter to air-dry.

Is this an appropriate practice? Why?

Case Study 3

Each Thursday afternoon, Dr. Fall and her staff perform laparoscopic tubal occlusions on women from the local villages. In between clients, the laparoscope and instruments are washed, rinsed, and soaked in a glutaraldehyde solution for a few minutes before they are dipped in water and reused.

Is this an appropriate practice? Why?

Answers to Exercise 11-2: Case Studies

Possible responses:

Case Study 1

No. Once instruments and other items have been placed in boiling water and the timing begins, no other instruments, other items, or additional water should be added. It does not matter if the instruments can be differentiated or not. Adding anything will contaminate the water and its contents, and timing must begin again for HLD to be achieved. In addition, Mr. Ramirez should not rely on memory for timing the instruments. He should either write down the time on paper or use a timer.

Case Study 2

No. Nurse Touré should not roll the gloves into balls for either steam sterilization or HLD by steaming. In order for steam to work (either for sterilization or HLD), it must have contact with all surfaces. Gloves that are to be steamed should be placed in pairs with the cuffs folded back and loosely layered in a criss-cross design. After processing, trays should not be placed directly on a surface such as the counter, because the holes in the tray can allow microorganisms to contaminate the gloves. If at all possible, gloves should be allowed to dry for 4–6 hours before use.

Case Study 3

No. The instruments should first be decontaminated in a 0.5% chlorine solution (except for the laparoscope and cable, which may be damaged by the chlorine). All items should then be cleaned with soap and water, rinsed, and dried before soaking in the glutaraldehyde solution for 20 minutes. All ports and valves should be opened, and items should be completely submerged in the solution. After soaking, they should be thoroughly rinsed with boiled water.

At My Facility..."

Ask the participants to write their responses to the questions in the space provided. Remind them to answer the questions as honestly as possible. Ask them to think about their response to each question to see if it reflects an appropriate infection prevention practice or if there are issues that need to be addressed. Ask them to write down any problems they identify. Allow 10–15 minutes for completion.

Optional Activity: Discussion Topic *(Approximate time: 10 minutes)*

Ask for volunteers to share their responses, and allow for discussion.

"At My Facility..."

Think about your clinical setting and write your answers to the following questions in the space provided. At your facility:

- Which high-level disinfection methods presented in this module are used at your facility?

- For each method of HLD used at your facility, are the steps followed as they were presented in this module? If not, which aspects of the procedure are different?

- How might the differences affect the quality of HLD?

- What changes might be made to your facility's HLD practices?

- Are items such as scalpel blades, suture needles, and scissors stored soaking in any solution?

Do your responses to these questions reflect an understanding or performance of appropriate infection prevention practices at your facility? If, based on your responses, you become aware of some problems or issues that need to be addressed, list them below:

Summary/Self-Assessment Answers

1. No. Boiling is a method of high-level disinfection, which means that all microorganisms, except some bacterial endospores, are killed.
2. Yes. HLD is suitable for processing specula to be used during vaginal examinations, because the specula will come in contact only with intact mucous membranes. In addition, HLD by boiling may be more cost-effective than sterilization.

Optional Activity: Discussion Topic *(Approximate time: 10 minutes)*

Read aloud the case study, and facilitate a discussion by asking the participants the questions that appear in the Participant's Handbook.

Note: The questions in this Summary/Self-Assessment are grouped by category (general items on high-level disinfection, HLD by boiling, using chemicals, and steaming) to help direct the participants to those statements that pertain to the type of HLD used at their facilities.

Answers to true/false questions:

General

3. F
4. T
5. T
6. F

Summary/Self-Assessment

Answers are provided at the end of this assessment.

Review the following case study, which appeared at the beginning of this module, and answer the questions below:

At a community health clinic, the specula used for pelvic examinations are processed by boiling. Nurse Diop, who has just started working at the clinic, feels that the specula should be sterilized to reduce the risk of infections in clients. Nurse Mwari, who is responsible for processing the instruments and other items, tells Nurse Diop that the specula are sterile, because the label on the front of the boiler says "instrument sterilizer."

1. Are instruments and other items sterile after boiling?

2. Is HLD an appropriate method for processing specula?

The following true/false and multiple-choice questions are grouped by category—after general items on high-level disinfection, there are items relating specifically to HLD by boiling, using chemicals, and steaming.

Decide whether each of the statements is T (true) or F (false). Write your response for each statement in the space provided.

General

3. ____ HLD kills all microorganisms. (page 11.2)

4. ____ HLD is suitable for instruments and other items that will be used during procedures in which they will come in contact with intact mucous membranes, such as pelvic examinations. (page 11.2)

5. ____ HLD is acceptable for surgical instruments only when sterilization is not practical or available. (page 11.2)

6. ____ Keeping HLD instruments and other items in a container of antiseptic solution will reduce the likelihood of their becoming contaminated. (pages 11.7 and 11.9)

HLD by boiling

7. F
8. F
9. T
10. T

HLD using chemicals

11. T
12. F
13. T

HLD by steaming

14. T
15. F
16. T
17. F

HLD by boiling

7. ____ Instruments and other items can be HLD by boiling for 10–15 minutes. (page 11.6)

8. ____ Cleaning instruments and other items is not necessary before HLD by boiling because any blood or organic material on them will be removed during the boiling process. (page 11.6)

9. ____ Before HLD by boiling, hinged instruments should be opened and items with multiple parts should be disassembled. (page 11.6)

10. ____ If the pot/boiler is covered, an MVA cannula does not need to be completely submerged in the water for HLD by boiling to be effective. (page 11.12)

HLD using chemicals

11. ____ When performing HLD using chemicals, instruments and other items should remain submerged for 20 minutes. (page 11.8)

12. ____ Instruments and other items may be rinsed with tap water following chemical HLD. (page 11.8)

13. ____ During chemical HLD, no additional instruments or other items should be added to the chemical solution once timing has begun. (page 11.8)

HLD by steaming

14. ____ Reusable surgical gloves can be HLD by steaming for 20 minutes. (page 11.11)

15. ____ A thermometer should be placed in the top tier of the steamer to monitor the temperature during the steaming process. (page 11.11)

16. ____ During HLD by steaming, gloves should not be packed tightly in the steamer trays. (page 11.11)

17. ____ There is no need to be concerned about contaminating MVA cannulae that have been high-level disinfected by steaming when the trays containing the cannulae are placed directly on the countertop to dry. (page 11.11)

Answers to multiple-choice questions:

General

18. a, b, c

HLD using chemicals

19. c, e

The following are multiple-choice questions. More than one option may be correct. Please circle the correct response(s).

General

18. Which of the following methods of HLD are acceptable for use with an MVA cannula? (page 11.12)

    a. Boiling
    b. Soaking in chemicals
    c. Steaming

HLD using chemicals

19. Which of the following chemicals are suitable for use in HLD? (page 11.9)

    a. Carbolic acid (e.g., Phenol, Lysol)
    b. Benzalkonium chloride (e.g., Zephiran)
    c. Chlorine
    d. *Para*-chloro-*meta*-xylenol (PCMX, chloroxylenol) (e.g., Dettol)
    e. Glutaraldehyde

Answers: 1. No. Boiling is a method of high-level disinfection, which means that all microorganisms, except some bacterial endospores, are killed; 2. Yes. HLD is suitable for processing specula to be used during vaginal examinations, because the specula will come in contact only with intact mucous membranes. In addition, HLD by boiling may be more cost-effective than sterilization; 3. F; 4. T; 5. T; 6. F; 7. F; 8. F; 9. T; 10. T; 11. T; 12. F; 13. T; 14. T; 15. F; 16. T; 17. F; 18. a, b, c; 19. c, e

MODULE 12 Housekeeping

Trainer's Notes for Module 12

This module covers the role that housekeeping activities play in preventing infections in a health care facility.

Audience The content of this module is geared toward all staff. It is highly likely that ancillary staff, such as housekeepers and cleaners, will be responsible for housekeeping activities and will, therefore, need to have a thorough understanding of this material. It is also important for service providers, such as doctors, nurses, and midwives, who are responsible for supervising (and perhaps training) the staff who perform housekeeping activities, as well as those who make decisions about housekeeping purchasing and practices, to be familiar with this material.

☞ Training Tip

If ancillary staff are responsible for carrying out housekeeping activities, it is important to spend time working with them to ensure that they understand and are able to perform these tasks appropriately. This is particularly important with low-literate/illiterate staff, who may be unable to easily use the Participant's Handbook and other materials, such as wall charts, for reference. When training is conducted on-site, be sure to allocate enough time for demonstrating and practicing the procedures presented in this module, as well as for assisting in resolving any problems that may exist.

Training Time

20 minutes to 1¼ hours, depending on which training activities are used.

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MODULE 12 Housekeeping

Materials and Supplies

- ✓ Transparencies for Module 12 (optional)
- ✓ Overhead projector (optional)
- ✓ Television monitor and videocassette recorder (optional)
- ✓ *Infection Prevention for Family Planning Service Programs*, AVSC International/JHPIEGO video, TDS 11 (optional)
- ✓ Flipchart paper, masking tape, colored markers

Advance Preparation

- Determine which training activities will be used to present the content of this module. For on-site training, review the activities presented in Appendix E: On-Site Training Activities. Prepare or gather any supplies needed for the activities you will be conducting.
- Cue the video to TDS 11, if used.
- Create transparencies or flipcharts, as needed.

Introduction

Introduce this module by reviewing the purpose and objectives that appear in the Participant's Handbook. If desired, you may conduct the following optional activity.

Optional Activity: Case Study *(Approximate time: 5 minutes)*

Read aloud the introductory case study, and direct the participants to the instructions that appear in their handbook.

MODULE 12 Housekeeping

Introduction

Purpose and Objectives

This module covers the role that housekeeping activities play in preventing infections in hospitals and clinics. Upon completion of this module, you should be able to:

- Explain what *housekeeping* means in a health care facility and what its purpose is
- List three to five general housekeeping guidelines
- Compare the housekeeping activities in client-care areas and non-client-care areas
- Explain why fumigation (disinfectant fogging) and the use of UV light are inappropriate housekeeping practices
- Describe how to prepare a disinfectant cleaning solution
- Explain the importance and method of cleaning up spills of blood and other organic material

Read the following case study, and try to keep it in mind as you learn the content of this module. See if you can determine whether the situation presents a risk of infection transmission and, if so, what should be done differently to reduce the risk. Questions about the case study appear in the Summary/Self-Assessment at the end of this module.

A community hospital has only one operating theater, which is very busy on weekdays. The head surgeon requires the staff to mop the floor and clean the walls, fixtures, and countertops with a glutaraldehyde solution (e.g., Cidex) once a week to sterilize them. This regimen usually requires using many liters of glutaraldehyde each week.

Directions for Independent Study

If you are preparing for this module independently, you should:

- Study this module.
- Answer the "At My Facility..." questions for this module.
- Answer the Summary/Self-Assessment questions at the end of this module.
- Write down any questions you have about this module for later discussion with the trainer.

Role of Housekeeping in Infection Prevention

Review the importance of housekeeping in infection prevention. and conduct the following training activity. Highlight the fact that housekeeping staff are at high risk of exposure to potentially infectious microorganisms.

Training Activity: Discussion Topic *(Approximate time: 5–10 minutes)*

Facilitate a discussion on the role of housekeeping activities by asking the participants:

- What does *housekeeping* mean in hospitals and clinics?
- What is the purpose of housekeeping?

Validate or correct their responses, as necessary.

Role of Housekeeping in Infection Prevention

The cleanliness of a health care facility is vital to the health and safety of its clients, staff, and visitors, as well as to the community at large; it is the foundation for preventing the transmission of infections in the facility. The facility's cleanliness is often the first thing that a client or visitor notices, and it is a sign of the staff's concern for the clients, other staff, and visitors. In addition, an appealing environment contributes to staff members' satisfaction in working at the facility (making them likely to be more productive) and is more pleasant for clients (which promotes use of the services). In places where clients and visitors may be unaccustomed to the standards of hygiene required in a health care facility, health care workers need to pay special attention to housekeeping.

Definition

Housekeeping: **the general cleaning and maintenance of cleanliness in a health care facility. In addition to cleanliness, the purpose of housekeeping is to reduce the number of microorganisms in the facility (thus reducing clients' and staff members' risk of infections) and provide an appealing work and service-delivery space.**

Housekeeping staff or staff who carry out housekeeping activities are at high risk of infections, because they are exposed to blood or other body fluids, contaminated sharps, etc., in the process of completing their duties. Some of these staff members may be less well-informed about the risks posed and not appreciate the seriousness of the risks. Therefore, it is particularly important to ensure that housekeeping staff know and follow the appropriate procedures.

General Housekeeping Guidelines

Review the material in the Participant's Handbook, and conduct the following training activity.

Training Activity: Individual Exercise *(Approximate time: 5–10 minutes)*

Ask the participants to write down:

- The housekeeping activities performed at their facilities
- When they are done
- How they are done
- What materials are used

Ask them to save their notes for referral during the next session, which covers specific housekeeping activities in client-care and non-client-care areas, to assess the appropriateness of their practices and to identify practices that need improvement.

During the course of this session, emphasize the following key points:

- The only way to ensure that housekeeping practices are maintained consistently is to create a cleaning schedule, post it where all staff responsible for housekeeping can see it, and routinely check that it is followed.
- Staff who are in charge or in supervisory positions should be responsible for ensuring that the schedule is followed.
- The need for cleaning housekeeping equipment (e.g., mops, buckets, and cloths) is often overlooked.
- Gloves (preferably utility gloves) should always be worn for housekeeping tasks.
- Dry-dusting should be avoided, to minimize the spread of dust particles and microorganisms.
- Fumigation and use of UV light do not reduce the risk of infections and should not be used.

Link the general guidelines of housekeeping at the service facility with the next section, which covers housekeeping activities in client-care and non-client-care areas, by explaining that since different activities occur in different areas of the facility, different housekeeping practices must be performed, as appropriate to the area's needs.

General Housekeeping Guidelines

General guidelines for housekeeping:

- Cleaning schedules should be created, posted where all staff responsible for housekeeping can see them, and closely followed.
- Always wear gloves (preferably heavy utility gloves) and shoes when cleaning client-care areas.
- Cleaning should be done in a way that minimizes the scattering of dust and dirt that may contain microorganisms. Use a damp or wet mop or cloth to clean walls, floors, and surfaces; avoid dry-dusting or sweeping, which increases the spread of dust and microorganisms.
- Scrubbing is the most effective way to remove dirt and microorganisms. Scrubbing should be a part of every cleaning procedure.
- Wash surfaces, such as walls, from top to bottom so that debris falls to the floor, where it can be cleaned up last. Similarly, clean highest fixtures first and work down—for example, clean ceiling lamps first, then shelves, then tables, and then the floor.
- Change cleaning solutions when they appear dirty. The disinfectant's ability to kill potentially infectious microorganisms is reduced when the solution contains a lot of soil. (Cleaning solutions are covered on page 12.8.)

Remember: Supplies and equipment used for cleaning need to be cleaned themselves to prevent the spread of infections. Housekeeping equipment, such as mops, buckets, and cloths, should be decontaminated, cleaned in detergent and water, rinsed in clean water, and allowed to dry before being reused. Contaminated cleaning equipment *spreads*, rather than reduces, microorganisms in the environment.

Common housekeeping practices that have been found to be ineffective:

Fumigation (disinfectant fogging) with formalin, formaldehyde, and paraformaldehyde

This is an ineffective method of reducing the risk of infections. (It is a perfect example of a ritual that is not based on scientific findings.) In addition to being ineffective, these agents are dangerous to the health: they are toxic, irritating to the eyes, and damaging to the mucous membranes, and they may cause cancer. Fumigation is time-consuming and makes the room unavailable for use, often leading to disruption of services or unnecessary inconvenience to clients and staff. Thorough cleaning with a disinfectant cleaning solution and scrubbing are effective and should be performed on a regular basis.

Note: Fumigation with insecticides or pesticides to reduce the number of insects, rodents, and pests is an acceptable practice.

Use of ultraviolet (UV) light

In most cases, this is neither a practical nor cost-effective approach to reducing the number of microorganisms in health care facilities. For example, in the largest and best-designed scientific

study measuring the effectiveness of UV light, the surgical-site infection rate did not decrease when UV light was used.

Some of the problems with UV light that make it unsatisfactory for general use in health care facilities include:

- The killing ability of UV light decreases sharply: (a) at a relative humidity greater than 60–70%; (b) in the presence of dust (in the air, on surfaces, on the bulb itself); and (c) with increasing distance from the lamp.
- The greatest reduction of airborne microorganisms occurs in settings in which the levels of microorganisms are low to begin with, which may not be the case in many low-resource settings.
- UV light does not penetrate most substances (including fluids and organic material such as mucus) and will therefore kill only microorganisms directly on the surface that are exposed to the UV light.
- The intensity of UV light needed to effectively kill microorganisms is damaging to people. Prolonged exposure can lead to reddened skin and irritated eyes. At safe levels of UV light, only modest reductions in the number of airborne microorganisms are seen.
- UV lighting fixtures are expensive to install and maintain and require regular servicing, including removing dust from the bulbs.

Housekeeping Activities in Client-Care and Non-Client-Care Areas

Introduce the idea of client-care and non-client-care areas of a health care facility, and review which areas of the facility fall into each category. Highlight the following points:

- The risk of transmitting infections is greater in client-care areas than in non-client-care areas.
- Toilets, latrines, sluice rooms, and areas in which instruments and other items are received for cleaning and processing should also be regarded as areas of high contamination.

Conduct the following training activity and, if desired, the following optional activity.

Training Activity: Individual Exercise *(Approximate time: 30 minutes)*

After reviewing the material in the Participant's Handbook, ask the participants to turn to the notes they created during the previous session, in which they wrote down the housekeeping procedures at their facilities. Ask the participants to:

- Assess the appropriateness of the practices at their facilities
- Suggest improved practices to replace any current practices that are not appropriate

Encourage the participants to refer to their handbooks while completing this exercise. Allow 20 minutes for completion. Validate or correct their responses, as necessary. If the participants use any inappropriate housekeeping practices, such as use of UV light or fumigation with formaldehyde, explain why these practices are ineffective, and explore with the participants some suitable alternatives to these practices.

Training Options

- If the participants are from only a few different facilities, ask those from the same facility to work together on practices at their facility.
- If the participants are from many different facilities, ask those from different facilities to work together on common housekeeping practices.

Optional Activity: Video Viewing *(Approximate time: 5–10 minutes)*

Show TDS 11 (length 1:40) from the infection prevention video, which covers cleaning up after a procedure. When the segment is over, review the material presented with the participants and reinforce the practices of decontaminating surfaces, instruments, and other items, and setting up the procedure room for the next client.

Training Option

The video may be shown either at the beginning of the session to introduce the topic or at the end of the session for review.

Refer the participants to the suggested schedules for cleaning in client-care areas and in toilets, latrines, and sluice rooms, which appear on pages 12.6 and 12.7 of their handbook. Suggest that the participants post the appropriate schedule in every room of their facilities.

Housekeeping Activities in Client-Care and Non-Client-Care Areas

Cleaning Non-Client-Care Areas

In areas of the facility in which clinical services are **not** provided and processing of instruments and other items does **not** occur, such as the waiting room and administrative space, the risk of infections is generally minimal. Therefore, routine cleaning—as done in the home—is usually satisfactory. Clean these areas with a cloth or mop dampened with detergent and water once a week or when visibly dirty; vacuum carpeted areas once a week and shampoo as needed. In unusual circumstances in which contamination has occurred in these areas, appropriate cleaning practices, as described below, must be used.

Cleaning Client-Care Areas

In areas in which clinical services are provided (such as operating theaters, procedure rooms, and laboratories), instruments and other items are cleaned and processed, and in toilets, latrines, and sluice rooms, there is the potential for contamination with infectious materials and the spread of infections. Therefore, these areas must be cleaned with special care, using a disinfectant cleaning solution. (Preparing a disinfectant cleaning solution is discussed on page 12.8.)

Schedules for cleaning in client-care areas and in toilets, latrines, and sluice rooms appear on the next two pages.

Schedule for Cleaning in Client-Care Areas

At the beginning of each day	Clean horizontal surfaces—operating/procedure tables, examination couches, chairs, trolley tops or Mayo stands, lamps, counters, and office furniture—with a cloth dampened with water and clean floors with a mop dampened with water to remove dust and lint that have accumulated overnight.
Between clients	• Clean operating/procedure tables, examination couches, trolley tops or Mayo stands, counters, lamps, and any other potentially contaminated surfaces in operating theaters and procedure rooms with a cloth dampened with a disinfectant cleaning solution. Alternatively, spray the solution onto the surfaces, using a spray bottle, and wipe with a cloth dampened with water. • Clean spills of blood or other body fluids with a 0.5% chlorine solution immediately. • Clean visibly soiled areas of the floor, walls, or ceiling with a mop or cloth dampened with a disinfectant cleaning solution. • Put waste in a leak-proof container, and empty the container when it is three-quarters full.
At the end of each clinic session or day	• Wipe down all surfaces—including counters, tables, sinks, lights, door handles/plates, and walls—with a cloth dampened with a disinfectant cleaning solution or spray the solution onto the surface using a spray bottle. Remember to wipe from top to bottom. Pay particular attention to operating/procedure tables, making sure to clean the sides, base, and legs thoroughly. Rinse sinks with clean water after cleaning. • Clean the floors with a mop soaked in a disinfectant cleaning solution. • Check sharps-disposal containers and remove and replace them if they are three-quarters full. • Remove medical or hazardous chemical waste, making sure to burn or bury it as soon as possible to limit contact with potentially infectious waste. (Waste disposal is covered in detail in Module 13: Waste Disposal.) • Wash waste containers with a disinfectant cleaning solution and rinse with water.
Each week	• Clean ceilings with a mop dampened with a disinfectant cleaning solution.

Remember:

- **Do not dry-sweep or dry-mop the operating theater/procedure rooms; this causes dust, debris, and microorganisms to spread, which can contaminate surfaces that have just been cleaned.**
- **Always wear gloves (preferably heavy utility gloves) and shoes when:**
  - **Handling chlorine and disinfectant cleaning solutions**
  - **Cleaning client-care areas**
  - **Cleaning heavily contaminated areas, such as those where blood or other body fluids have been spilled**

Schedule for Cleaning Toilets, Latrines, and Sluice Rooms

Task	How to perform task	When to perform task
Clean toilets/latrines	Use a cloth dampened with a disinfectant cleaning solution	Daily, or more often, if visibly soiled
Clean floors	Use a mop dampened with a disinfectant cleaning solution	Daily, or more often, if visibly soiled
Clean walls	Wipe with a cloth dampened with a disinfectant cleaning solution	Daily, or more often, if visibly soiled
Clean ceilings	Use a mop dampened with a disinfectant cleaning solution	Weekly, or more often, if visibly soiled
Clean sinks	Wipe with a cloth dampened with a disinfectant cleaning solution and rinse with clean water	Daily, or more often, if visibly soiled.
Clean waste containers	Wipe with a cloth dampened with a disinfectant cleaning solution	Daily or more often, if visibly soiled
Empty waste containers		Daily, or more often, if visibly soiled.

Remember:

- **Always wear gloves (preferably heavy utility gloves) and shoes when handling chlorine and disinfectant cleaning solutions and when cleaning toilets, latrines, and sluice rooms.**
- **Areas such as toilets, latrines, and sluice rooms are heavily contaminated with microorganisms. These areas should be cleaned daily, or more often, if necessary, with a disinfectant cleaning solution. Use different cleaning supplies to clean toilets, latrines, and sluice rooms than to clean operating theaters and procedure rooms.**

Preparing a Disinfectant Cleaning Solution

Review the steps of preparing a disinfectant cleaning solution. Highlight the information in the "Remember" box on page 12.8 of the Participant's Handbook, stressing the importance of not mixing chlorine solutions with ammonia, ammonium chloride, or phosphoric acid. Also highlight the fact that both a disinfectant and a detergent are needed to make an effective cleaning solution. If desired, you may conduct the following optional activity.

Optional Activity: Discussion Topic *(Approximate time: 10 minutes)*

Assess the participants' knowledge of disinfectant cleaning solutions by asking:

- What is the most cost-effective and widely available disinfectant that can be used to make a disinfectant cleaning solution?
- How would you make a disinfectant cleaning solution?
- What is the purpose of using disinfectant and detergent for making a disinfectant cleaning solution?

Preparing a Disinfectant Cleaning Solution

A disinfectant cleaning solution contains a disinfectant along with a detergent and water. Use such a solution when cleaning areas that are potentially contaminated with infectious materials, such as operating theaters, procedure rooms, toilets, latrines, and sluice rooms.

The cleaning solution must contain both a disinfectant and a detergent, because:

- Disinfectants rapidly kill or inactivate infectious microorganisms during the cleaning process, and
- Detergents break up and dissolve or suspend grease, oil, and other organic matter so that it can easily be removed by cleaning; water or disinfectants alone do not do this effectively.

Steps of Preparing a Disinfectant Cleaning Solution

1 Prepare a 0.5% chlorine solution. (Refer to the instructions on page 8.4.) Alternatives to chlorine include disinfectants containing 5% carbolic acid, such as Phenol or Lysol, or quaternary ammonium compounds. In most settings, a chlorine solution made from locally available bleach is the cheapest alternative.

2 Add some detergent to the 0.5% chlorine (or other disinfectant) solution and mix. Continue adding detergent until the solution is mildly foamy or bubbly.

Remember: Chlorine solutions should **never** be mixed with cleaning products containing ammonia, ammonium chloride, or phosphoric acid. Combining these chemicals will result in the release of a chlorine gas, which can cause nausea, eye irritation, tearing, headache, and shortness of breath. These symptoms may last for several hours. If you are exposed to an unpleasantly strong odor following the mixing of a chlorine solution with a cleaning product, leave the room or area immediately and do not return until the fumes have cleared completely.

Cleaning Up Spills

Review the material in the Participant's Handbook, and conduct the following training activity. Emphasize the fact that if the health care worker is not sure if a fluid contains potentially infectious material, he or she should always assume that it does and follow the instructions for cleaning it up.

Training Activity: Discussion Topic *(Approximate time: 5–10 minutes)*

Ask the participants:

- How should spills of blood or other body fluids be handled?
- When is the best time to clean up spills?
- What would happen if spills were allowed to remain until the end of the session/day or until someone could clean them?

Validate or correct their responses, as necessary.

Cleaning Up Spills

The general guideline for managing spills of potentially infectious fluids is to clean them up **immediately**. In addition to preventing the spread of infections, prompt removal of spills from the floor also prevents accidental falls and slips. If you are not sure whether a fluid contains potentially infectious microorganisms, always assume that it does and follow the instructions for cleaning it up.

When cleaning up spills:

- If the spill is small, wipe it with a cloth that has been saturated with a 0.5% chlorine solution.
- If the spill is large, cover (flood) the area with a 0.5% chlorine solution, wipe it with a cloth (or a mop if the spill is on the floor), and then clean the area with a disinfectant cleaning solution.
- Do **not** simply place a cloth over the spill for cleaning up later; the cloth may become soaked with the fluid, exposing others to potentially infectious microorganisms. In addition, if the spill is on the floor, staff or clients could easily slip and fall on it and injure themselves.

Remember: Always wear gloves (preferably heavy utility gloves) and sturdy shoes when cleaning.

"At My Facility..."

Ask the participants to write their responses to the questions in the space provided. Remind them to answer the questions as honestly as possible. Ask them to think about their response to each question to see if it reflects an appropriate infection prevention practice or if there are issues that need to be addressed. Ask them to write down any problems they identify. Allow 10–15 minutes for completion.

Optional Activity: Discussion Topic *(Approximate time: 10 minutes)*

Ask for volunteers to share their responses, and allow for discussion.

In addition, ask the participants to keep the material they generated during the sessions "General Housekeeping Guidelines" and "Housekeeping Activities in Client-Care and Non-Client-Care Areas" as possible resources for their implementation plan for improving infection prevention practices, which they will develop in Module 14: Implementation Plans and Closure.

"At My Facility..."

Think about your clinical setting and write your answers to the following questions in the space provided. In addition, keep the material you generated during the sessions "General Housekeeping Guidelines" and "Housekeeping Activities in Client-Care and Non-Client-Care Areas" for possible use while developing your implementation plan for improving infection prevention practices in Module 14: Implementation Plans and Closure.

At your facility:

- Are cleaning schedules posted where staff responsible for housekeeping practices can see them? If so, are they closely followed?

- Do staff wear utility gloves when cleaning client-care areas and toilets, latrines, and sluice rooms?

- Are the guidelines for cleaning client-care areas used at your facility similar to those presented in this handbook? If not, how do they vary? How might this affect the risk of transmitting infections at your facility?

- Is fumigation (disinfectant fogging) with formalin, formaldehyde, or paraformaldehyde performed or is UV light used for housekeeping at your facility?

Do your responses to these questions reflect an understanding or performance of appropriate infection prevention practices at your facility? If, based on your responses, you become aware of some problems or issues that need to be addressed, list them below:

Summary/Self-Assessment Answers

1. No. It is not possible to sterilize the walls, and using a glutaraldehyde solution to clean surfaces such as walls is a poor use of resources, since using many liters of the solution is costly. In addition, the fumes can be irritating to the staff.
2. At the end of each day, the floor should be mopped and the walls, fixtures, and countertops wiped down with a disinfectant cleaning solution.

Optional Activity: Discussion Topic *(Approximate time: 10 minutes)*

Read aloud the case study, and facilitate a discussion by asking the participants the questions that appear in the Participant's Handbook.

Answers to true/false questions:

3. F
4. F
5. T
6. T
7. T
8. F
9. T

Summary/Self-Assessment

Answers are provided at the end of this assessment.

Review the following case study, which appeared at the beginning of this module, and answer the questions below:

A community hospital has only one operating theater, which is very busy on weekdays. The head surgeon requires the staff to mop the floor and clean the walls, fixtures, and countertops with a glutaraldehyde solution (e.g., Cidex) once a week to sterilize them. This regimen usually requires using many liters of glutaraldehyde each week.

1. Is this practice appropriate? Why?

2. What would be a better housekeeping practice?

Decide whether each of the following statements is T (true) or F (false). Write your response for each statement in the space provided.

3. ____ The disinfectant cleaning solution used to clean the client-care areas of a facility is made by combining a 1% chlorine solution with detergent. (page 12.8)

4. ____ Fumigation with formalin is an effective and efficient way to reduce contamination of environmental surfaces, such as walls, ceilings, and floors. (page 12.3)

5. ____ Combining chlorine with cleaning products containing ammonia will result in the release of a toxic gas, which may cause temporary illness lasting several hours. (page 12.8)

6. ____ Spills of blood or other body fluids should be cleaned up immediately to minimize the risk of infections and prevent injuries from falls. (page 12.9)

7. ____ Surfaces and waste-disposal containers in the client-care areas of a facility should be cleaned daily using a disinfectant cleaning solution to maintain a clean, safe, and appealing environment. (page 12.6)

8. ____ Housekeeping equipment, such as mops, brushes, sponges, and buckets, does not need to be decontaminated, cleaned, and dried, since those implements are always in a disinfectant solution and are used to clean the facility. (page 12.3)

9. ____ Dry-dusting and sweeping should be avoided, because they spread dust particles and microorganisms into the air and onto cleaned surfaces. (page 12.3)

10. F
11. T

Answers to multiple-choice questions:

12. a, b, c
13. a, b, d

10. ____ Because the operating theater is cleaned at the end of each day, it is not necessary to perform housekeeping activities in the morning before caring for the first client. (page 12.6)

11. ____ Between clients, operating or procedure tables should be cleaned by wiping with a disinfectant solution. (page 12.6)

The following are multiple-choice questions. More than one option may be correct. Please circle the correct response(s).

12. Maintaining a clean facility by following good housekeeping practices: (page 12.2)
    a. Provides an appealing work environment
    b. Reduces the risk of infections
    c. Reflects a positive attitude on the part of service providers and ancillary staff
    d. Is unlikely to affect client decisions about seeking services at the facility

13. Housekeeping staff at a health care facility are at high risk of infections: (page 12.2)
    a. If they do not understand how diseases are transmitted
    b. If they do not wear utility gloves while performing cleaning activities
    c. If they mop the floor in the reception area
    d. Because they are exposed to potentially contaminated blood and other body fluids as part of their work

Answers: 1. No. It is not possible to sterilize the walls, and using a glutaraldehyde solution to clean surfaces such as walls is a poor use of resources, since using many liters of the solution is costly. In addition, the fumes can be irritating to the staff; 2. At the end of each day, the floor should be mopped and the walls, fixtures, and countertops wiped down with a disinfectant cleaning solution; 3. F; 4. F; 5. T; 6. T; 7. T; 8. F; 9. T; 10. F; 11. T; 12. a, b, c; 13. a, b, d

MODULE 13 Waste Disposal

Trainer's Notes for Module 13

This module covers the role that waste disposal plays in preventing the transmission of infections in health care facilities.

Audience [illegible]

Training Tip

If ancillary staff are responsible for performing waste-disposal activities, it is important to spend time working with them to ensure that they understand and are able to perform these tasks appropriately. This is particularly important with low-literate/illiterate staff, who may be unable to easily use the Participant's Handbook and other materials, such as wall charts, for reference. When training is conducted on-site, be sure to allocate enough time for demonstrating and practicing the procedures presented in this module, as well as for assisting in resolving any problems that may exist.

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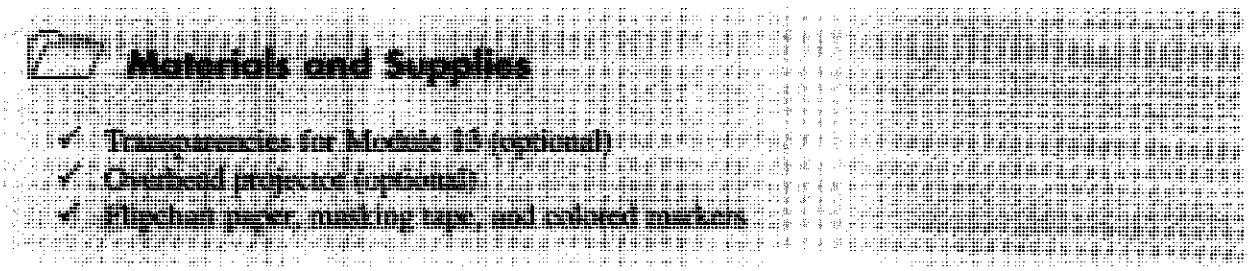
MODULE 13 Waste Disposal



Advance Preparation

- Determine which training activities will be used to present the content of this module. For on-site training, review the activities presented in Appendix E: On-Site Training Activities. Prepare or gather any supplies needed for the activities you will be conducting.
- Find out what the regulations are for disposing of medical waste in the participants' locale.
- Get samples of locally available puncture-resistant sharps-disposal containers and waste-disposal containers.
- Create transparencies or flipcharts, as needed.

Introduction

Introduce this module by reviewing the purpose and objectives that appear in the Participant's Handbook. If desired, you may conduct the following optional activity.

Optional Activity: Case Study *(Approximate time: 5 minutes)*

Read aloud the introductory case study, and direct the participants to the instructions that appear in their handbook.

MODULE 13 Waste Disposal

Introduction

Purpose and Objectives

This module will teach you the proper procedures for disposing of waste so that you can protect yourself, your clients, and the community from infections. Upon completion of this module, you should be able to:

- Describe why appropriate waste disposal is often not performed
- Differentiate between *general, medical,* and *hazardous chemical waste*
- State the importance of correctly disposing of waste and who is at risk of infections and injury from waste generated at a health care facility
- Explain the following aspects of waste management: sorting, handling, interim storage, disposal
- List three to five general guidelines for disposing of medical waste
- Explain the special procedures for disposing of:
  - sharps
  - liquid medical waste
  - hazardous chemical waste
- Explain how to build a drum incinerator and a burial site for waste disposal (if applicable)

Read the following case study, and try to keep it in mind as you learn the content of this module. See if you can determine whether the situation presents a risk of infection transmission and, if so, what should be done differently to reduce the risk. Questions about the case study appear in the Summary/Self-Assessment at the end of this module.

All waste from the district hospital is gathered and thrown into piles behind the main hospital building. Every six months, the hospital director hires some laborers to shovel the waste into trucks and cart it off to the closest dump, which is located in a neighboring town. Frequently, people pick through the waste looking for items that they can use or sell, children play near the waste, and dogs poke their noses in the piles.

Directions for Independent Study

If you are preparing for this module independently, you should:

- Study this module.
- Learn the local regulations for disposing of medical waste.
- Find out what waste-disposal practices are performed at your facility.
- Complete Exercise 13-1: Case Studies.
- Answer the "At My Facility..." questions for this module.
- Answer the Summary/Self-Assessment questions at the end of this module.
- Write down any questions you have about this module for later discussion with the trainer.

Importance of Proper Waste Disposal

Review the material in the Participant's Handbook, and highlight the following points about proper waste disposal in health care facilities:

- Medical waste, when not correctly disposed of, poses a risk of infections to health care staff, clients, and the community at large.
- Service providers often do not know what happens to the waste produced from service delivery, nor do they know who handles it after they put it in the trash container.
- Anyone who handles medical or hazardous chemical waste—from the time it is thrown out by a service provider until it reaches the site of disposal—is at risk of infections or injury.
- Proper handling of medical and hazardous chemical waste minimizes the spread of infections and reduces the risk of accidental injury to staff, clients, visitors, and the community.

Conduct the following training activity. If desired, you may also conduct the following optional activity.

Training Activity: Discussion Topic *(Approximate time: 10–15 minutes)*

Ask the participants:

- Do you know where the waste generated at your facility goes for disposal? Do you know who handles or disposes of the waste?
- Why and how does contaminated waste pose a risk of infections to those who handle it? Give some examples.
- Aside from the staff members who handle the waste, who else is at risk of infections from contaminated waste?
- Are there regulations in your area for disposal of medical and chemical waste? If so, what are they, and why do you think the specific regulations exist?

Optional Activity: Discussion Topic *(Approximate time: 10–15 minutes)*

Display a flipchart with the terms *general waste*, *medical waste*, and *hazardous chemical waste*. Ask the participants to explain the differences between the three types of waste and to give examples of each type. Note examples under the appropriate heading on the flipchart. Allow for questions and clarify as needed.

Importance of Proper Waste Disposal

There are three types of waste found in health care facilities:

1. General waste
2. Medical waste
3. Hazardous chemical waste

Definitions

General waste: nonhazardous waste that poses no risk of injury or infections. This is similar in nature to household trash. Examples include uncontaminated paper, boxes, packaging materials, bottles, plastic containers, and food-related trash.

Medical waste: material generated in the diagnosis, treatment, and/or immunization of clients, including:

- Blood, blood products, and other body fluids, as well as materials containing fresh or dried blood or body fluids, such as bandages and surgical sponges
- Organic waste, such as human tissue, body parts, placentas, and products of conception
- Sharps (used or unused), including hypodermic and suture needles, scalpel blades, blood tubes, pipettes, and other glass items that have been in contact with potentially infectious materials (such as glass slides and coverslips)

Hazardous chemical waste: chemical waste that is potentially toxic or poisonous, including cleaning products, some disinfectants, cytotoxic drugs, and radioactive compounds

Adequate disposal of medical and hazardous chemical waste from health care facilities poses problems worldwide and is, in many settings, one of the most neglected areas of infection prevention.

Appropriate disposal of medical and hazardous chemical waste is a problem because:

- The staff who collect and dispose of waste at health care facilities are often unaware of the risks that medical and hazardous chemical waste pose to themselves, other facility staff, clients, visitors, the community, and the environment.
- Many health care facility staff do not know how waste is handled or where it goes, and they generally assume that waste is disposed of in an appropriate manner. In addition, those who decide on the facility's budget (such as government officials) or those who handle and dispose of trash once it leaves the facility (such as trash haulers or dump operators) often do not understand the risks to the facility's staff, clients, visitors, the community, and the environment.
- Health care facilities are often designed with little consideration given to waste disposal.
- Waste disposal often requires compromises, because practical disposal may not be optimal as far as health, safety, or the environment is concerned.
- In some settings, there may be a widespread feeling that fancy, expensive waste-disposal technology is necessary. If this technology is unavailable or unaffordable, many people believe that there is little they can do to address the problem of inadequate waste disposal.

Disposal of medical and hazardous chemical waste requires special attention in order to maintain a safe and pleasant environment.

Proper handling and disposal of medical and hazardous chemical waste:

- Minimizes the spread of infections and reduces the risk of accidental injury to staff, clients, visitors, and the local community
- Helps provide an aesthetically pleasing atmosphere
- Reduces odors
- Reduces the number of insects and animals
- Reduces the likelihood of contaminating the soil or ground water with chemicals or micro-organisms

Housekeeping and other staff have a responsibility to dispose of all medical and hazardous chemical waste in a manner that poses the least hazard to themselves, clients, visitors, other health care workers, and the community. Proper waste disposal is a preventive and protective practice.

The way in which waste is handled depends in large part on the type and size of the facility (e.g., a hospital versus a health post), the amount of waste generated, and the location of the facility (urban or rural).

Who Is at Risk?

- Anyone who handles medical or hazardous chemical waste—from the time it is thrown out by a service provider until it reaches the site of disposal—is at risk of infections or injury.
- Improperly disposed of sharps pose the greatest risk to staff who handle and dispose of waste and can cause injury and transmission of serious infections, including HIV and hepatitis B.
- A large percentage of staff who collect and remove waste, both inside and outside of health care facilities, report having experienced work-related injuries. Those reporting high rates of medical waste–related injuries include nurses, midwives, nursing aides, and cleaning and maintenance staff. If at all possible, these staff should be vaccinated against hepatitis B.
- One of the greatest risks that members of the community face in regard to the health care facility is exposure to potentially infectious medical waste. When contaminated dressings, sharps, and other waste is not disposed of properly, it can be found by children who are playing and cause injury and infections. Lack of proper waste-disposal practices also puts the local community at risk of infections when waste, such as syringes and needles, is scavenged. In many low-resource settings, scavenging of medical waste is a significant problem. The World Health Organization has reported numerous cases around the world of the transmission of hepatitis B to people who have scavenged medical waste.

Remember: Always wear heavy utility gloves and shoes when handling waste. Wash the gloves before removing them and then wash your hands.

Sorting, Handling, Interim Storage, and Disposal of Medical Waste

Review the information in the Participant's Handbook. If desired, you may conduct the following optional activity. Reinforce the fact that only a small percentage of the waste generated by a health care facility is medical waste, and, therefore, sorting the waste is crucial to ensure the effective use of disposal staff and resources.

Optional Activity: Discussion Topic *(Approximate time: 30–45 minutes)*

Facilitate a discussion on waste management by asking the participants to share how their facilities sort, handle, perform interim storage, and dispose of medical waste. Ask them to identify practices at their facilities that are **not** consistent with the procedures presented in their handbook, and discuss ways to overcome impediments to following these procedures. Record their responses on a flipchart and save it for use in developing implementation plans in Module 14: Implementation Plans and Closure.

Sorting, Handling, Interim Storage, and Disposal of Medical Waste

Since disposal of medical waste is frequently a problem, it is useful to develop a medical-waste management plan and to designate an individual to coordinate medical-waste management. The management plan should include training all staff who handle medical waste, as well as orienting the entire staff to the overall plan. (This section deals exclusively with management of solid medical waste. Disposal of sharps, liquid medical waste, and hazardous chemical waste is covered on pages 13.7 and 13.8.)

There are four aspects of medical-waste management:

1. ***Sorting***

   Only a small percentage of the waste generated by a health care facility is medical waste that must be specially handled to reduce the risk of infections or injury. Therefore, sorting the waste at the point at which it is generated can greatly reduce the amount that needs special handling. Poor separation of waste at the point at which it is generated leads to large amounts of waste having to be handled specially, which can overwhelm the disposal system, lead to improper disposal of medical waste, and put everyone at risk.

   Separate containers should be used for disposing of general and medical waste. Waste should be put in the appropriate containers by the person who generates it. Use colored plastic containers/bags, painted drums, or easily readable labels on containers to help distinguish between general- and medical-waste containers. For example, paint the containers used for medical waste red or use red plastic bags, if available.

2. ***Handling***

   Handle medical waste as little as possible before disposal. Waste containers in operating theaters, procedure rooms, and toilets, latrines, and sluice rooms should be emptied when they become three-quarters full (at least once daily). Do **not** collect medical waste from client-care areas by emptying it into open carts or wheelbarrows; this may lead to contamination of the surroundings and scavenging of waste, as well as increase the risk of injury to staff, clients, and visitors.

   Always wear heavy utility gloves and shoes when handling medical waste. Always wash your hands after handling waste and after removing your gloves.

3. ***Interim storage***

   If it is necessary to store medical waste on-site before disposal:

   - Place waste in an area that is minimally accessible to staff, clients, and visitors.
   - Make sure all containers have lids; cover the containers so that insects, rodents, and other animals cannot get into them.
   - Plan for only short-term storage—usually for several hours, but no more than one or two days.

4. Disposal

Whenever possible, medical waste should be disposed of on the premises; this allows staff who understand the risks involved to supervise the disposal process.

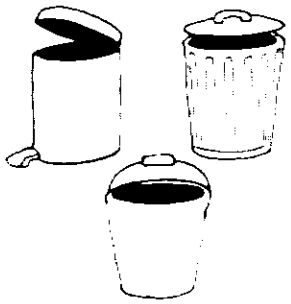
- Burning is preferable to burying medical waste, since the high temperature destroys microorganisms and reduces the amount of waste. Burning in an incinerator or oil drum is recommended. Open burning is **not** recommended, because it causes scattering of waste, is dangerous, and is unattractive. However, if open burning must be done, carry the waste to the site just before burning, and burn it in a small, designated area. Remain with the fire until it is extinguished. (Information about building a drum incinerator is provided on page 13.12.)
- If medical waste cannot be burned, on-site burial is the next best option. However, burial is feasible only when there is sufficient space to dig a pit the size needed to accommodate the amount of medical waste generated at the facility. The pit should be surrounded by a fence or wall to limit access to it and to prevent scavenging of waste. (Information about building a burial site is provided on page 13.13.)
- When neither burying nor burning medical waste on-site is practical or possible, alternate arrangements for disposing of medical waste must be made. These may include:
  - Transporting medical waste to an off-site incinerator or burial site
  - Transporting medical waste to a community dump. This is the least desirable alternative, because: open dumps are often easily accessible to members of the community, thus increasing their risk of exposure to infectious microorganisms; open dumps facilitate the spread of infections by flies, rodents, and other animals that come in contact with medical waste; and the waste may never reach the disposal site because of scavenging along the way. If medical waste will be handled during transport by nonfacility personnel, such as municipal trash removers, these personnel must be educated about the cautions and concerns regarding medical waste.

Remember: General waste can be taken to the community waste-disposal site.

General guidelines for disposal of medical waste are provided on the next page.

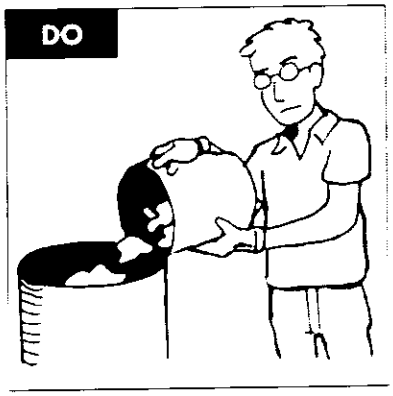
General Guidelines for Disposal of Medical Waste

- Use washable, leak-proof containers for disposal of medical waste in operating theaters and procedure rooms. Plastic or galvanized metal containers with covers are the best type, because they are not likely to corrode. Use small receptacles that use step-on levers/pedals to open the covers, if available.

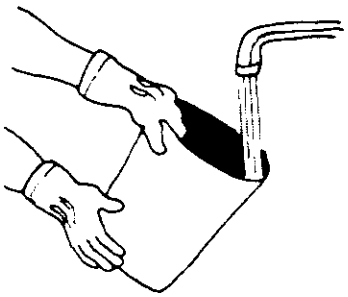


- Always keep waste containers in convenient places for users.

- Empty the container daily or when it is three-quarters full.
- **Never** put hands into containers with medical waste.



- Always dispose of medical waste correctly; never simply throw it outside or leave it in an open pile.
- Always wear heavy utility gloves and shoes when handling and transporting medical waste. Wash both the gloves and your hands afterward.



- Wash containers used for medical waste with a disinfectant cleaning solution and rinse them with water daily (or more often, if they are visibly contaminated after the medical waste is dumped).

Disposal of Sharps, Liquid Medical Waste, and Hazardous Chemical Waste

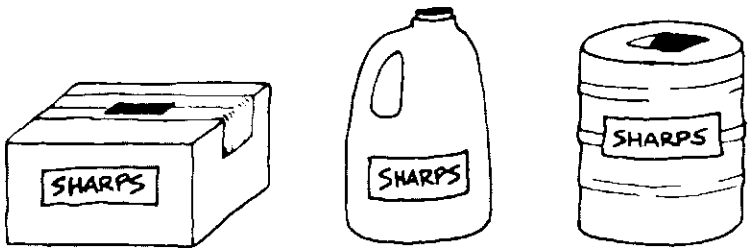
Review the information in the Participant's Handbook. Remind the participants to always wear heavy utility gloves and shoes when handling sharps, liquid medical waste, and hazardous chemical waste.

Disposal of Sharps, Liquid Medical Waste, and Hazardous Chemical Waste

Sharps, liquid medical waste, and hazardous chemical waste require special disposal procedures, as follows.

Sharps

- Dispose of all used sharp items in puncture-resistant containers. Puncture-resistant sharps containers can be made out of a heavy cardboard box, an empty plastic jug, or a metal container. (Glass bottles are not recommended, but if they must be used, take care so that they do not break.) Sharps containers should be located close to the place in which procedures are performed so that staff do not have to walk across the room (or farther) carrying used sharps. Keep a sharps-disposal container in the laundry in case sharps are found in linen.



- Close sharps containers securely when they are three-quarters full. When sharps containers become too full, people may push the sharps into the containers, causing injury.
- Sharps are **not** destroyed by burning, except in large industrial incinerators. If an industrial incinerator is not available:
  - Render sharps harmless by placing needles, plastic syringes, and scalpels in a metal container and then, when the container is three-quarters full, pouring in fuel and igniting and burning it until the fire goes out on its own. Plastic syringes will melt and, when they cool, become a solid block of plastic, with the sharps embedded in the block. The block can then be buried.
  - Decontaminate the sharps and bury them in a pit to make it difficult for others to scavenge them. If it is not possible to bury all medical waste on-site, sharps should be given priority for burial, since they pose the biggest risk of injury and infections.
- Always wear heavy utility gloves and shoes when handling or transporting sharps-disposal containers. Wash both the gloves and your hands afterward.

Remember: To reduce the risk of needlesticks, never bend, break, or remove needles from the syringe before disposal and do not routinely recap needles.

Liquid Medical Waste

- When carrying or disposing of liquid medical waste, be careful to avoid splashing the waste on yourself, others nearby, or surfaces.
- Carefully pour liquid waste down a sink, drain, flushable toilet, or latrine. If this is not possible, bury it in a pit. *Note:* Before pouring the waste down a sink, drain, or toilet, consider where it empties. It is hazardous for liquid medical waste to run through open gutters or to come out of pipes that empty onto the grounds of the facility.
- Rinse the sink, drain, or toilet thoroughly with water to remove residual waste, again avoiding splashing. Clean with a disinfectant cleaning solution at the end of each day, or more frequently, if heavily used or soiled.
- Decontaminate the container that held the liquid waste by filling it with a 0.5% chlorine solution and soaking it for 10 minutes before washing.
- Always wear heavy utility gloves and shoes when handling or transporting liquid medical waste. Wash both the gloves and your hands afterward.

Hazardous Chemical Waste

- Cleaning solutions and disinfectants, such as glutaraldehyde, should be handled as described above for liquid medical waste. Rinse containers thoroughly with water; wash glass containers with detergent and water, rinse thoroughly, and reuse. Do not reuse plastic containers.
- Always wear heavy utility gloves and shoes when handling or transporting hazardous chemical waste. Wash both the gloves and your hands afterward.
- Disposing of cytotoxic chemicals and radioactive waste requires special consideration beyond the scope of this training course. If your facility's waste includes these types of materials, consult experts for guidance on appropriate handling and disposal.

Remember: Always wear heavy utility gloves and shoes when handling sharps, other medical waste, or hazardous chemical waste.

Exercise 13-1: Case Studies

Use the following cases (or use case histories of your own) to help the participants think through the issues involved in waste disposal. Divide the participants into small groups and assign two cases to each group. Allow 10 minutes for completion. Bring the groups together and review each case, asking for a volunteer from each group to present the group's work. Allow for discussion; give feedback and validate or correct the participants' responses, as necessary.

Training Options

- After dividing the participants into small groups, ask each group to complete all of the cases. When the groups are brought together, ask for a volunteer from each group to report the group's responses to only one of the cases.
- Read the cases aloud, and ask for volunteers to respond to the questions. (This works well with low-literate/illiterate staff or when time is short.)
- Ask the participants to write their responses in their handbooks, and ask for volunteers to read them aloud. Alternatively, ask the participants to switch books with another participant and correct the other's responses.

Possible responses:

Case Study 1

a. (1) Dumping medical waste outside of the fence instead of in the pit; (2) using the pit for nonmedical waste, while leaving medical waste exposed; (3) improperly disposing of sharps; and (4) exposing the gardener and possibly others to contaminated waste.
b. Ms. Gomez should point out the problems she noticed to the sanitation officer and find out the reasons for the inappropriate practices. She should work with the sanitation officer to correct the waste-disposal practices and follow up to make sure the proper practices are maintained.

Case Study 2

a. (1) Improperly disposing of syringes and needles at the clinic; (2) disposing of medical waste in a shallow pit that is easily accessible to the community; and (3) lack of knowledge of appropriate practices by the staff.
b. The providers, other clinic staff, and members of the community, including the teenage girls who scavenge in the pit and others who could contract an infection from one of the girls or those using the syringe barrels.
c. Ms. Oludara should inform the staff of the situation and organize an infection prevention update for all staff to review the safe use and disposal of needles and syringes. The clinic should then develop a plan to: improve the waste-disposal site so that it is not easily accessible to members of the community; consider burning the needles and syringes as described in this module, so that both the needles and syringes are no longer usable; and educate the clinic's clients (and others in the community, if possible) about the potential hazards of medical waste.

Exercise 13-1: Case Studies

Read the following case studies and answer the questions below. Possible responses appear on page 13.11.

Case Study 1

Ms. Gomez is a new district supervisor making her first visit to the local clinic. The sanitation officer takes her on a tour of the facility and explains all the waste-disposal functions in each area. Upon visiting the waste-disposal site, Ms. Gomez finds a large pit that is less than half full, with a layer of leaves and other garden debris visible. While talking to the sanitation officer, she sees a gardener dump a wheelbarrow full of branches, leaves, and other debris into the pit. Then, against the outside of the fence, she finds a pile of what looks like recently dumped medical waste, including bloody dressings and exposed needles attached to IV tubing.

a. What are the inappropriate waste-disposal practices here?

b. What should be done about this situation?

Case Study 2

Ms. Oludara is a nurse-midwife at a small but busy maternal/child health clinic. She recently attended an infection prevention training course and realized that she did not know where medical waste was disposed of at her clinic. Upon returning to the clinic, Ms. Oludara discovers that the area designated for waste disposal is a shallow pit in the trees behind the clinic. She notices that the pit contains many plungers for syringes but not barrels. She questions the doctors, midwives, and housekeeping staff, but no one can explain what happens to the syringe barrels. The providers say that after using the syringes and needles, they remove the needles, place them in empty bottles, and throw the syringes in the trash can. Ms. Oludara then asks the man who collects and disposes of the medical waste about the barrels. He tells her that he once saw some teenage girls collecting the syringe barrels, and they told him that they use the barrels as rollers for their hair, which he thought was a clever idea.

a. What are the inappropriate waste-disposal practices here?

b. Who is at risk of infections or injury, and why?

c. What should be done about this situation?

continued

Case Study 3

a. (1) Improperly disposing of sharps, and (2) dumping medical waste in areas that are easily accessible.

b. Dr. Asante should: (1) hold a meeting with the staff responsible for waste disposal, describe the incident, and explain the potential risk to the injured man and his family; (2) immediately assess the overall waste-disposal practices among all levels of staff, and institute a program for staff to follow that involves sorting waste so that only medical waste, which can cause infections or injury if not properly disposed of, goes to the incinerator; (3) set up an inservice refresher course for all staff to reinforce their roles in waste disposal for infection prevention, including the safe use and disposal of sharps; and (4) conduct periodic follow-up evaluations to assess the consistency of correct waste-disposal practices after the refresher course.

Case Study 4

a. (1) Lack of staff knowledge about how waste is disposed of, where it goes, and how it is destroyed; and (2) improperly disposing of sharps and other medical waste.

b. Mr. Andreyev should: (1) assess the facility's waste-disposal practices and share the findings with the facility's supervisors and policy-makers; (2) develop a plan for refreshing staff about the appropriate waste-disposal practices; (3) explore the possibility of burning or burying medical waste on-site; and (4) conduct periodic follow-up evaluations to assess the consistency of correct waste-disposal practices after the refresher course.

Exercise 13-1: Case Studies continued

Case Study 3

Dr. Asante is the director of a clinic that is holding a community health fair. During the opening session, many more people arrive than can fit in the space, and some spill out into the bushy areas. As the opening speech begins, a painful wail is heard from the back of the crowd: a man has stepped on a needle and syringe, which is now sticking out of his foot. After inspecting the area where the man was standing, Dr. Asante finds a pile of fresh medical waste at the base of a tree. He becomes angry and confused—since the clinic has an incinerator, he does not understand why the medical waste was dumped there. He discusses the issue with the staff responsible for waste disposal and running the incinerator, who tell him that they often receive more waste than the incinerator can handle and sometimes have to dump waste in the trees.

a. What are the inappropriate waste-disposal practices here?

b. What should be done about this situation?

Case Study 4

Mr. Andreyev is conducting an infection prevention training for 20 newly hired staff in his hospital's new children's unit. During the module on waste disposal, he asks the supervisors what happens to the waste that is generated at the clinic. Everyone looks at one another and replies, "It is burned in an incinerator, of course." But when Mr. Andreyev asks where the incinerator is located and whether he can see it, he discovers that no one present has ever visited it. He decides they should visit the waste-disposal site and asks one of the workers to take them there. Upon arriving at the site, they cannot find an incinerator. However, they do find a very large dumpster, which is overflowing with contaminated waste, including IV fluid bags, tubing with needles still attached, bloody gauze, and syringes with needles sticking up.

a. What are the inappropriate waste-disposal practices here?

b. What should be done about this situation?

Answers to Exercise 13-1: Case Studies

Possible responses:

Case Study 1

a. (1) Dumping medical waste outside of the fence instead of in the pit; (2) using the pit for nonmedical waste, while leaving medical waste exposed; (3) improperly disposing of sharps; and (4) exposing the gardener and possibly others to contaminated waste.

b. Ms. Gomez should point out the problems she noticed to the sanitation officer and find out the reasons for the inappropriate practices. She should work with the sanitation officer to correct the waste-disposal practices and follow up to make sure the proper practices are maintained.

Case Study 2

a. (1) Improperly disposing of syringes and needles at the clinic; (2) disposing of medical waste in a shallow pit that is easily accessible to the community; and (3) lack of knowledge of appropriate practices by the staff.

b. The providers, other clinic staff, and members of the community, including the teenage girls who scavenge in the pit and others who could contract an infection from one of the girls or those using the syringe barrels.

c. Ms. Oludara should inform the staff of the situation and organize an infection prevention update for all staff to review the safe use and disposal of needles and syringes. The clinic should then develop a plan to: improve the waste-disposal site so that it is not easily accessible to members of the community; consider burning the needles and syringes as described in this module, so that both the needles and syringes are no longer usable; and educate the clinic's clients (and others in the community, if possible) about the potential hazards of medical waste.

Case Study 3

a. (1) Improperly disposing of sharps, and (2) dumping medical waste in areas that are easily accessible.

b. Dr. Asante should: (1) hold a meeting with the staff responsible for waste disposal, describe the incident, and explain the potential risk to the injured man and his family; (2) immediately assess the overall waste-disposal practices among all levels of staff, and institute a program for staff to follow that involves sorting waste so that only medical waste, which can cause infections or injury if not properly disposed of, goes to the incinerator; (3) set up an inservice refresher course for all staff to reinforce their roles in waste disposal for infection prevention, including the safe use and disposal of sharps; and (4) conduct periodic follow-up evaluations to assess the consistency of correct waste-disposal practices after the refresher course.

Case Study 4

a. (1) Lack of staff knowledge about how waste is disposed of, where it goes, and how it is destroyed; and (2) improperly disposing of sharps and other medical waste.

b. Mr. Andreyev should: (1) assess the facility's waste-disposal practices and share the findings with the facility's supervisors and policy-makers; (2) develop a plan for refreshing staff about the appropriate waste-disposal practices; (3) explore the possibility of burning or burying medical waste on-site; and (4) conduct periodic follow-up evaluations to assess the consistency of correct waste-disposal practices after the refresher course.

Building a Drum Incinerator and a Burial Site

To begin this session, ask the participants:

- Are drum incinerators or burial sites used at your facility?
- Do you know how to construct a drum incinerator and a burial site?

This content does not need to be covered if the participants' facilities already have incinerators or burial sites or if the material seems inappropriate for the facility (e.g., if it is a large, urban university hospital). If the material is appropriate and the answer to the second question is "no," review the key points about building drum incinerators and burial pits. If desired, you may conduct the following optional activity.

Optional Activity: Discussion Topic *(Approximate time: 15–30 minutes)*

If the participants are familiar with the principles of constructing a drum incinerator or burial pit, lead a discussion by asking:

- **Burning**
  - Where should a drum incinerator be constructed?
  - What is the best container for making a drum incinerator?
  - What type of base should the drum incinerator be placed on?
  - What kind of waste should be burned in the incinerator?
  - What should be done if the material to be burned is wet?
  - What should be done with the ashes from the burned material?
- **Burial**
  - Where, in relation to a source of water, should a burial site be placed?
  - How deep should the burial site be?
  - How much dirt should be used to cover buried waste?
  - When should the burial site be considered full?

If the participants are not familiar with these principles, present the material in the Participant's Handbook and use these questions as a review.

Building a Drum Incinerator and a Burial Site

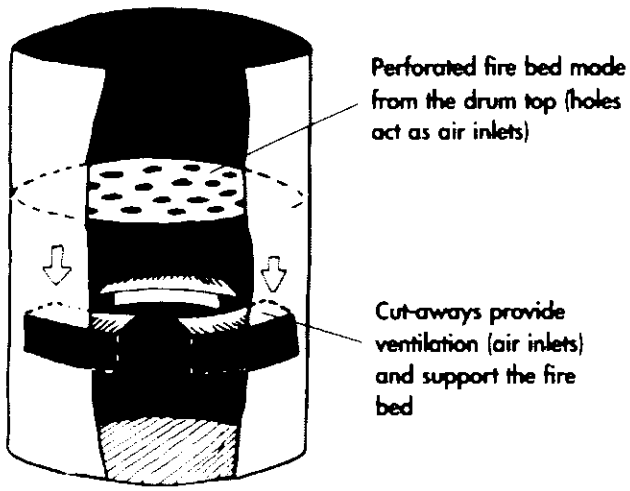
As stated earlier, the way in which waste is handled depends in large part on the type and size of the facility (e.g., a hospital versus a health post), the amount of waste generated, and the location of the facility (urban or rural). In general, a drum incinerator is useful only for small, often rural, facilities that do not have large quantities of medical waste to be burned. For larger facilities with greater quantities of medical waste, an incinerator that is large enough to accommodate the facility's demands is necessary. An engineer or other expert will need to provide assistance in building or installing such an incinerator.

Drum Incinerator

Small facilities with low-volume medical waste can use a drum incinerator to burn medical waste. When using a drum incinerator:

- Choose a place that is downwind from the clinic, so that smoke and odors do not blow.
- Use an oil drum. Make sure the incinerator has sufficient air inlets on the side of the drum for efficient burning.
- Place the incinerator on hard earth or a concrete base to prevent grass from catching fire during the burning process.
- Burn only medical waste to reduce the amount of waste that needs to be burned.
- In many cases, medical waste does not burn easily, especially if it is wet. Add kerosene to make the fire hot enough to burn all the waste. Be sure to add the kerosene **before** starting the fire, since adding it afterward might cause the fire to explode.
- Put up a fence or wall around the incinerator, or never leave a fire unattended, to ensure the safety of clients, staff, visitors, and community members while burning waste.
- Treat the ash from the incinerated material as general waste: bury or dispose of it in a designated area.

Drum Incinerator



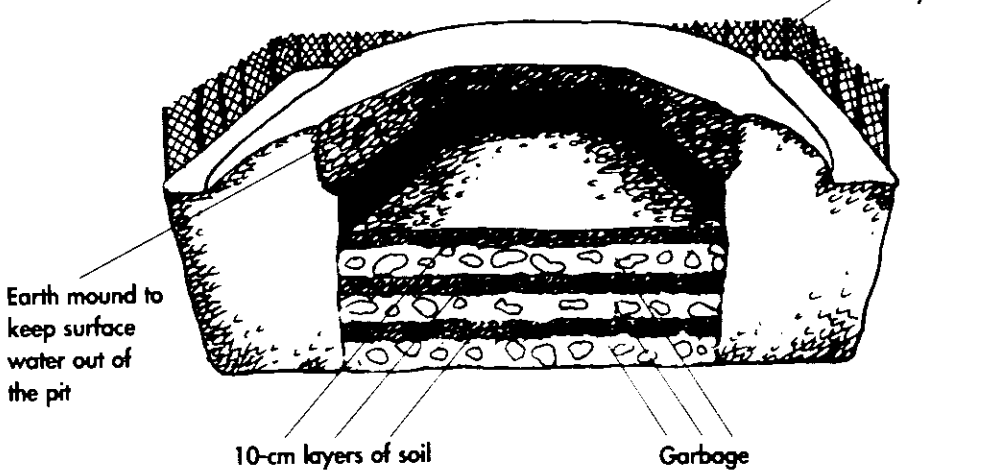
ADAPTED FROM: Coad, A. (ed.). 1994. *Managing medical wastes in developing countries: Report of a consultation on medical wastes management in developing countries, WHO, Geneva, September 1992.* World Health Organization, p. 19.

Burial Site

When using a burial site:

- Choose a site that is at least 50 meters away from any water source to avoid contaminating the water source. The site should be in an area that is located downhill from any wells, is free of standing water, will not flood, and has proper drainage. The site should **not** be located on land that will be used for agriculture or development.
- Dig a pit 1–2 meters wide and 2–5 meters deep. The bottom of the pit should be 1.8 meters above the water table. (Consult your local water engineer/water authority for information about the location of the water table.)
- Put up a fence or wall around the site or opening to keep animals and children out.
- Cover the pit with a 10- to 30-cm layer of soil every time waste is added.
- When the level of waste reaches to within 30–50 cm of the ground surface, fill the pit with dirt, seal it with concrete, and dig another pit.

Burial Site with Fence



ADAPTED FROM: Coad, A. (ed.). 1994. *Managing medical wastes in developing countries: Report of a consultation on medical wastes management in developing countries. WHO, Geneva, September 1992.* World Health Organization, p. 24.

"At My Facility..."

Ask the participants to write their responses to the questions in the space provided. Remind them to answer the questions as honestly as possible. Ask them to think about their response to each question to see if it reflects an appropriate infection prevention practice or if there are issues that need to be addressed. Ask them to write down any problems they identify. Allow 10–15 minutes for completion.

Optional Activity: Discussion Topic *(Approximate time: 10 minutes)*

Ask for volunteers to share their responses, and allow for discussion.

"At My Facility..."

Think about your clinical setting and write your answers to the following questions in the space provided. At your facility:

- Do staff understand the importance of proper disposal of medical waste and hazardous chemical waste and the consequences of improper waste disposal?

- Is medical waste sorted from general waste at the point at which it is generated, so that the amount of waste that requires special handling is reduced?

- Is medical waste disposed of adequately (burned, buried, or handled in another acceptable way)? If not, how might improvements be made?

- Are sharps disposed of according to the guidelines presented in this handbook? If not, how do they vary? How might this affect the risk of transmitting infections at your facility?

- Do all staff wear heavy utility gloves and shoes when handling sharps, other medical waste, and hazardous chemical waste?

Do your responses to these questions reflect an understanding or performance of appropriate infection prevention practices at your facility? If, based on your responses, you become aware of some problems or issues that need to be addressed, list them below:

Summary/Self-Assessment Answers

1. The staff who dispose of the waste, the laborers who cart the waste away, and members of the community are all at risk of infections.
2. Sort medical waste from general waste at the point at which waste is generated to reduce the amount of waste requiring special handling; build an incinerator or pit to burn or bury the medical waste; remove the waste more often; make sure laborers understand the risks involved and the proper way to handle waste; educate staff and the community about proper waste disposal; and ensure that people and animals do not have access to the waste during the time it is stored at the hospital.

Optional Activity: Discussion Topic *(Approximate time: 10 minutes)*

Read aloud the case study, and facilitate a discussion by asking the participants the questions that appear in the Participant's Handbook.

Answers to true/false questions:

3. T
4. T
5. F
6. T
7. T
8. F
9. T
10. F

Summary/Self-Assessment

Answers are provided at the end of this assessment.

Review the following case study, which appeared at the beginning of this module, and answer the questions below:

All waste from the district hospital is gathered and thrown into piles behind the main hospital building. Every six months, the hospital director hires some laborers to shovel the waste into trucks and cart it off to the closest dump, which is located in a neighboring town. Frequently, people pick through the waste looking for items that they can use or sell, children play near the waste, and dogs poke their noses in the piles.

1. Who is at risk of infections in this situation?

2. What are some ways to improve the hospital's waste-disposal practices in order to reduce the risk of infections?

Decide whether each of the following statements is T (true) or F (false). Write your response for each statement in the space provided.

3. ____ Everyone who handles medical waste—from the point at which it is generated through disposal—is at risk of infections or injury. (page 13.3)

4. ____ One way to improve poor waste-disposal practices is to develop a waste-management plan and designate a staff member to coordinate all waste disposal. (page 13.4)

5. ____ If medical waste needs to be stored at a facility before it is burned, it should be placed in a big pile behind the clinic. (page 13.4)

6. ____ Whenever possible, medical waste should be burned or buried on-site. (page 13.5)

7. ____ Liquid medical waste can be disposed of by pouring it down a sink, drain, toilet, or latrine. (page 13.8)

8. ____ Cytotoxic chemicals and radioactive waste should be disposed of in the same manner as all other liquid medical waste. (page 13.8)

9. ____ Burial sites for medical waste should not be located near water sources due to potential water contamination. (page 13.13)

10. ____ Scavenging of medical waste is rarely a problem in low-resource settings. (page 13.3)

Answers to multiple-choice questions:

11. b, d
12. a, b, c, d
13. b, d

The following are multiple-choice questions. More than one option may be correct. Please circle the correct response(s).

11. Which of the following are considered medical waste? (page 13.2)

    a. Outdated client records
    b. Discarded bandages
    c. Trash from the hospital kitchen
    d. Used syringes and needles

12. Proper disposal of medical waste: (page 13.3)

    a. Reduces the number of insects around a facility
    b. Minimizes the spread of infections
    c. Reduces the risk of injury
    d. Improves the appearance of a facility

13. Proper disposal of used hypodermic needles and other sharps includes: (page 13.7)

    a. Breaking or bending the needle before disposal
    b. Placing the needle and attached syringe in a puncture-resistant container
    c. Waiting until sharps containers are full before throwing them away
    d. Placing sharps containers close to places where procedures are performed

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Answers: 1. The staff who dispose of the waste, the laborers who cart the waste away, and members of the community are all at risk of infections; 2. Sort medical waste from general waste at the point at which waste is generated to reduce the amount of waste requiring special handling; build an incinerator or pit to burn or bury the medical waste; remove the waste more often; make sure laborers understand the risks involved and the proper way to handle waste; educate staff and the community about proper waste disposal; and ensure that people and animals do not have access to the waste during the time it is stored at the hospital; 3. T; 4. T; 5. F; 6. T; 7. T; 8. F; 9. T; 10. F; 11. b, d; 12. a, b, c, d; 13. b, d

MODULE 14 Implementation Plans and Closure

Trainer's Notes for Module 14

This module provides a wrap-up of the infection prevention training course. It includes an exercise that may be used as an overall review of the course, implementation plans for participants to formulate, the Knowledge-Assessment Test (as a posttest), and an overall course evaluation. Also included is a closing activity to highlight the fact that everyone at a health care facility plays an important role in infection prevention.

Audience This module is appropriate for all staff and is equally appropriate for on-site and off-site trainings. All course participants—whether they are service providers or ancillary staff—can develop implementation plans. Each participant should develop an implementation plan that is appropriate to the tasks for which he or she is responsible.

Training Option

Low-literate/illiterate participants can work with the trainer or another course participant, either individually or in small groups, to complete the various activities in this module. The trainer or participant providing assistance can present the questions orally and write down the participants' responses.

Training Time

2–3½ hours, depending on which training activities are used.

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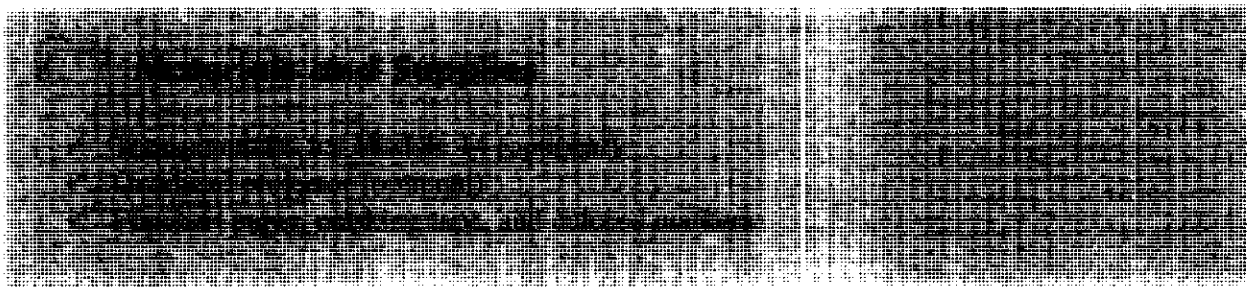
MODULE 14 Implementation Plans and Closure



Advance Preparation

- Determine which training activities will be used to present the content of this module, and prepare or gather any supplies needed for the activities you will be conducting.
- Make a copy of the Knowledge-Assessment Test for each participant, if possible.
- Obtain or prepare a course evaluation form if you will not be using the one supplied in Appendix B: End-of-Training Evaluation Form.
- Create transparencies or flipcharts, as needed.

Introduction

Introduce this module by reviewing the purpose and objectives that appear in the Participant's Handbook.

MODULE 14 Implementation Plans and Closure

Introduction

Purpose and Objectives

This module provides a wrap-up of the infection prevention training course. Upon completion of this module, you should be able to:

- List obstacles to improving infection prevention practices and some ways to address them
- List the three most important infection prevention practices that need to be implemented or changed at your facility
- List some ways to bring about these changes
- Explain why it is important for everyone to do his or her part in order for infection prevention practices to be effective

Directions for Independent Study

If you are preparing for this module independently, you should:

- Study this module.
- Complete the infection prevention crossword puzzle.
- Complete the implementation plan.
- Write down any questions you have about this module for later discussion with the trainer.

Review of Infection Prevention Concepts

If desired, review the key infection prevention concepts presented in this curriculum by conducting the following optional activity.

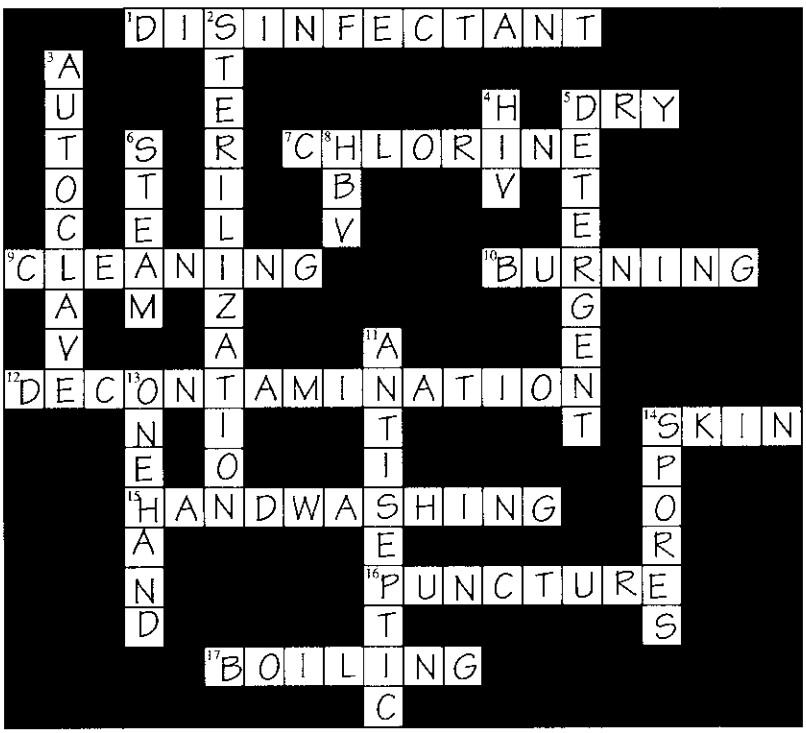
Optional Activity: Individual Exercise *(Approximate time: 30 minutes)*

Direct the participants to the infection prevention crossword puzzle. Review the instructions with them, and ask them to complete it individually. Allow 15 minutes for completion. Ask for volunteers to share their answers. Validate or correct their answers, as needed.

Training Option

- As the participants call out their answers, fill them in on a transparency of the incomplete puzzle.
- To conduct this exercise as a large-group exercise, display a transparency of the incomplete puzzle, read each clue, ask for volunteers to call out the answers, and write the answers on the transparency using a felt-tipped pen or magic marker.

Answers



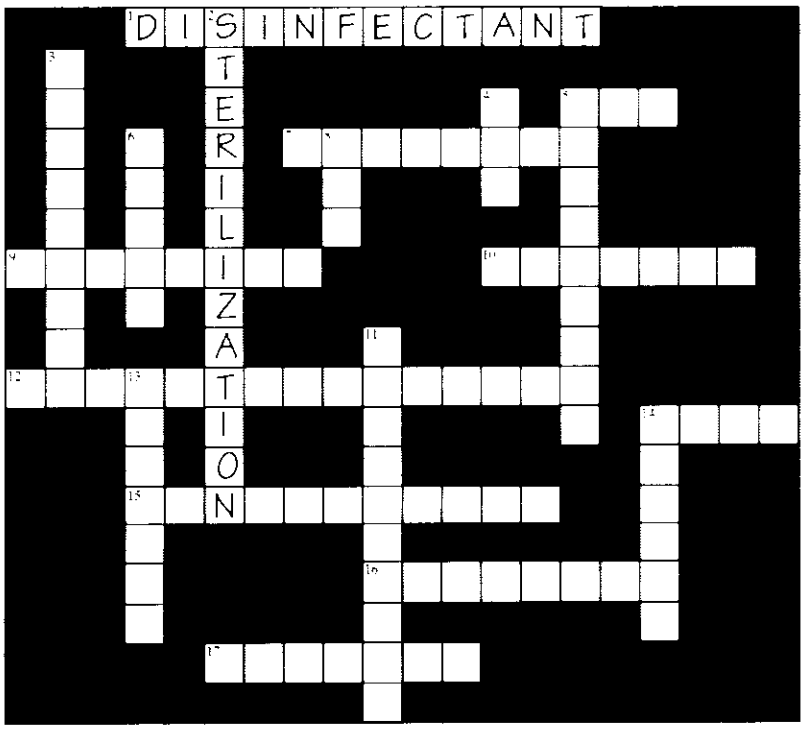
Review of Infection Prevention Concepts

Complete the infection prevention crossword puzzle below for a fun way to review the infection prevention terms and concepts learned in this training. Answers appear on page 14.12.

Infection Prevention Crossword Puzzle

Instructions:

1. **Read the first clue (descriptive statement) in the "Across" column (1 Across) and write the answer, starting in box 1 and going across. Note that only one letter goes in each box. (See the example on the puzzle.)**
2. **Continue for all the clues in the Across column. If you do not know on answer, skip to the next clue and come back to it later when other letters have been filled in.**
3. **Read the clues in the "Down" column and write the answers. (See the example on the puzzle.) Some of the letters will already be filled in from clues you have already answered. The letters you fill in must match the ones that are there. (In the example on the puzzle, the letter *S* fits in the answers to both 1 Across and 2 Down.)**
4. **Continue until all the boxes have been filled in.**



ACROSS

1. Type of solution used to reduce the number of microorganisms on inanimate objects
5. Pickups (lifters, cheatle forceps) should be stored _____
7. Active chemical ingredient in the solution commonly used for decontamination
9. Instrument-processing step before sterilization or high-level disinfection
10. Ideal method of waste disposal
12. First step in processing instruments and other items
14. Antiseptics are used to reduce the number of microorganisms on _____
15. Very simple, yet important, infection prevention practice
16. A _____-resistant container should be used for disposal of sharps (needles, scalpel blades, etc.)
17. A method of high-level disinfection of instruments and other items

DOWN

2. Process that kills all microorganisms (including bacterial endospores)
3. Machine used for sterilizing instruments and other items
4. Virus that causes AIDS (abbreviation)
5. A brush and _____ should be used when cleaning instruments and other items
6. Difference between autoclaving and dry-heat sterilization
8. Virus that is easily transmitted by a needlestick injury (abbreviation)
11. Never leave instruments, blades, needles, etc., soaking in _____ or disinfectant solutions
13. The safe way to recap needles is the _____ technique (2 words)
14. Most difficult form of bacteria to kill

Common Obstacles to Improving Infection Prevention Practices

Review the material presented in the Participant's Handbook, using it to lead into the development of implementation plans in the next session.

Common Obstacles to Improving Infection Prevention Practices

There are three general obstacles to improving infection prevention practices throughout the world:

1. Lack of knowledge of appropriate practices
2. Resistance to changing old habits—that is, inappropriate practices that staff learned a long time ago and have performed for years
3. Inadequate supplies, equipment, and space for performing the appropriate practices

Some approaches to addressing these obstacles include:

- Sharing the information you learned in this workshop with others, training those you supervise, and posting important information in key areas (such as autoclave instructions on the wall next to the autoclave).
- Explaining that because science and medicine are always evolving, infection prevention practices may also change. As new information is learned, improved practices may be developed and current practices may be shown to be ineffective or unnecessary.
- Explaining why a given practice is important (such as how decontamination protects health care workers from infections). When people understand why it is important to do something a particular way, they are much more likely to do it correctly. This is especially important when the new way takes longer or is more involved than the old way or when an entirely new practice is being introduced.
- Assessing whether or not supplies are being used in ways that are most appropriate and cost-effective and, if not, determining how to better manage the use of suplies. The money saved could then be used to purchase other needed supplies and equipment that are currently unavailable. Likewise, you could assess how the current space is being used and determine if it is possible to reorganize activities in a way that allows for more efficient use of space.

Implementation Plans

Direct the participants to pages 14.4–14.7 in their handbook and ask them to develop implementation plans to help improve infection prevention practices at their facilities. Ask them to identify and prioritize the three most important infection prevention practices at their facility that need to be implemented or changed based on review of the "At My Facility..." sections they completed for each of the other modules in this training course, as well as material generated throughout the course that was to be saved for use in developing the implementation plans. Allow 30–45 minutes for completion. Ask for volunteers to share their plans; allow for discussion. Inform the participants that the implementation plan may be used during a follow-up visit to their facility to evaluate how successful they have been in implementing/changing infection prevention practices. Instruct them to save their implementation plans for review at that time.

Training Options

- If there are several participants from the same facility or the same department, ask them to work together to select priority problems and/or prepare implementation plans.
- If time is limited, ask the participants to address only one problem or to review their "At My Facility..." sections in the evening before this session and select priority problems then.
- If you have access to a copy machine during the training, make a copy of each participant's implementation plan and keep it for use during the follow-up visit.

Implementation Plans

One of the most important parts of this (or any) training course is taking all the information that has been presented, as well as the experience you have had, and determining how to apply it to your daily work. Exactly how you do this may differ from how other participants do it, since your work roles and responsibilities may be different from theirs. The important thing is to figure out how *you* can best implement the practices you have learned in this training in order to improve infection prevention at your facility.

Review the "At My Facility..." sections that you completed for each module in this training course, as well as the materials you saved during the course for use in developing an implementation plan. For the tasks for which you are responsible, select the three most important infection prevention practices at your facility that need improvement; make sure that they are practices for which you feel you can help bring about the necessary changes. Prioritize those three areas (1 = most important, 3 = least important).

In selecting problems that are a priority, select problems for which:

- The consequences of performing the current, inappropriate practice are or may be serious
- The resources needed to resolve the problem are currently available or are possible to obtain
- You are responsible for performing the practice or you supervise the staff who perform it
- The current, inappropriate practice affects most or many of the services provided at your facility

Complete all three parts of the implementation plan, which appear on the next three pages.

Implementation Plan: Problem 1

What is the most important infection prevention practice that you would like to implement or change at your facility?

What information, new skills, supplies, staff training, etc., do you need to implement or change the practice at your facility?

What are some problems you might encounter in implementing or changing this practice?

Who can assist or advise you in implementing or changing this practice? (Write their names.)

What specific steps can you take to implement or change the practice when you return to work?

Step 1

Step 2

Step 3

By what date might the practice be implemented or changed?

Implementation Plan: Problem 2

What is the second most important infection prevention practice that you would like to implement or change at your facility?

What information, new skills, supplies, staff training, etc., do you need to implement or change the practice at your facility?

What are some problems you might encounter in implementing or changing this practice?

Who can assist or advise you in implementing or changing this practice? (Write their names.)

What specific steps can you take to implement or change the practice when you return to work?

Step 1

Step 2

Step 3

By what date might the practice be implemented or changed?

Implementation Plan: Problem 3

What is the third most important infection prevention practice that you would like to implement or change at your facility?

What information, new skills, supplies, staff training, etc., do you need to implement or change the practice at your facility?

What are some problems you might encounter in implementing or changing this practice?

Who can assist or advise you in implementing or changing this practice? (Write their names.)

What specific steps can you take to implement or change the practice when you return to work?

Step 1

Step 2

Step 3

By what date might the practice be implemented or changed?

Knowledge Assessment and Course Evaluation

If you have made copies of the Knowledge-Assessment Test, distribute one copy to each participant; if not, ask the participants to turn to the copy in their handbook, tear it out, write their name at the top, and complete it. (The test appears on pages 14.9–14.10 of their handbook.) Allow 20 minutes for completion. Ask for volunteers to read the questions aloud and give their answers. (*Note:* Inform the participants that they should not change any of their answers at this time.) Allow for discussion, and validate or correct their answers, as necessary.

Collect the tests from the participants. After the session, grade the tests, record the results on the remaining copy of the Individual and Group Performance Matrix (which appears in Appendix D), and compare the participants' responses with those from the pretest. (Instructions for completing the matrix appear in Appendix D.)

Training Options

- If there are few participants, read the questions aloud and ask the participants to answer them orally. Record the responses of the group as a whole on the matrix for comparison with the posttest results.
- If some of the participants are low-literate/illiterate, ask some of the other participants to assist them in completing the test.

Direct the participants to the course evaluation form in Appendix B: End-of-Training Evaluation Form or distribute a copy of your own evaluation form to each participant. You may use a form preferred by the institution you are working with (if they have one), one you have used previously, or one you have designed specifically for this course.

Knowledge Assessment and Course Evaluation

The trainer will ask you to complete the same Knowledge-Assessment Test that you completed at the beginning of this workshop, which appears again on the next two pages. The results of this test will be used to measure the change in the group's knowledge, as well as every participant's individual knowledge, of infection prevention practices as a result of the training.

Do **not** complete the Knowledge-Assessment Test if you are studying the content of this course independently.

The trainer may also ask you to complete a course evaluation, either the one that appears in Appendix B: End-of-Training Evaluation Form of this handbook or another one that he or she will distribute. Please answer the questions as honestly and completely as possible. This feedback will enable the trainer to make any necessary changes to the training course during future workshops.

Answers to Knowledge-Assessment Test

Answers to true/false questions:

1. F
2. F
3. T
4. F
5. T
6. T
7. T
8. F
9. T

Answers to multiple-choice questions:

10. a, b, c

Knowledge-Assessment Test

Decide whether each of the following statements is T (true) or F (false). Write your response for each statement in the space provided.

1. ____ Since it is easy to tell which clients are infected with HIV and other bloodborne infections, it is not necessary to take appropriate steps to protect yourself from infections with every client.

2. ____ Boiling is a method of sterilization.

3. ____ Items such as pickups (lifters, cheatle forceps), suture needles, and surgical scrub brushes should not be left soaking in antiseptic or disinfectant solutions.

4. ____ Fumigation (fogging) with formaldehyde or other disinfectants is an effective and efficient way to reduce contamination of surfaces such as walls, ceilings, and floors.

5. ____ Hands should always be washed after removing gloves following a clinical procedure.

6. ____ For steam sterilization to be effective, steam must reach all surfaces of the instruments and other items.

7. ____ Contamination can be minimized by reducing the number of people permitted into operating theaters, procedure rooms, and areas in which instruments and other items are processed.

8. ____ As long as instruments and other items will be sterilized or high-level disinfected, it is not necessary to clean them with detergent and water.

9. ____ Sorting medical waste from general waste at the point at which it is generated is a good way to reduce the amount of waste requiring special handling.

The following are multiple-choice questions. More than one option may be correct for each question. Please circle the correct response(s) for each question.

10. Following appropriate infection prevention practices is important to:

    a. Prevent infections in service providers and ancillary staff
    b. Prevent infections, such as wound infections, abscesses, and pelvic inflammatory disease (PID), in clients
    c. Protect the community from infections that originate in health care facilities

11. a
12. a, c
13. a, b
14. b, c
15. a, b

11. Decontaminating instruments and other items immediately after use in a 0.5% chlorine solution for 10 minutes:

    a. Reduces the risk of infections in facility staff by killing HIV and the hepatitis viruses
    b. Removes blood and tissue, making it unnecessary to clean the instruments and other items
    c. Allows instruments and other items to be reused immediately

12. Handwashing:

    a. Decreases client sickness and death
    b. Is usually performed appropriately in most health care facilities
    c. Protects both the client and service provider from infections

13. Antiseptic and disinfectant solutions:

    a. Should be stored in a cool, dark place
    b. Can be easily contaminated
    c. Can be used interchangeably

14. To reduce the risk of infections and injury:

    a. All hypodermic needles should be recapped
    b. In a sterile field, sharps should be passed in a kidney basin or other container
    c. Sharps should be disposed of in a puncture-resistant container

15. Housekeeping staff are at risk of infections:

    a. When cleaning operating theaters and procedure rooms
    b. When disposing of medical waste
    c. They are not at risk of infections as long as they are not directly involved in client-care activities

Closure

Display a flipchart outlining the overall course objectives. Read each objective aloud and ask the participants if the objective has been met. Clear up any unresolved issues. Then review the material presented in the Participant's Handbook. If desired, close the session with the following optional activity.

Optional Activity: Large-Group Exercise *(Approximate time: 20–30 minutes)*

Have the participants construct a spider's web of yarn, which will: (a) show that everyone can make a contribution to good infection prevention practices; (b) demonstrate that when one person does not do his or her share, infection prevention will not be adequate; and (c) point out that every contribution, no matter how large or small, is important to ensure good infection prevention practices. *Instructions for this activity, Spider's Web of Yarn, appear in Appendix F: Additional Trainer's Resources.*

Closure

As has been emphasized throughout this training course, implementing adequate infection prevention practices does not require fancy or expensive equipment and supplies. The internationally accepted practices covered in this training use low-tech approaches that are practical, simple, easy to use, and generally inexpensive. In addition, although supplies and equipment are needed for good infection prevention practices, it is the staff more than the materials that makes the difference. Well-trained, interested, and motivated staff who have limited access to supplies and equipment are more likely to implement and follow accepted infection prevention practices than are poorly trained, unmotivated staff who have access to the most up-to-date and expensive supplies and equipment.

As time passes, you will probably not be able to remember everything you learned in the training. Refer to this Participant's Handbook as often as necessary to remind yourself of the specific practices needed. You may also want to copy some of the charts or other information and post them in various locations at your facility. For example, it might be useful to post the instructions for steam sterilization on the wall next to the autoclave. Whenever possible, share the information you have learned with your colleagues who did not attend the training, and discuss these practices with your colleagues who did.

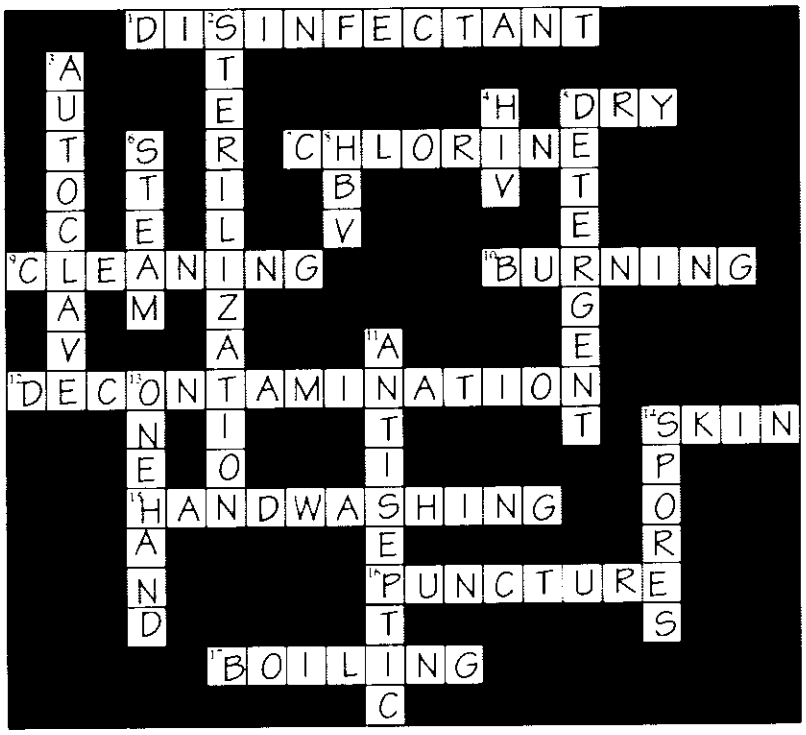
Infection prevention is *everybody's* business. Just as everyone who works at a health care facility is at risk of infections and injury, every person working at the facility has a role to play in making the services offered and the environment as safe as possible. Appropriate infection prevention practices can and should be adopted by every staff member as they apply to his or her duties. In order for infection prevention to be as effective as possible, each staff member must do his or her part.

Remember:

- **Change is a process, not an event that happens all at once.**
- **Do not try to change everything at once.**
- **Some people are likely to be resistant to change.**
- **Take small steps forward, and do not get discouraged if there are a few small steps backward (this happens sometimes).**
- **Help people work through and adjust to new practices.**
- **Do not give up—always remember that it is possible to improve infection prevention practices.**
- **Start with yourself—do not expect others to do things that you do not do yourself.**

Answers to Infection Prevention Crossword Puzzle

The instructions and clues for this crossword puzzle appear on page 14.2.



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Appendix A

Glossary of Infection Prevention Terms

Glossary of Infection Prevention Terms

Antiseptic A chemical agent used on the skin and mucous membranes to remove or kill microorganisms without causing damage or irritation. An antiseptic may also prevent the growth and development of microorganisms. Antiseptics are not meant to be used on inanimate objects, such as instruments and surfaces.

Aseptic technique Practices that help reduce the risk of postprocedure infections in clients by reducing the likelihood that, during clinical procedures, microorganisms will enter areas of the body where they can cause disease. While all infection prevention practices contribute to this effort, aseptic technique refers to those practices performed just before or during a clinical procedure, including handwashing, surgical handscrub, using barriers such as gloves and surgical attire, properly preparing a client for clinical procedures, maintaining a sterile field, using good surgical technique, and maintaining a safer environment in the surgical/procedure area.

Chemical sterilization *See* sterilization.

Cleaning The second step in processing instruments and other items for reuse, this process entails scrubbing instruments and other items with a brush, detergent, and water before they are sterilized or high-level disinfected to remove blood, other body fluids, organic material, tissue, and dirt. In addition, cleaning greatly reduces the number of microorganisms (including bacterial endospores) on instruments and other items, making it a crucial processing step. If instruments and other items have not first been cleaned, sterilization and high-level disinfection (HLD) may not be effective, because: (1) microorganisms trapped in organic material may be protected and survive the sterilization or HLD process; and (2) organic material and dirt can make the chemicals used in chemical sterilization and HLD less effective.

Decontamination The first step in processing instruments and other items for reuse, this process kills viruses (such as hepatitis B, other hepatitis viruses, and HIV) and many other microorganisms, making instruments and other items safer to handle by staff who clean them. In addition, decontami-

nation prevents blood, other body fluids, and tissue from drying on instruments and other items, making them easier to clean. Decontamination is performed by soaking instruments and other items in a 0.5% chlorine solution for 10 minutes immediately after use.

Disinfectant

A chemical agent used to kill microorganisms on inanimate objects, such as instruments and surfaces. Disinfectants are not meant to be used on the skin or mucous membranes.

Dry-heat sterilization (electric oven)

See sterilization.

General waste

Nonhazardous waste that poses no risk of injury or infections. Similar in nature to household trash, general waste includes uncontaminated paper, boxes, packaging materials, bottles, plastic containers, and food-related trash.

See also medical waste, hazardous chemical waste.

Hazardous chemical waste

Chemical waste that is potentially toxic or poisonous, including cleaning products, some disinfectants, cytotoxic drugs, and radioactive compounds.

See also general waste, medical waste.

High-level disinfection (HLD)

The third step in processing instruments and other items for reuse, this process eliminates all microorganisms (bacteria, viruses, fungi, and parasites), but does not reliably kill all bacterial endospores, which cause diseases such as tetanus and gas gangrene. HLD is suitable for instruments and other items that will come in contact with broken skin or intact mucous membranes. HLD can be performed by boiling, use of chemicals, or steaming.

Housekeeping

The general cleaning and maintenance of cleanliness in a health care facility. In addition to cleanliness, the purpose of housekeeping is to reduce the number of microorganisms in the facility (thus reducing clients' and staff members' risk of infections) and provide an appealing work and service-delivery space.

Instruments and other items

As used in this curriculum, this term includes:

- Instruments used during surgery or other clinical procedures, such as pelvic examination, insertion of IUD or Norplant implants, childbirth, manual vacuum aspiration (MVA), and collection of samples for testing for sexually transmitted diseases
- Other items that are reused during the delivery of health services, such as pickups (lifters or cheatle forceps), instrument pans and trays, reusable hypodermic needles and syringes, reusable gloves, and linen

Medical waste

Material generated in the diagnosis, treatment, and/or immunization of clients, including:

- Blood, blood products, and other body fluids, as well as materials containing fresh or dried blood or other body fluids, such as bandages and surgical sponges
- Organic waste, such as human tissue, body parts, placentas, and products of conception
- Sharps (used or unused), including hypodermic and suture needles, scalpel blades, blood tubes, pipettes, and other glass items that have been in contact with potentially infectious materials (such as glass slides and coverslips)

See also general waste, hazardous chemical waste.

Microorganisms

Organisms that can be seen only with the magnification of a microscope. They exist everywhere in the environment—in people, animals, plants, soil, air, and water and other solutions.

Sharps-disposal container

A puncture-resistant container for disposal of used needles and other sharp objects. A sharps-disposal container may be made out of a heavy cardboard box, an empty plastic jug, or a metal container.

Standard precautions

A set of clinical practice recommendations designed to help minimize the risk of exposure to infectious materials, such as blood and other body fluids, by both clients and staff. Standard precautions help break the disease-transmission cycle at the mode of transmission step.

Steam sterilization (autoclaving)

See sterilization.

Sterilization

The third step in processing instruments and other items for reuse, this process eliminates all microorganisms (bacteria, viruses, fungi, and parasites), including bacterial endospores. Sterilization is recommended for instruments and other items that will come in contact with the bloodstream or tissues under the skin. The three methods of sterilization are:

- *Steam sterilization (autoclaving)* - This method requires moist heat under pressure. For steam to be produced, there must be sources of both water and heat. A heat source is necessary to maintain the required temperature and pressure. Heat can be provided by electricity or any other fuel source (such as an electric stove or kerosene burner), depending on the type of autoclave used.
- *Dry-heat sterilization (electric oven)* - This method requires heat for a specific period of time. For dry-heat sterilization to be achieved, a constant supply of electricity is necessary. Only glass or metal objects can be sterilized by this method, because high temperatures are necessary for sterilization to be achieved. This method of sterilization cannot be used for other items, such as surgical gloves, which may melt or burn.
- *Chemical sterilization* - This method is used for instruments and other items that are heat-sensitive or when heat sterilization is unavailable. Instruments and other items can be sterilized by soaking them in a chemical solution, such as a product containing glutaraldehyde, followed by rinsing them in sterile water.

Surgical attire

Attire such as gloves, caps, masks, and gowns that help reduce the risk of postprocedure infections in clients by reducing the likelihood that clients will be exposed to potentially infectious microorganisms. In addition, this attire—as well as protective eyewear, waterproof aprons, and sturdy footwear—protects the service provider from exposure to clients' potentially infectious blood and other body fluids.

Appendix B

End-of-Training Evaluation Form

End-of-Training Evaluation Form

Please complete all sections of this evaluation form, using the reverse side for comments, if needed. Your responses will assist the training organizers in determining what modifications, if any, should be made to this program.

A. Overall Evaluation

Select the choice that best reflects your overall evaluation of this training:

____Very good ____Good ____Fair ____Poor ____Very poor

B. Specific Aspects

1. Respond to each of the following elements of the training (circle the number of your response for each):

ELEMENT	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
Content					
• Information was sufficient	5	4	3	2	1
• Information was well organized	5	4	3	2	1
Materials and Visual Aids					
• Were of high quality	5	4	3	2	1
• Were useful	5	4	3	2	1
Instructor Presentation					
• Instructor was knowledgeable on this subject	5	4	3	2	1
• Instructor had a good presentation style	5	4	3	2	1
• Instructor was responsive to the participants' questions and needs	5	4	3	2	1
Practice Sessions					
• Were useful	5	4	3	2	1
• Allowed enough time to practice procedures	5	4	3	2	1

2. The length of training was: ____Too long ____Just right ____Too short

3. The most important thing I learned in this training was:

continued

End-of-Training Evaluation Form continued

C. For the Future

Please think about this training and all the elements (content, materials, presentation, practice sessions, etc.) you feel should be the same if this training is repeated. Also think about what aspects you feel could be improved and what elements you feel should be eliminated from this training.

1. I suggest the following be SAVED and included in future training (include reasons why):

2. I suggest the following be CHANGED for future training (include reasons why):

3. I suggest the following be REMOVED from future training (include reasons why):

D. Comments

Appendix C

Implementing and Managing an Infection Prevention Program

Implementing and Managing an Infection Prevention Program

This appendix is intended for supervisors or others in positions of authority who are involved in making changes in policy or practice. If you are not involved in making such decisions, it may be useful to show this appendix to the appropriate person(s) at your facility after the training course.

Success in implementing and maintaining appropriate infection prevention practices at a health care facility requires knowledge of proper infection prevention practices, creativity, effective management skills, and contributions from all staff at the facility. When resources are limited, it is important to have an organized supply system to ensure an adequate and reliable stock of essential materials and equipment.

This appendix provides guidance on:

- Gaining staff and administrative support for improving infection prevention practices and transferring the knowledge and skills necessary for making changes
- Assessing current infection prevention practices and making appropriate recommendations for improvement
- Implementing the changes necessary to improve infection prevention practices
- Monitoring infection prevention practices and addressing any problems identified
- Evaluating whether infection prevention practices have been improved

(For more information on ways to facilitate the quality-improvement process at a health care facility, see the *Facilitative Supervision Handbook*, a work in progress in AVSC's Quality Improvement Series.)

Gaining Support for Infection Prevention

To improve infection prevention practices at your facility, you must first identify and bring together the key individuals at the facility who can help plan, implement, and support the recommended changes. The types of individuals will vary depending on the size and type of facility; they may include administrators, service providers, central supply staff, housekeeping staff, laboratory technicians, and/or infection control committee members. In addition, if the facility has a community board, a representative should be part of the group to represent the client perspective and communicate the group's goals to the community, the consumers of the facility's services.

Including all these types of individuals is important for several reasons:

- Infection prevention training can be effective only if the participants have the opportunity and support needed to implement their newly acquired knowledge and skills. Therefore, administrative support is crucial to improving infection prevention practices.
- Decisions about infection prevention practices reflect considerations of a variety of factors.

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including available equipment, personnel, administrative support, and budget. Involving a multifaceted group allows different perspectives to be heard and the possibility of gaining valuable input into making realistic decisions for change.

- People are often resistant to change—even when it is desired—and this resistance can be a difficult barrier to overcome. Including all levels of staff will help staff feel invested in the process and likely make them more open to change, thus reducing or eliminating obstacles and barriers.

Once the group of key personnel is in place, they should receive a brief overview of the infection prevention training course and the need to improve infection prevention practices at the facility. (Information from Module 2: Importance and Purpose of Infection Prevention and Module 14: Implementation Plans and Closure may be used to prepare such an overview.) Then they should be informed about the proposed process that might be undertaken to initiate and maintain improved infection prevention practices, which is described in the remainder of this appendix.

Assessing the Current Status of Infection Prevention Practices

Before implementing a plan to improve infection prevention practices at your facility, you must carefully assess the practices currently being performed. This initial assessment will serve not only to identify areas for improvement, but will also supply baseline information against which to compare findings from subsequent assessments so that you can evaluate the success of your efforts.

A good way to assess infection prevention practices is to observe staff in their daily work and compare their activities with infection prevention "standards," or ideal ways that the practices should be performed. The Infection Prevention Assessment Survey, which begins on page C.11, lists all of the infection prevention standards that should be achieved at the facility. As you observe infection prevention practices at your facility, use the Infection Prevention Assessment Survey or a similar assessment tool to determine which standards have and have not been achieved. The User's Guide to the Infection Prevention Assessment Survey, which begins on page C.17, provides a detailed explanation of each standard.

One-time observation of staff performing infection prevention practices indicates only whether or not the particular staff you are observing have achieved the standard at that particular time; it does not indicate whether the standard is achieved by those staff all the time or whether it is achieved by other staff. Therefore, to get a broader picture of the practices at the facility, it may be useful to observe different staff performing them at different times. (If direct observation of staff activities is not possible, you may be able to determine whether infection prevention practices are being performed properly by talking with staff and touring the facility.)

In assessing infection prevention practices, you will likely find that some practices were performed properly, some need to be improved, and still others need to be newly instituted. If some of the standards were not achieved, it may be because your facility's protocols for infection prevention differ from the standards. Therefore, it will be necessary to review your facility's protocols to see whether they are consistent with the infection prevention standards presented in this curriculum. Protocols and practices that are consistent with the standards should be reinforced; proto-

cols and practices that are outdated, not practiced, or practiced improperly should be targeted for change.

Designing a Plan to Improve Infection Prevention Practices

Identifying Why the Standards Were Not Met

Once the assessment has been conducted, you and the staff will be able to determine which of the standards were not achieved and thus need to be improved. To select appropriate interventions for improving infection prevention practices, you must first determine the reasons why practices were performed improperly; this is critical to ensuring that the proposed interventions will actually address the cause of the problem. For example, if staff already know about the need to decontaminate used instruments and other items but do not have access to chlorine, arranging for training on decontamination will not improve their performance of the practice.

The following steps may be taken to help determine the reasons why practices were performed improperly:

- ***Step 1:*** Identify the standards that were not achieved, using the Infection Prevention Assessment Survey.
- ***Step 2:*** For each standard that was not achieved, identify the cause or problem that prevented it from being achieved. Do this by repeatedly asking "Why?" until the cause is determined. For example:

  Standard that was not achieved: Instruments and other items should be decontaminated by placing them in a 0.5% chlorine solution immediately after use and letting them soak for 10 minutes.
  Why was it not achieved? Because there is no bucket with decontamination solution in the operating theater.
  Why? Because the cleaner doesn't make any solution.
  Why? Because there is no liquid or powdered bleach to use to make the solution.
  This is the cause of the problem.

Often, infection prevention standards are not achieved because of one or more of the following reasons:

- **Misunderstanding of the risks involved.** Often staff believe that the incidence of postprocedure infections at their facility or serious infections in their community is low, putting them at low risk of infections in their daily work. Consequently, they feel that the infection prevention practices they are currently performing are adequate—even when they are not—and therefore they do not see the need to spend time, energy, and money to institute new procedures or modify existing ones.
- **Lack of knowledge of appropriate practices.** Some staff may be unsure about their job responsibilities, as well as how and why to perform their jobs in certain ways. Every person working at the facility has a role to play in infection prevention to ensure that the services and environment are as safe as possible, and appropriate infection prevention practices can and should be adopted by all staff as they apply to their duties.

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- **Resistance to changing old habits.** Resistance to change can be a major obstacle to improving infection prevention practices and is not easy to address. Staff may feel that the procedures they learned years ago and have been performing for years are adequate and thus do not need to be changed.
- **Having inadequate supplies, equipment, and space for performing the appropriate practices.** While this is often one of the greatest obstacles to good infection prevention in low-resource settings, it is often overemphasized or used as an excuse for not improving practices. Performing appropriate infection prevention practices does not require fancy, expensive equipment or supplies. The internationally accepted standards presented in this training course use low-tech approaches that are practical, simple, and inexpensive and utilize mostly locally available supplies. Instituting the appropriate practices has already been successfully done in many low-resource settings.

Prioritizing Practices That Need Improvement

Achieving all of the standards on the list may be extremely difficult, especially if many were not achieved. Therefore, staff should prioritize those areas of infection prevention that are immediately most critical or can be most easily and quickly improved. Once these priority practices have been improved, staff can identify the next set of practices needing the most immediate attention and develop plans for achieving them, and so on, until all of the standards have been achieved.

In prioritizing the standards to be achieved, it is important to determine what kinds of problems are standing in the way of achieving the standards. Such problems fall into two categories:

- Those that are within the power of facility management and staff to solve
- Those whose solutions require the intervention of a higher level of management, such as district, regional, or headquarters-level administrators

Problems that fall into the first category are likely to be easier to solve and should be considered priorities. Those that fall into the second category are likely to be more difficult to solve and may be frustrating for facility administrators and staff. In such cases, facility administrators can act as a liaison between the staff and higher-level management to help facilitate staff access to resources and communication of the problem to higher-level managers. By bringing such opportunities for improvement to the attention of higher authorities, facility administrators can be a catalyst for institution-wide improvements.

Prioritizing may best be done with the key individuals identified on page C.1. After reviewing the outcomes of the assessment, these individuals can begin to prioritize the areas needing improvement by discussing how the recommended changes would affect such factors as service delivery, budget, administrative systems, and equipment and supply needs. They can also review the assessments that staff who participated in the infection prevention training course made of infection prevention practices at the facility, as well as the implementation plans the course participants developed for identifying and addressing priority problems. (Staff assessments appear in the "At My Facility..." exercises in Modules 2–13 of the curriculum; development of implementation plans is presented in Module 14.)

When prioritizing practices to address, consider the following:

- Are resources needed to improve infection prevention practices? If so, are they currently available or is it possible to obtain them?
- If funds are required, will there be allowances in the budget?
- Do the current inappropriate practices affect most or many of the services provided at the facility?
- Will addressing these practices improve the quality of the services currently provided?
- Can improvements be made within the next six months?
- Do the anticipated activities fit in with and support other changes and activities that are planned or under way at the facility?

Overcoming Barriers to Implementation

After identifying the reasons why the infection prevention standards were not achieved, you and the staff can develop a plan to overcome the four main barriers to achieving infection prevention standards that were presented in the previous section. It is preferable to involve facility staff—rather than district, regional, or national-level administrators—in this activity, because they are the ones who will be implementing the necessary changes and understand which practices may or may not be possible or feasible to achieve on a daily basis. If it is necessary to involve higher-level administrators, facility administrators can act as a liaison between facility staff and higher-level administrators.

Misunderstanding of the Risks Involved

To increase staff's knowledge of their risk of infections in providing health care services, all staff must understand that:

- Postprocedure infections may be difficult to identify, especially for many outpatient services.
- Infections do not always cause problems serious enough to make the client seek medical attention. Though the infections may prolong the healing process, eventually they may resolve on their own.
- Clients may seek treatment for postprocedure infections at another facility or at a pharmacy.
- Clients or staff may not find out they are infected with HIV or the hepatitis viruses until years after the infection occurs, when little connection to a past clinical procedure or workplace accident would be evident.
- There is little reliable data on the prevalence of viruses such as HIV or the hepatitis viruses for many countries throughout the world.
- It does not take many infected people to put the community at risk of infections. A few initial infections can lead to many other infections.

Lack of Knowledge of Appropriate Practices

Training is necessary so that all staff have a good understanding of:

- ***What* tasks they and their co-workers are responsible for.** Having job descriptions that clearly state all staff member's roles and responsibilities can help ensure that all staff know what they and their colleagues are supposed to do. All staff should be able to answer the question "Who is responsible for...?" For example, everyone should know who is responsible for making sure that

the decontamination solution is prepared properly, clients are adequately prepared before surgery, and waste is disposed of in a safe manner. As much as possible, one person should be responsible (and therefore accountable) for each infection prevention practice.

- ***How* to accomplish the tasks they are responsible for.** Once new practices have been decided upon, all appropriate staff at the facility should receive training in the new procedures. Depending on the type and size of the facility and the amount of new information to be learned, the training may be in the form of on-the-job training, formal in-service training lasting one day or longer (referred to in the curriculum as "on-site training"), or training at a location other than the facility (referred to in the curriculum as "off-site training"). "Refresher" training can reinforce already acquired knowledge, skills, and attitudes. On-the-job and in-service training may be the most cost-effective and logical ways to train the largest number of staff in infection prevention practices. Staff who participated in the infection prevention course should share what they learned with the appropriate staff through on-the-job training, presentations, or participation in in-service training. If, in the example on page C.3, the answer to the question "Why doesn't the cleaner make the solution?" had been "Because he doesn't know how," the way to address this problem would be to train the cleaner in how to prepare the solution. This might best be achieved through on-the-job training.

  As a supervisor, you will need to identify gaps in training and provide continual on-the-job training and support for those you supervise. (In order to best provide on-the-job training, supervisors should also attend the infection prevention training.) If turnover is high, more intensive training efforts will be required to ensure that all staff are trained in infection prevention practices.
- ***Why* they should perform the tasks in a particular way.** The importance of ensuring that all staff understand why they are asked to do something a certain way cannot be overstated. Staff are more likely to follow procedures when there is a good reason for performing them in a particular way and they know what it is. For example, if cleaning staff understand that people (including themselves) are at risk of infections when handling medical waste improperly, they are more likely to handle the waste properly.

In addition to training, all staff should have access to infection prevention reference materials, such as the Participant's Handbook of this curriculum, other books, or videotapes, to consult when necessary as reminders of the proper ways to perform the practices. It is also helpful to post information and reminders in appropriate places, such as hanging a wall chart with the parameters for steam sterilization next to the autoclave. Staff who have attended an infection prevention training course can also serve as a good resource by providing gentle reminders when they notice an inappropriate infection prevention practice. Special attention should be given to ancillary staff, whose duties may put them at great risk of infections and injury, or to staff who are low-literate/illiterate, who may be unable to easily use the Participant's Handbook or other materials, such as wall charts, for reference.

Resistance to Changing Old Habits

One way to address this problem is by having the key individuals described on page C.1 explain the importance of performing infection prevention practices in protecting both clients and staff.

This may help staff understand the need for and importance of addressing inappropriate practices and may thus lessen their resistance to change. These key individuals should explain to staff that:

- Because science and medicine are always evolving, infection prevention practices may also change.
- As new information is learned, improved practices may be developed and current practices may be shown to be ineffective or unnecessary.

Ensuring that all staff understand why a given practice is important may also help lower their resistance to change. As stated earlier, when staff understand why it is important to do something a particular way, they are much more likely to do it correctly. This is especially important when the new way takes longer or is more involved than the old way or when an entirely new practice is being introduced.

Inadequate Supplies, Equipment, and Space

It is critical to provide the necessary equipment and supplies so that appropriate infection prevention practices can be implemented over the long term. You and the staff should identify locally available resources and determine how to best use them in the face of limited funds. In the example on page C.3, one way to address the problem would be to ask the supply manager to order bleach from central supply.

Another problem often encountered in low-resource settings is the inappropriate use of supplies or available space. It is important to assess whether or not supplies are being used in ways that are most appropriate and cost-effective and, if not, determine how the money spent on them could be used more appropriately so that the necessary supplies and equipment can be made available. For example, while an expensive commercial disinfectant product may be appropriate for cleaning the floors in the facility, bleach—which is usually much less expensive—is equally effective when mixed with detergent. The money saved could then be used for other supplies that currently may not be affordable.

Likewise, it is necessary to assess how the current space is being used and determine if it is possible to reorganize activities or work spaces in a way that allows for more efficient use of space. (Figures 7-2 and 7-3, which appear on pages 7.7 and 7.8 of the curriculum, illustrate ways to arrange the work space so that contaminated instruments and other items are prevented from coming in contact with processed instruments and other items. These figures may be shared with the staff to help them decide what arrangements would work best at the facility, given the available space.)

Implementing the Necessary Changes

Once a plan to improve infection prevention practices has been designed, the plan can be implemented and the new or improved practices can be performed. Motivated staff and administrative support are two key components to successful implementation of appropriate infection prevention practices.

Although supplies and equipment are necessary for performing infection prevention practices, it is the people, more than the materials, that make the difference. Well-trained, interested, and motivated staff—even those with limited access to supplies and equipment—are more likely to perform appropriate infection prevention practices than are poorly trained, unmotivated staff who work at a facility that has all the latest and most expensive equipment and supplies.

Likewise, administrative support is critical to motivating staff and ensuring that the new practices continue to be performed. To show their commitment to and support for infection prevention, senior-level staff and supervisors can:

- Follow appropriate practices themselves
- Help ensure that adequate supplies are available
- Support others in their efforts to perform their duties in a safe manner by emphasizing the importance of good infection prevention practices, the critical role that each staff member plays, and the rationale for performing the various procedures as indicated
- Be willing to investigate and institute steps to correct lapses in appropriate practice
- Supervise staff in a manner that provides support, encouragement, and assistance, including recognizing staff for performing well or making improvements, encouraging staff to communicate with their supervisors, and encouraging supervisors to listen to the concerns and suggestions of their staff

Offering staff an opportunity to express their feelings about the changes in practice can provide information about what is working well and what will need more support or time or possibly another approach. Obtaining the client's perspective on the changes can also provide the positive feedback to sustain continued changed practices.

As you and the staff attempt to improve infection prevention practices, keep in mind the following:

- Change is a process, not an event that happens all at once.
- Do not try to change everything at once.
- Some people are likely to be resistant to change.
- Take small steps forward, and do not get discouraged if there are a few small steps backward (that happens sometimes).
- Help people work through and adjust to new practices.
- Do not give up—always remember that it is possible to improve infection prevention practices.
- Start with yourself—do not expect others to do things you do not do yourself.

Monitoring and Evaluating Infection Prevention Practices

Once infection prevention practices have been implemented, they must be monitored and evaluated regularly to determine whether staff are continuing to perform them properly and to measure the overall success of the staff's efforts to improve practices. Monitoring and evaluation may take several forms.

You can informally monitor the staff's practices on an ongoing basis by observing them as they perform their daily routines. Using a facilitative approach—one that emphasizes mentoring, joint problem-solving, and two-way communication between the supervisor and staff—is likely to yield the best results. Staff can also provide informal monitoring by giving reminders and encouragement to their co-workers.

If training was provided to improve the staff's practices, a follow-up evaluation should be scheduled to see how well the participants are using the new skills, identify performance gaps that may still exist, and plan for additional training or on-the-job reinforcement, if needed.

More formal approaches include an annual assessment by administration using the Infection Prevention Assessment Survey and a staff self-assessment. After conducting the initial assessment of infection prevention practices using the Infection Prevention Assessment Survey (which served as the basis for the plan to improve infection prevention practices), facility administrators should conduct the survey annually (preferably, in the final quarter of the year) to compare the results with those from the previous assessment. Applying the survey results should be a collaborative process, involving staff in discussing the findings and identifying problems or gaps.

Staff may conduct a self-assessment two to four times per year using COPE or other quality-improvement exercises. COPE (which stands for "client-oriented, provider-efficient services") involves all staff at the facility and provides an opportunity for staff to identify problems needing to be addressed, helps determine possible solutions, spreads responsibility for resolving problems to the staff most involved, helps create team spirit, and can break down departmental barriers. (For information on conducting COPE exercises, see the AVSC publication *COPE: Client-Oriented, Provider-Efficient Services: A Process and Tools for Quality Improvement in Family Planning and Other Reproductive Health Services.*)

While COPE helps staff identify ways to improve the quality of infection prevention practices, it does not objectively measure progress or compare current practices against the standards, as does the Infection Prevention Assessment Survey. Therefore, problems and gaps identified in the survey should be discussed and integrated into ongoing COPE action plans.

Supervisors at various levels can use the results of evaluation measures as follows:

- Facility supervisors can:
  - Identify problems and provide an opportunity for improvement
  - Determine training needs
  - Measure progress in improving quality from one year to the next
  - Involve staff in measuring progress and identifying the causes of problems
  - Report on infection prevention practices at the facility
- District or regional supervisors can:
  - Assist facility supervisors in planning and prioritizing technical assistance and training
  - Measure progress at the facility level and, to some degree, the support received and needed from the supervisory system
  - Identify successes, gaps, and problems that exist systemwide by analyzing results from all of

the facilities in one district or region and develop an implementation plan to address the problems or refer them for national-level consideration
  - Discuss and coordinate with supervisors at the district or regional level
  - Report on infection prevention practices in the district or region
- National-level supervisors can:
  - Assist district or regional supervisors in identifying systemwide successes, gaps, and problems
  - Measure progress at the facility, district, regional, and national levels
  - Respond to specific needs identified on a priority basis
  - Report on infection prevention practices in the nation
  - Report on progress in improving service quality

When using the information gathered from the Infection Prevention Assessment Survey, it is important to remember that the survey provides only a snapshot of what happened on a given day in those parts of the facility in which the survey was conducted, and it may not necessarily reflect practices or trends throughout the entire facility. The importance of the survey is to get a sense of whether or not practices have changed for the better, and caution should be taken not to generalize the results.

To continue involving the staff in efforts to improve infection prevention, it may be useful to share with them the results of the previous year's and current year's assessments so they can see what changed—that is, learn which standards that had not been achieved the year before were achieved this year, and vice versa. Once all of the practices have been reviewed, the staff can discuss why they think certain practices improved or worsened and problem-solve to find ways to change practices identified as needing improvement.

Infection Prevention Assessment Survey

For each of the standards listed below, place a check in the "Yes" or "No" box, as appropriate, to indicate whether or not the standard was achieved. If a particular standard is not applicable to the facility at which the survey is being conducted, enter N/A ("not applicable") in the "Achieved" column.

Use the "Comments" column to note details about why a standard was not achieved or other information that may be useful in identifying or resolving inappropriate practices.

Refer to the User's Guide to the Infection Prevention Assessment Survey, which appears on page C.17, for a detailed explanation of each standard.

STANDARD	ACHIEVED?		COMMENTS
	YES	NO	
Handwashing			
1. Hands should be washed when indicated.			
2. Hands should be washed with soap and running water.			
3. Hands should be dried with a clean towel or allowed to air-dry.			
4. Plans should be made and supplies should be available for times when running water from a tap is not available.			
Use of Gloves			
5. Gloves should be worn whenever contact with blood or other body fluids is anticipated.			
6. Utility gloves should be worn when handling contaminated instruments and other items, handling medical or hazardous chemical waste and linen, performing housekeeping activities, and cleaning contaminated surfaces.			

continued

Infection Prevention Assessment Survey continued

STANDARD	ACHIEVED?		COMMENTS
	YES	NO	
Antiseptics and Disinfectants			
7. Antiseptics should be used only on the skin and mucous membranes.			
8. Disinfectants should be used only for processing instruments and other items for reuse and for housekeeping activities.			
9. Antiseptics and disinfectants should be handled in a manner that reduces the risk of contamination.			
Aseptic Technique			
10. A surgical handscrub should be performed before all surgical procedures.			
11. Sterile or high-level disinfected surgical gloves should be put on in ways that do not contaminate the gloves and removed in ways that do not expose the wearer or others to blood or other body fluids.			
12. Shaving the surgical site should not be performed routinely and should be performed only when absolutely necessary.			
13. The surgical/procedure site should be properly prepared using an appropriate antiseptic solution.			
14. A sterile field should be established and maintained during all surgical/clinical procedures.			
15. Traffic and activities should be controlled and appropriate attire should be worn in surgical/procedure areas.			

continued

Infection Prevention Assessment Survey continued

STANDARD	ACHIEVED? YES	ACHIEVED? NO	COMMENTS
Use and Disposal of Needles and Other Sharps			
16. Hypodermic needles should not be routinely recapped and should never be bent or broken before disposal. Needles should not be removed from syringes before disposal.			
17. Sharps should be disposed of in puncture-resistant containers.			
18. Sharps containers should be available wherever sharps are used. Containers should be disposed of when they are three-quarters full.			
19. Unprotected sharp items should not be passed directly from one person to another during surgical/clinical procedures.			
20. A new or properly processed needle and syringe should be used every time an injection is given or medication is withdrawn from a multidose vial.			
Processing Instruments and Other Items			
21. "Clean" and "dirty" activities should be performed in separate areas. When only one room is available for processing instruments and other items, it should be arranged so that activities and objects flow in an organized fashion from receiving used items to storing sterilized or high-level disinfected items.			
22. Instruments and other items should be stored dry and should never be left soaking indefinitely in solutions.			
23. Soiled linen should be handled wearing utility gloves in a way that prevents exposure of the skin and mucous membranes to potentially contaminated material.			

continued

Infection Prevention Assessment Survey continued

STANDARD	ACHIEVED?		COMMENTS
	YES	NO	
Decontamination			
24. Instruments and other items should be decontaminated by placing them in a 0.5% chlorine solution immediately after use and letting them soak for 10 minutes.			
Cleaning			
25. Instruments and other items should be thoroughly scrubbed using a soft brush, detergent, and water and rinsed thoroughly with clean water before sterilization or HLD.			
26. If gloves are processed, they should be checked carefully for holes or tears after cleaning.			
Sterilization			
27. For steam sterilization, instruments and other items should be packed in a way that allows steam to reach all surfaces.			
28. Appropriate parameters (time, temperature, pressure) for steam sterilization should be followed.			
29. Appropriate parameters (temperature, time) for dry-heat sterilization should be followed.			
30. Sterilization equipment should be properly monitored and maintained.			
31. A properly prepared chemical solution, such as a product containing glutaraldehyde, should be used for chemical sterilization.			
32. For chemical sterilization, instruments and other items should be dry, opened or disassembled, and completely submerged in the solution.			

continued

Infection Prevention Assessment Survey continued

STANDARD	ACHIEVED? YES	ACHIEVED? NO	COMMENTS
Sterilization continued			
33. Instruments and other items should soak in the chemical solution for the time listed in the manufacturer's instructions and then be rinsed with sterile water.			
34. After any method of sterilization, instruments and other items should be stored in a way that limits the risk of contamination.			
High-Level Disinfection (HLD)			
35. For HLD by boiling, instruments and other items should be opened or disassembled, completely submerged in water, and boiled for 20 minutes from the time when the water reaches a rolling boil.			
36. An appropriate and properly prepared chemical solution should be used for chemical HLD.			
37. For chemical HLD, instruments and other items should be dry, opened or disassembled, and completely submerged in the solution.			
38. Instruments and other items should soak in the chemical solution for 20 minutes and then be rinsed with boiled water.			
39. If gloves or MVA cannulae are steamed, they should be placed in the steamer in a way that allows steam to contact all surfaces and should steam for 20 minutes.			
40. After any method of HLD, instruments and other items should be stored in a way that limits the risk of contamination.			

continued

Infection Prevention Assessment Survey continued

STANDARD	ACHIEVED? YES	ACHIEVED? NO	COMMENTS
Housekeeping			
41. Non-client-care areas should be kept free of dust, dirt, and organic debris.			
42. Client-care areas should be wiped each morning and cleaned with a disinfectant cleaning solution between clients and at the end of each clinic session or day.			
43. Once a week, the ceilings in operating theaters and procedure rooms should be cleaned with a mop dampened with a disinfectant cleaning solution.			
44. Housekeeping equipment (mops, buckets, and cloths) should be decontaminated, cleaned in detergent and water, rinsed in clean water, and allowed to dry before reuse.			
45. Fumigation and ultraviolet (UV) light should not be used to disinfect operating theaters or other areas of the facility.			
Waste Disposal			
46. General and medical waste should be separated into appropriate containers at the point at which it is generated.			
47. Solid medical waste should be either burned or buried in a pit.			
48. The community should be protected from possible exposure to medical waste.			
49. Liquid medical waste and most hazardous chemical waste should be poured down a drain or buried in a pit.			
50. Containers used for medical waste should be cleaned with a disinfectant cleaning solution and rinsed with water daily, or more often, if visibly contaminated.			

User's Guide to the Infection Prevention Assessment Survey

The Infection Prevention Assessment Survey provides the recognized "standards," or ideals, for the various infection prevention practices described in this training curriculum. By using this survey, you can compare the infection prevention practices at a health care facility with the standards to determine whether or not each standard is being met. This User's Guide to the Infection Prevention Assessment Survey provides a brief explanation of and rationale for each standard and provides more detailed information about how to get the most out of using the survey.

Note: In order to assess whether or not a standard is being achieved, it is best to observe the practices as they are being conducted. However, if direct observation is not possible, routine performance of various practices may be determined by talking with service providers and ancillary staff and touring the facility.

Handwashing

Handwashing significantly reduces the number of potentially infectious microorganisms on the hands of service providers and reduces client sickness (morbidity) and death (mortality) caused by infections spread in the health care facility.

1. *Hands should be washed when indicated.*

Hands should be washed in all of the following situations:

- Immediately after arriving at work and before leaving work at the end of the day
- Before and after examining each client
- After touching any instrument or object that might be contaminated with blood or other body fluids, or after touching mucous membranes (e.g., eyes, nose, mouth)
- Before putting on gloves for clinical procedures
- After removing gloves
- After using the toilet or latrine

Check **"YES"** if hands are washed during these situations.

2. *Hands should be washed with soap and running water.*

Water and mechanical friction (scrubbing or rubbing) alone are not adequate for cleaning hands. Soap must be used in conjunction with water and rubbing to remove transient organisms and soil. Running water does not have to come from a tap mounted on a sink; running water can come from a bucket with a tap or a pitcher. If running water is not available, an alcohol handrub may be substituted for handwashing with soap and water.

Check **"YES"** if hands are washed with soap and running water. If running water is not available and an alcohol handrub is used, check **"NO"** and record this in the "Comments" column.

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3. *Hands should be dried with a clean towel or allowed to air-dry.*

If towels are used, they should be either disposable (such as paper towels) or for personal use only. More than one person should not use the same towel, because towels quickly become contaminated with microorganisms from the users' hands and can easily be passed from one user to another.

Check **"YES"** if hands are dried with a clean towel or allowed to air-dry.

4. *Plans should be made and supplies should be available for times when running water from a tap is not available.*

Even if water from a tap is normally available at a facility, there may be times when water from a tap is not available. Therefore, at facilities in which water from a tap is sometimes unavailable, plans should be in place for these times and all of the necessary supplies should be available to obtain water from an alternate source.

Check **"YES"** if plans have been made and supplies are available for times when water from a tap is not available.

Use of Gloves

Gloves provide a barrier against potentially infectious microorganisms in blood, other body fluids, and medical waste. They also protect against hazardous chemical waste. There are three types of gloves used in health care settings: surgical, single-use examination, and utility gloves.

5. *Gloves should be worn whenever contact with blood or other body fluids is anticipated.*

Sterile or high-level disinfected surgical gloves are preferred for procedures in which there will be contact with the bloodstream or tissues under the skin (e.g., surgical procedures, insertion of Norplant implants, pelvic examinations of women in labor). Single-use examination gloves are indicated for all procedures in which there will be contact with intact mucous membranes (e.g., IUD insertion, manual vacuum aspiration, pelvic examination) or for situations in which the provider may be exposed to a client's blood or other body fluids (e.g., drawing blood, working in the laboratory). (If single-use examination gloves are not available, sterile or high-level disinfected surgical gloves should be used.)

Check **"YES"** if sterile or high-level disinfected surgical gloves and examination gloves are used as indicated.

6. ***Utility gloves should be worn when handling contaminated instruments and other items, handling medical or hazardous chemical waste and linen, performing housekeeping activities, and cleaning contaminated surfaces.***

Staff who may not have direct client contact are at risk of infections if their work exposes them to potentially contaminated instruments or other items or blood or other body fluids. Wearing utility gloves when handling any potentially contaminated materials and when cleaning instruments or other items reduces the risk of infections.

Check **"YES"** if staff wear utility gloves as indicated.

Antiseptics and Disinfectants

Antiseptics are chemical agents that are used on the skin and mucous membranes to remove or kill microorganisms. Examples include alcohol, chlorhexidine gluconate (e.g., Hibitane, Savlon), hexachlorophene (e.g, pHisoHex), iodine, iodophors (e.g., Betadine), and *para*-chloro-*meta*-xylenol (PCMX, chloroxylenol; e.g., Dettol).

Disinfectants are chemical agents that are used on inanimate objects, such as instruments and surfaces, to kill microorganisms. Examples include chlorine and glutaraldehyde.

7. ***Antiseptics should be used only on the skin and mucous membranes.***

Antiseptics are indicated for:

- Surgical handscrub
- Skin, cervical, and vaginal preparation before a clinical procedure
- Handwashing in high-risk situations, such as before invasive procedures or contact with clients at high risk of infections

Antiseptics should never be used on instruments or other items, surfaces, or reusable gloves. In addition, instruments and other items should never be left soaking in an antiseptic solution.

Check **"YES"** if antiseptics are used only on the skin and mucous membranes as indicated. *Note:* Record the name(s) of the antiseptic(s) used in the "Comments" column.

8. ***Disinfectants should be used only for processing instruments and other items for reuse and for housekeeping activities.***

Disinfectants are indicated for:

- Processing instruments and other items (high-level disinfectants)
- Cleaning surfaces (low-level disinfectants)

Disinfectants are not to be used on the skin or mucous membranes. In addition, instruments and other items should not be left soaking indefinitely or stored in disinfectant solutions.

Check **"YES"** if disinfectants are used on inanimate objects as indicated. *Note:* Record the name(s) of the disinfectant(s) used in the "Comments" column.

9. Antiseptics and disinfectants should be handled in a manner that reduces the risk of contamination.

Antiseptic and disinfectant solutions can easily become contaminated; microorganisms can survive and grow in them. Care must be taken to avoid contamination of antiseptics and disinfectants by following these guidelines:

- Solutions should be poured into smaller containers for use during service delivery.
- The amount of antiseptic needed for one client should be poured into a small bowl or gallipot before starting the procedure, and any remaining solution should be discarded at the end of the procedure.
- Solutions should be poured without touching the rim or the solution itself with hands, cotton, or gauze.
- Gauze, cotton wool, and cotton balls should not be stored in antiseptic solutions, since gauze and cotton provide a good medium for microorganisms to grow.
- Containers should be stored in a cool, dark area.

Check **"YES"** if antiseptics and disinfectants are handled as indicated.

Aseptic Technique

Aseptic technique refers to practices that help reduce the risk of postprocedure infections in clients by reducing the likelihood that, during clinical procedures, microorganisms will enter areas of the body where they can cause disease.

10. A surgical handscrub should be performed before all surgical procedures.

A surgical handscrub should be performed to prevent the growth of microorganisms inside surgical gloves during the procedure and reduce the client's risk of infections if gloves develop holes, tears, or nicks during the procedure.

A surgical handscrub should be performed as follows:

- Remove all jewelry.
- Clean fingernails with a stick or brush.
- Wash hands with an antiseptic for 3–5 minutes. Beginning at the fingertips, wash between the fingers and move toward the elbow.
- Rinse each arm separately, fingertips first, holding hands above the level of the elbows.

- Dry hands with a sterile towel or allow to air-dry.
- Hold hands above the level of the waist at all times.

If an antiseptic is not available or staff are allergic to the available antiseptic, staff should scrub as described above with plain soap and water and then apply 3–5 mL of alcohol or an alcohol handrub solution and rub hands together until they are dry. Ideally, surgical handscrub should be performed between each procedure. However, to prevent skin irritation from too-frequent handscrubbing in high-volume settings, the surgical team can use 3–5 mL of an alcohol handrub solution between clients, rubbing the hands together until they are dry. Staff should scrub every hour or after every four clients (whichever comes first).

Check **"YES"** if a surgical handscrub is performed as indicated before all surgical procedures.

11. Sterile or high-level disinfected surgical gloves should be put on in ways that do not contaminate the gloves and removed in ways that do not expose the wearer or others to blood or other body fluids.

Sterile or high-level disinfected surgical gloves should not be contaminated while they are being putting on. When removing contaminated gloves, the wearer should not touch the outside of the glove, which is contaminated, and should use caution so as to avoid exposing himself or herself to blood or other body fluids.

Check **"YES"** if staff follow the procedures for putting on and removing surgical gloves.

12. Shaving the surgical site should not be performed routinely and should be performed only when absolutely necessary.

Shaving can create nicks and breaks in the skin, which can lead to increased risk of postprocedure infections. Research has shown a reduction in the number of postoperative surgical-site infections when shaving is not performed. Clipping hair with scissors is acceptable if hair interferes with the procedure. Shaving the surgical site should be performed only when absolutely necessary.

Check **"YES"** if shaving is not performed routinely, hair is clipped with scissors if it interferes with the procedure, and shaving is performed only when absolutely necessary.

13. The surgical/procedure site should be properly prepared using an appropriate antiseptic solution.

The surgical/procedure site should be cleaned with soap and water and then cleaned with an antiseptic solution just before the procedure. If an iodophor (e.g., Betadine) is used, it should

be left on for 2 minutes before wiping off the excess solution. The site should be wiped using a circular motion, beginning in the center of the site and moving out.

Check **"YES"** if the surgical site is prepared as indicated.

14. A sterile field should be established and maintained during all surgical/clinical procedures.

A sterile field is maintained by:

- Placing only sterile items for use within the sterile field
- Opening, dispensing, or transferring sterile items without contaminating them
- Considering items located below the level of the draped client to be unsterile
- Not allowing sterile personnel to reach across unsterile areas or to touch unsterile items
- Recognizing and maintaining the service provider's sterile area (when gowned, this extends from the chest to the level of the sterile field; sleeves are sterile from 5 cm above the elbow to the cuff)
- Recognizing that the edges of a package containing a sterile item are considered unsterile
- Recognizing that a sterile barrier that has been penetrated (wet, cut, or torn) is considered contaminated
- Being conscious of where your body is at all times and moving within or around the sterile field in a way that maintains sterility
- Not placing sterile items near open windows or doors

Once the sterile field is established, it should be maintained until the procedure is finished. If a "break" (contamination) occurs, it must be corrected before the procedure continues.

Check **"YES"** if the sterile field is maintained as indicated.

15. Traffic and activities should be controlled and appropriate attire should be worn in surgical/procedure areas.

Minimizing traffic in surgical/procedure areas reduces the number of microorganisms and amount of dirt and dust in the area. Only necessary staff should be allowed in these areas during procedures. Changing into attire designated for use in the surgical area further reduces the introduction of microorganisms into the area. Proper surgical attire includes caps, masks, gowns, protective eyewear, and sturdy footwear. Staff (including cleaning staff) should wear caps, masks, and sturdy footwear at all times in the surgical area. Masks should cover the nose and mouth; caps should cover all hair; footwear should completely cover the foot. Street shoes should be clean, or staff should change to shoes or boots that are worn only in the surgical area.

Check **"YES"** if these conditions are met.

Use and Disposal of Needles and Other Sharps

Injury from hypodermic needlesticks or other sharp objects is the number-one cause of occupational exposure to bloodborne pathogens. Therefore, all sharps must be handled and disposed of properly.

16. Hypodermic needles should not be routinely recapped and should never be bent or broken before disposal. Needles should not be removed from syringes before disposal.

Needles and other sharps should be handled as little as possible after use. If recapping is absolutely necessary, the one-hand technique should be used, as follows:

- Place the cap on a flat surface, then remove your hand.
- With one hand, hold the syringe and use the needle to "scoop up" the cap.
- When the cap covers the needle completely, use the other hand to secure the cap on the needle hub, being careful to handle the cap at the bottom only (near the hub).

Check **"YES"** if hypodermic needles are not routinely recapped and are never bent or broken before disposal. Also check **"YES"** if the one-hand technique is used when recapping is necessary.

17. Sharps should be disposed of in puncture-resistant containers.

A puncture-resistant sharps container can be made out of a heavy cardboard box, an empty plastic jug, or a metal container.

Check **"YES"** if sharps are disposed of in puncture-resistant containers.

18. Sharps containers should be available wherever sharps are used. Containers should be disposed of when they are three-quarters full.

Sharps containers should be available in injection rooms, treatment rooms, operating theaters, labor and delivery rooms, laboratories, and any other places where sharps are used. They should never be filled to capacity because sharps may penetrate the container wall and cause injury.

Check **"YES"** if sharps containers are available in all the areas when sharps are used and are disposed of when they are three-quarters full.

19. ***Unprotected sharp items should not be passed directly from one person to another during surgical/clinical procedures.***

During surgical/clinical procedures, sharps should be placed in and picked up from a kidney basin or a designated "safe zone" to minimize the risk of injury to clients and providers.

Check **"YES"** if sharps are not passed directly from one person to another during surgical/clinical procedures.

20. ***A new or properly processed needle and syringe should be used every time an injection is given or medication is withdrawn from a multidose vial.***

A new or properly processed needle and syringe should be used to prevent contaminating the solution in the vial. Needles should never be left inserted in the vial cap, because the hole in the needle can allow contaminates to get into the solution.

Check **"YES"** if a new or properly processed needle and syringe are used as indicated and if needles are not left inserted in multidose vials.

Processing Instruments and Other Items

Processing reusable instruments and other items used in surgical/clinical procedures involves four steps:

1. Decontamination
2. Cleaning
3. Sterilization or high-level disinfection (HLD)
4. Storage

The order of the steps, as well as the area in which they are performed, are important to reduce the number of microorganisms on the instruments and other items and minimize the risk of infections.

21. ***"Clean" and "dirty" activities should be performed in separate areas. When only one room is available for processing instruments and other items, it should be arranged so that activities and objects flow in an organized fashion from receiving used items to storing sterilized or high-level disinfected items.***

"Clean" activities—such as sterilization, HLD, and storage—should be conducted in separate areas from "dirty" activities—such as decontamination and cleaning—in order to reduce the risk of contaminating sterile or high-level disinfected instruments and other items.

Check **"YES"** if clean and dirty activities are performed in separate areas.

22. ***Instruments and other items should be stored dry and should never be left soaking indefinitely in solutions.***

Instruments and other items should always be stored dry, since bacteria can grow in solutions, even if a disinfectant is added. Instruments and other items should never be left soaking indefinitely in any type of solution; if they are sterilized or high-level disinfected with chemicals, they should soak only for the amount of time specified and then be removed from the disinfectant solution, rinsed, and stored dry.

Check **"YES"** if all instruments and other items are stored dry and are not left soaking indefinitely in solutions.

23. ***Soiled linen should be handled wearing utility gloves in a way that prevents exposure of the skin and mucous membranes to potentially contaminated material.***

When handling soiled linen, it should be folded so that the contaminated area is on the inside. All laundry, whether or not it is visibly contaminated, should be handled wearing utility gloves and clothing that covers the arms, legs, and feet. Protective eyewear is also recommended.

Check **"YES"** if soiled linen is handled as indicated.

Decontamination

Decontamination kills viruses (such as hepatitis B, other hepatitis viruses, and HIV) and many other microorganisms, making instruments and other items safer to handle by staff who clean them.

24. ***Instruments and other items should be decontaminated by placing them in a 0.5% chlorine solution immediately after use and letting them soak for 10 minutes.***

Immediately after a procedure is over, instruments and other items should be placed in a 0.5% chlorine solution and left soaking for 10 minutes. The container should be in close proximity to the surgical/clinical area. The chlorine can be in powder or liquid form.

Check **"YES"** if instruments and other items are decontaminated immediately after use as indicated. *Note:* Record the chlorine product used and the percent of "active" chlorine in the "Comments" column.

Cleaning

Cleaning is performed before instruments and other items are sterilized or high-level disinfected to remove blood, other body fluids, organic material, tissue, and dirt and to ensure that sterilization and HLD can be achieved.

25. ***Instruments and other items should be thoroughly scrubbed using a soft brush, detergent, and water and rinsed thoroughly with clean water before sterilization or HLD.***

Detergent is necessary to remove protein, oils, or grease. Hand soap should not be used to clean instruments and other items, because the fatty acid contained in the soap will react with the minerals of hard water, leaving a residue or scum that is difficult to remove. Instruments with multiple parts should be disassembled, and the grooves, teeth, and joints of the instruments and other items should be brushed.

Check **"YES"** if cleaning is performed as indicated.

26. ***If gloves are processed, they should be checked carefully for holes or tears after cleaning.***

Gloves can tear and be punctured easily; therefore, they should be checked for holes after washing. To check for holes, inflate the glove with air and hold it under water; if air bubbles appear, the glove has a hole and should be disposed of. Alternatively, fill the glove with water; if any leaks out, the glove has a hole and should be disposed of.

Check **"YES"** if gloves are checked for holes after cleaning.

Sterilization

Sterilization eliminates all microorganisms (bacteria, viruses, fungi, and parasites), including bacterial endospores. It is the recommended method for processing instruments and other items that will come in contact with the bloodstream or tissues under the skin. Instruments and other items can be sterilized by steam under pressure (autoclaving or moist heat), dry heat, or soaking in chemicals.

27. ***For steam sterilization, instruments and other items should be packed in a way that allows steam to reach all surfaces.***

For steam sterilization to be effective, steam must have direct contact with all surfaces of the instruments and other items, as follows:

- Before sterilization, all jointed instruments and other items should be opened and those with sliding or multiple parts should be disassembled.
- All instruments and other items that are wrapped must be loaded in the autoclave in a way that allows steam to contact all surfaces. All packs, drums, and unwrapped items should be arranged in the autoclave in a way that allows steam to circulate freely. Gloves should not be wrapped into tight balls.

Check **"YES"** if instruments and other items are properly prepared and loaded in the autoclave as indicated.

28. *Appropriate parameters (time, temperature, pressure) for steam sterilization should be followed.*

Specific time, temperature, and pressure requirements are necessary for steam sterilization to be effective. While parameters may vary depending on the autoclave, the following rules generally apply (the manufacturer's instructions should be followed whenever possible):

- Time = 30 minutes if instruments and other items are wrapped, 20 minutes if they are unwrapped
- Temperature = 121°C (250°F)
- Pressure = 106 kPa (15 lb/in^2)

Timing should not begin until the temperature and pressure requirements are met.

Check **"YES"** if the appropriate parameters for steam sterilization are followed as indicated.

29. *Appropriate parameters (temperature, time) for dry-heat sterilization should be followed.*

Specific time and temperature requirements are necessary for dry-heat sterilization to be effective, as follows:

Temperature	Time
170°C (340°F)	1 hour
160°C (320°F)	2 hours
150°C (300°F)	2½ hours
140°C (285°F)	3 hours

Timing should not begin until the temperature requirement has been reached.

Check **"YES"** if the appropriate parameters for dry-heat sterilization are followed as indicated.

30. *Sterilization equipment should be properly monitored and maintained.*

Autoclaves (steam sterilizers) and dry-heat ovens should be properly maintained to ensure that sterilization can be achieved. Routine maintenance should become standard procedure, and someone should be assigned to be responsible for this task. If repairs are necessary, they should be made before the equipment is used again. Biological monitoring should be performed weekly (or monthly, if testing weekly is not possible) to verify that sterilization is effective.

Check **"YES"** if autoclaves and dry-heat ovens are properly maintained and biological monitoring is performed regularly as indicated.

31. A properly prepared chemical solution, such as a product containing glutaraldehyde, should be used for chemical sterilization.

The products that are most likely to be available for chemical sterilization are those containing glutaraldehyde (e.g., Cidex). Formaldehyde should not be used. Most glutaraldehyde solutions are effective for anywhere from 14–30 days (the manufacturer's instructions should always be followed), and the container should be labeled with the date the solution was prepared and the date it expires. The solution should be discarded if it becomes cloudy.

Check **"YES"** if an appropriate chemical solution is prepared and used as indicated.

32. For chemical sterilization, instruments and other items should be dry, opened or disassembled, and completely submerged in the solution.

Instruments and other items should be dry before chemical sterilization, because water from wet instruments and other items dilutes the chemical solution and reduces its effectiveness. For chemical sterilization to be effective, the chemicals must have contact with all surfaces. Therefore, all instruments and other items, ports, and valves must be opened, disassembled, and completely submerged in the solution.

Check **"YES"** if instruments and other items to be chemically sterilized are dry, opened or disassembled, and completely submerged in the solution as indicated.

33. Instruments and other items should soak in the chemical solution for the time listed in the manufacturer's instructions and then be rinsed with sterile water.

In general, instruments and other items should soak in a glutaraldehyde solution for 10 hours (the manufacturer's recommendation should be followed, especially if other products are used). No instruments or other items should be added to or removed from the solution once timing has begun. Instruments and other items should be thoroughly rinsed with sterile water. (Boiled water is not sterile.)

Check **"YES"** if instruments and other items are soaked in the chemical solution and rinsed with sterile water as indicated.

34. After any method of sterilization, instruments and other items should be stored in a way that limits the risk of contamination.

Regardless of the sterilization process, sterile instruments and other items should be stored dry. Wrapped instruments and other items should be stored in a closed cabinet, and unwrapped instruments and other items should be stored in a covered, sterile container. All

sterile instruments and other items should be stored in an environment that is free of dust, dirt, and insects. Properly stored wrapped instruments and other items are considered sterile as long as they remain intact and dry; properly stored unwrapped instruments and other items may be stored for up to one week.

Check **"YES"** if sterile instruments and other items are stored properly as indicated.

High-Level Disinfection (HLD)

High-level disinfection eliminates all microorganisms (including bacteria, viruses, fungi, and parasites), but does not reliably kill all bacterial endospores. HLD is suitable for instruments and other items that will come in contact with broken skin or intact mucous membranes. It is the only acceptable alternative to sterilization when sterilization is not possible. Instruments and other items can be high-level disinfected by boiling, soaking in chemicals, or steaming.

35. For HLD by boiling, instruments and other items should be opened or disassembled, completely submerged in the water, and boiled for 20 minutes from the time when the water comes to a rolling boil.

Water must touch all surfaces for HLD by boiling to be achieved. Therefore, all instruments and other items must be disassembled, opened, and completely submerged in the water. (The exception to this is cannulae used in manual vacuum aspiration, or MVA, which do not need to be submerged in the water if the pot/boiler is kept covered.) Timing should not begin until the water is at a rolling boil. No additional water, instruments, or other items should be added or removed once timing has begun. Instruments and other items are ready to be removed after 20 minutes and should be removed while the water is still boiling, using sterile or high-level disinfected pickups (lifters, cheatle forceps).

Check **"YES"** if instruments and other items are HLD by boiling as indicated.

36. An appropriate and properly prepared chemical solution should be used for chemical HLD.

Solutions must be properly prepared. The products most likely to be available for chemical HLD are chlorine or those containing glutaraldehyde (e.g., Cidex). Formaldehyde should not be used. Most glutaraldehyde solutions are effective for anywhere from 14–30 days (the manufacturer's instructions should always be followed), and the container should be labeled with the date the solution was prepared and the date it expires. The solution should be discarded if it becomes cloudy. A new chlorine solution should be prepared each day.

Check **"YES"** if a chemical solution is properly prepared and used for chemical HLD as indicated. *Note:* Record the type(s) of solution(s) used in the "Comments" column.

37. For chemical HLD, instruments and other items should be dry, opened or disassembled, and completely submerged in the solution.

Instruments and other items should be dry before chemical HLD, because water from wet instruments and other items dilutes the chemical solution and reduces its effectiveness. For chemical HLD to be effective, the chemicals must have contact with all surfaces. Therefore, all instruments and other items, ports, and valves must be opened, disassembled, and completely submerged in the solution.

Check **"YES"** if instruments and other items to be chemically high-level disinfected are dry, opened or disassembled, and completely submerged in the solution as indicated.

38. Instruments and other items should soak in the chemical solution for 20 minutes and then be rinsed with boiled water.

Instruments and other items should soak in a chemical solution for 20 minutes. No instruments or other items should be added to or removed from the solution once timing has begun. Instruments and other items should be thoroughly rinsed with boiled water.

Check **"YES"** if instruments and other items are soaked in the chemical solution and rinsed with boiled water as indicated.

39. If gloves or MVA cannulae are steamed, they should be placed in the steamer in a way that allows steam to contact all surfaces and should steam for 20 minutes.

For HLD by steaming to be effective, steam must have direct contact with all surfaces of the gloves or MVA cannulae. Paired, cuffed gloves or MVA cannulae should be placed in a steamer tray, loosely layered in a criss-cross design. Gloves should never be rolled into balls or packed tightly in the tray(s).

Check **"YES"** if gloves and MVA cannulae are HLD by steaming as indicated.

40. After any method of HLD, instruments and other items should be stored in a way that limits the risk of contamination.

Regardless of the HLD process, high-level disinfected instruments and other items should be stored dry. They should be placed in a covered, dry, high-level disinfected container in an environment that is free of dust, dirt, and insects and may be stored for up to one week.

Check **"YES"** if instruments and other items that have been high-level disinfected are stored properly as indicated.

Housekeeping

Housekeeping is the general cleaning and maintenance of cleanliness in a health care facility. In addition to cleanliness, it reduces the number of microorganisms in the facility (thus reducing clients' and staff members' risk of infections) and provides an appealing work and service-delivery space.

41. Non-client-care areas should be kept free of dust, dirt, and organic debris.

Non-client-care areas should have an orderly appearance, as follows:

- The areas should be cleaned with a cloth or mop dampened with detergent and water once a week or when visibly dirty. Cloths and mops should be damp so the dirt and dust particles are picked up, not spread around.
- Waste containers should be emptied daily.
- Toilets, latrines, and sluice rooms should be cleaned daily with a disinfectant cleaning solution.

Check **"YES"** if non-client-care areas and toilets, latrines, and sluice rooms are cleaned and waste containers are emptied as indicated.

42. Client-care areas should be wiped each morning and cleaned with a disinfectant cleaning solution between clients and at the end of each clinic session or day.

Client-care areas require special attention to cleaning, as follows:

- Surfaces should be wiped and mopped with water at the beginning of each day, because dust settles overnight. Cloths and mops should be damp so that the dirt and dust particles are picked up, not spread around.
- Between clients, all potentially contaminated surfaces should be wiped with a cloth dampened with a disinfectant cleaning solution.
- At the end of each clinic session or day, all surfaces and floors should be wiped or mopped with a cloth or mop soaked in a disinfectant cleaning solution.
- Spills of any type should be cleaned immediately with a 0.5% chlorine solution.

Check **"YES"** if client-care areas are cleaned as indicated.

43. Once a week, the ceilings in operating theaters and procedure rooms should be cleaned with a mop dampened with a disinfectant cleaning solution.

Check **"YES"** if the ceilings in operating theaters and procedure rooms are cleaned each week as indicated.

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44. Housekeeping equipment (mops, buckets, and cloths) should be decontaminated, cleaned in detergent and water, rinsed in clean water, and allowed to dry before reuse.

Items used for housekeeping need to be cleaned themselves to reduce the chances of spreading infections. Contaminated cleaning equipment spreads, rather than reduces, microorganisms in the environment.

Check **"YES"** if housekeeping equipment is decontaminated, cleaned, rinsed, and dried before reuse as indicated.

45. Fumigation and ultraviolet (UV) light should not be used to disinfect operating theaters or other areas of the facility.

Fumigation and use of ultraviolet (UV) light do not reduce the risk of infections in health care facilities. In addition, formaldehyde and other agents that are commonly used for fumigation are harmful to staff. These approaches should not be used to disinfect any room in the facility.

Check **"YES"** if fumigation or UV light is not used to disinfect in the facility.

Waste Disposal

There are three kinds of waste generated at a health care facility:

- *General waste:* nonhazardous waste that poses no risk of injury or infections, including uncontaminated paper, boxes, packaging materials, bottles, plastic containers, and food-related trash.
- *Medical waste:* material generated in the diagnosis, treatment, and/or immunization of clients, including:
  - Blood, blood products, and other body fluids, as well as materials containing fresh or dried blood or body fluids (e.g., bandages, surgical sponges)
  - Organic waste, such as human tissue, body parts, placentas, and products of conception
  - Sharps (used or unused), including hypodermic and suture needles, scalpel blades, blood tubes, pipettes, and other glass items that have been in contact with potentially infectious materials (e.g., glass slides, coverslips)
- *Hazardous chemical waste:* chemical waste that is potentially toxic or poisonous, including cleaning products, some disinfectants, cytotoxic drugs, and radioactive compounds.

Proper handling and disposal of waste minimizes the spread of infections and reduces the risk of accidental injury to staff, clients, visitors, and the community. All staff should wear utility gloves and shoes when handling medical and hazardous chemical waste.

46. *General and medical waste should be separated into appropriate containers at the point at which it is generated.*

Separating waste can greatly reduce the amount of waste requiring special handling. Waste should be separated at the point at which it is generated by placing it into bins marked "general waste" and "medical waste." These containers should be emptied frequently. Waste should never be separated at the disposal or transfer site because it needlessly exposes the staff to infectious agents.

Check **"YES"** if waste is separated at the point at which it is generated as indicated.

47. *Solid medical waste should be either burned or buried in a pit.*

Properly burning or burying medical waste protects the community from accidental exposure to infectious agents. Burning in an incinerator or oil drum is recommended. Open burning is not recommended, because it causes scattering of waste, is dangerous, and is unattractive.

If medical waste is burned in an incinerator, the following criteria should be met:

- The incinerator is located downwind from the clinic.
- The incinerator has sufficient air inlets on the side for efficient burning.
- The incinerator is placed on hard earth or a concrete base.
- Only medical waste is burned.

If medical waste is buried, the following criteria should be met:

- The burial site is at least 50 meters away from any water source, is located downhill from any wells, is free of standing water, is in an area that does not flood, has proper drainage, and is not located on land that will be used for agriculture or development.
- The pit is 1–2 meters wide and 2–5 meters deep. The bottom of the pit is 1.8 meters above the water table.
- Every time waste is added to the pit, it is covered with a 10- to 30-cm layer of soil.
- When the level of waste reaches to within 30–50 cm of the ground surface, the pit is filled with dirt, sealed with concrete, and another pit is dug.

Check **"YES"** if medical waste is burned or buried as indicated.

48. *The community should be protected from possible exposure to medical waste.*

Interim storage sites and medical waste-disposal sites should be located in areas that are minimally accessible to staff, clients, visitors, and the community. If they are not contained (e.g., in an incinerator), they should be protected by a barrier such as a fence or wall to keep animals and children out.

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Check **"YES"** if the interim storage site and medical waste-disposal site are located in isolated areas or are protected by a fence or wall as indicated.

49. Liquid medical waste and most hazardous chemical waste should be poured down a drain or buried in a pit.

Liquid medical waste and hazardous chemical waste can be hazardous to the environment and should be disposed of according to local regulations. If there are no guidelines, pour solutions down a sink, drain, flushable toilet, or latrine, or bury them in a pit. Do not pour solutions directly on the ground or near an outdoor water source. (*Note:* Cytotoxic chemicals and radioactive waste require special handling.)

Check **"YES"** if liquid medical waste and hazardous chemical waste are disposed of according to local guidelines or as indicated.

50. Containers used for medical waste should be cleaned with a disinfectant cleaning solution and rinsed with water daily, or more often, if visibly contaminated.

Staff should always wear heavy utility gloves and shoes when cleaning the containers.

Check **"YES"** if medical-waste containers are cleaned daily as indicated.

Appendix D

Individual and Group Performance Matrix

Individual and Group Performance Matrix

To compare the individual participants' and the entire group's knowledge at the end of the course, complete one copy of the matrix after the participants have completed the pretest and one copy after they have completed the posttest.

The test question numbers are listed across the top of the matrix, and the participant numbers are listed along the left side of the matrix. Transfer the results of each test onto the matrix by filling in the boxes that correspond to the questions that the participants answered correctly, as shown in the sample on the next page. This allows for easy identification of questions that many of the participants answered incorrectly.

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Individual and Group Performance Matrix
Sample Matrix Filled in for Five Participants

Course Location:_____ Dates:_____

Trainer(s): _____

Participant #	Test Question #															# of Test Questions Correct	% of Test Questions Correct
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
1																8	53
2																9	60
3																12	80
4																11	73
5																13	86
6																	
7																	
8																	
9																	
10																	
11																	
12																	
13																	
14																	
15																	
16																	
17																	
18																	
19																	
20																	
Total percentage of questions answered correctly																	70

Individual and Group Performance Matrix

Course Location:_____ Dates:_____

Trainer(s): _____

Participant #	Test Question #															# of Test Questions Correct	% of Test Questions Correct
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
1																	
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18																	
19																	
20																	
Total percentage of questions answered correctly																	

Individual and Group Performance Matrix

Course Location:_____ Dates:_____

Trainer(s): _____

Participant #	Test Question #															# of Test Questions Correct	% of Test Questions Correct
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
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20																	
Total percentage of questions answered correctly																	

Appendix E

On-Site Training Activities

On-Site Training Activities

The following are activities that may be conducted during the practice sessions of an on-site training workshop. These activities are meant to supplement those listed in the Notes for Trainers throughout each module.

As you observe the participants perform various infection prevention practices (or as they discuss them with you), reinforce those practices that are performed well and point out those needing improvement. For practices needing improvement, discuss with the participants why the practices are inappropriate or ineffective, demonstrate the proper procedures, ask the appropriate participants to practice the procedures to ensure that they understand them, and help the participants plan ways to implement changes, as possible, given the situation and constraints of the facility.

It is important to have access to the locally available supplies needed to perform infection prevention practices for use during the training workshop. Sometimes these supplies are available at the facility (e.g., in the pharmacy or central stores). If they are not available at the facility, they may be purchased locally, either before the training workshop begins or during the course of the workshop, or you may ask facility administrators to purchase the supplies before the workshop begins. Alternatively, you may take some of the participants to the market during the workshop to purchase the supplies. At the end of the workshop, AVSC recommends leaving the supplies at the facility so the participants may continue using them after the training to perform appropriate infection prevention practices.

List of On-Site Activities

Module 2: Importance and Purpose of Infection Prevention

Ask the participants to identify infection prevention practices performed at the facility that they know require improvement, and discuss how improvements can be made.

Module 3: Handwashing and Use of Gloves

- Tour the handwashing areas of the facility. If bars of soap are kept in nondraining soap racks or dishes or if common basins and/or towels are used by multiple staff, ask the participants to discuss ways to remedy these inappropriate practices. Help them plan ways to implement the changes.
- If running water is ever unavailable at the facility, help the participants plan ways to wash hands when running water is not available.
- Demonstrate and ask the participants to practice the steps of routine handwashing.
- Demonstrate how to prepare an alcohol handrub solution. Pass around the prepared solution, and ask the participants to sample it by rubbing it into their skin until dry. Review the proper use of an alcohol handrub.

- Review the three kinds of gloves and discuss the appropriate uses of each kind. Distribute utility gloves to the participants responsible for cleaning and housekeeping activities, and ask them to discuss why utility gloves are important and when gloves should be used in the course of their work.

Module 4: Antiseptics and Disinfectants

- Gather bottles of the antiseptics and disinfectants used at the facility, and ask the participants how each antiseptic and disinfectant is used. Review the appropriate and inappropriate uses of each. Correct any inappropriate uses by demonstrating alternatives, and help the participants plan ways to implement changes, if possible.
- Demonstrate ways to prevent contamination of antiseptics and disinfectants, and help the participants plan ways to implement changes, if possible.
- Locate small bottles (e.g., 100–500 mL) for storing solutions for daily use. Ask the participants to discuss the proper use and cleaning of these bottles, as well as ways to label containers appropriately.

Module 5: Aseptic Technique

- Demonstrate the steps of surgical handscrub, and ask the participants who perform surgical handscrub to practice the steps.
- Demonstrate the steps of putting on and removing surgical gloves, and ask the participants who participate in surgical procedures to practice the steps. (If desired, the Skills Practice Checklist: Gloving, which appears on pages 5.12 and 5.13 of this curriculum, may be used to conduct this activity.)
- Demonstrate how to properly wear each of the garments of surgical attire, and review the importance of wearing each garment.
- Tour the operating theaters and procedure rooms and observe clinical procedures as they are performed. Afterward, ask the participants to discuss whether surgical/procedure sites were prepared properly, a sterile field was maintained, wrapped sterile packs were opened properly, good surgical technique was used, and a safer environment was maintained. If inappropriate practices are found, suggest changes and help the participants plan ways to implement them.

Module 6: Use and Disposal of Needles and Other Sharps

- Observe clinical procedures as they are performed, paying attention to how used sharps are handled and disposed of and how injections are given. Afterward, ask the participants to discuss how sharps-disposal containers can be used or improvements in practice can be made, if necessary, and help them plan ways to implement the changes.
- Demonstrate and ask the participants to practice the hands-free technique for passing sharps during clinical procedures.
- Help the participants secure or construct a supply of suitable sharps-disposal containers (e.g., make arrangements with the pharmacy to give the staff empty small, heavy cardboard boxes), and place them throughout the facility, as appropriate.

- Demonstrate and ask the participants to practice the one-hand technique for recapping used hypodermic needles.
- Review the steps to be taken after accidental exposure to blood or other body fluids.
- Demonstrate and ask the participants to practice the proper use of multidose vials.

Module 7: Introduction to Processing of Instruments and Other Items

Tour the room(s) where instrument processing is performed at the facility. Ask the participants to note the locations of all the sinks, countertops, work areas, storage areas, waste areas, and equipment contained there. Ask them whether or not the room(s) are arranged appropriately and, if not, how the room(s) might be rearranged and what areas/items might be moved, given the space available, to minimize the level of contamination in areas in which "clean" activities take place. If possible, help the participants develop plans for improving the flow of movement in the instrument processing area(s) to reduce the risk of contamination.

Module 8: Decontamination and Preparation of Chlorine Solutions

- Purchase or locate the supplies needed for decontamination.
- Ask the participants what bleach products are available at the facility. Help them locate the percentage of "active" (available) chlorine in these products, which is usually listed on the bottle. (The participants may need to check with the pharmacy or central stores if the bleach is not in its original container or is in powder form.)
- Demonstrate how to make a 0.5% chlorine solution from locally available bleach, and ask the participants responsible for decontamination to practice the steps. Mark buckets and measuring containers, as described on page 266 of this curriculum, for easy preparation in the future.
- Demonstrate and ask the participants to practice the routine steps of decontamination, as well as the special considerations for decontaminating reusable needles and syringes, gloves, storage containers for instruments and other items, laparoscopes, and instruments used during manual vacuum aspiration (MVA).
- Place buckets for decontamination in every operating theater and procedure room, and discuss or ask supervisors to designate those staff members who will be responsible for the various parts of the decontamination process.

Module 9: Cleaning Instruments and Other Items

- Purchase or locate the supplies needed for cleaning instruments and other items.
- Demonstrate the routine steps of cleaning, as well as the special considerations for cleaning reusable needles and syringes, gloves, linen, environmental surfaces, and instruments used during manual vacuum aspiration (MVA). Ask the participants responsible for cleaning instruments and other items to practice the steps.

Module 10: Sterilization and Storage

If steam sterilization is used:

- Review the current practices related to steam sterilization and storage of sterile instruments and other items. If inappropriate practices are found, suggest changes and help the participants plan ways to implement them.
- Demonstrate the proper way to load items into the autoclave. Ask the participants responsible for processing instruments and other items to practice loading items into the autoclave.
- Run through an autoclave cycle with the participants, demonstrating the routine steps of steam sterilization, as well as the special considerations for steam-sterilizing reusable needles and syringes, gloves, and linen. As you run through the cycle, demonstrate or discuss the monitoring activities appropriate to steam sterilization. Ask the staff responsible for processing instruments and other items to practice the steps.
- Demonstrate the steps of wrapping instruments, gloves, and other items for steam sterilization, and ask the participants responsible for wrapping to practice them. (If desired, the Skills Practice Checklists for wrapping instruments and other items and for wrapping gloves, which appear on pages 10.9 and 10.11 of this curriculum, may be used to conduct this activity.)
- Check the autoclave to see if it is in good working order. If not, discuss your findings with the participants, and ask them to present ideas for getting repairs or for using an alternate method of sterilization or high-level disinfection (HLD).
- Demonstrate the daily and weekly autoclave maintenance tasks, and ask the participants responsible for processing instruments and other items to practice them.
- Help the participants develop an autoclave maintenance schedule, and post it on a wall near the autoclave.

If dry-heat sterilization is used:

- Review the current practices related to dry-heat sterilization and storage of sterile instruments and other items. If inappropriate practices are found, suggest changes and help the participants plan ways to implement them.
- Run through a dry-heat sterilization cycle with the participants, demonstrating the routine steps of dry-heat sterilization, as well as the special considerations for sterilizing reusable needles and syringes using dry heat. As you run through the cycle, demonstrate or dicuss the monitoring activities appropriate to dry-heat sterilization. Ask the participants responsible for processing instruments and other items to practice the steps.
- Check the dry-heat oven to see if it is in good working order. If not, discuss your findings with the participants, and ask them to present ideas for getting repairs or for using an alternate method of sterilization or HLD.
- Demonstrate the proper tasks for maintaining the dry-heat oven, and ask the participants responsible for processing instruments and other items to practice them.
- Help the participants develop a schedule for maintaining the dry-heat oven, and post it on a wall near the oven.

If chemical sterilization is used:

- Review the current practices related to chemical sterilization and storage of sterile instruments and other items. If inappropriate practices are found, suggest changes and help the participants plan ways to implement them.
- Demonstrate the routine steps of chemical sterilization. As you go through the process, demonstrate or discuss the monitoring activities appropriate to chemical sterilization. Ask the participants responsible for processing instruments and other items to practice the steps.
- Ask the participants which solutions they use for chemical sterilization. Point out any products that are being used inappropriately, if needed, and explain why they are inappropriate. Help the participants determine which locally available products are appropriate for chemical sterilization or what alternate methods of sterilization or HLD are available.

Module 11: High-Level Disinfection and Storage

If HLD by boiling is used:

- Review the current practices related to HLD by boiling and storage of high-level disinfected instruments and other items. If inappropriate practices are found, suggest changes and help the participants plan ways to implement them.
- Demonstrate the routine steps of HLD by boiling, and discuss special considerations for boiling cannulae used during manual vacuum aspiration (MVA). Ask the participants responsible for processing instruments and other items to practice the steps.
- If boilers are used, check to see if they are in good working order. If they are not in good working order, discuss your findings with the participants, and ask them to present ideas for getting repairs or for using an alternate method of HLD or a method of sterilization.

If chemical HLD is used:

- Review the current practices related to chemical HLD and storage of high-level disinfected instruments and other items. If inappropriate practices are found, suggest changes and help the participants plan ways to implement them.
- Demonstrate the routine steps of chemical HLD. Ask the participants responsible for processing instruments and other items to practice the steps.
- Ask the participants which solutions they use for chemical HLD. Point out any products that are being used inappropriately, if needed, and explain why they are inappropriate. Help the participants determine which locally available products are appropriate for chemical HLD or what alternate methods of HLD or sterilization are available.

If HLD by steaming is used:

- Review the current practices related to steaming and storage of gloves and cannulae used during manual vacuum aspiration (MVA). If inappropriate practices are found, suggest changes and help the participants plan ways to implement them.
- Demonstrate the steps of steaming gloves or cannulae in a steamer, and ask the participants responsible for processing these items to practice the steps.

Module 12: Housekeeping

- Tour the facility with the participants, and ask them to explain which housekeeping activities are performed in client-care and non-client-care areas, when and how they are performed, and what materials are used to perform them. If inappropriate practices are found, suggest changes and help the participants plan ways to implement them.
- Help the participants develop a housekeeping schedule for each room, and post it where all staff can see it.
- Ask the participants if fumigation and/or UV light are used as infection prevention practices. Point out why these practices are ineffective, if needed, and help the participants determine what more effective housekeeping methods are available.
- Purchase or locate the supplies needed to prepare a disinfectant cleaning solution: a bucket, a 0.5% chlorine solution, detergent, utility gloves, and something for mixing the solution. Demonstrate the steps of preparing the solution, and ask the participants responsible for housekeeping to practice them.

Module 13: Waste Disposal

- Tour the facility with the participants, including the waste-disposal site, and observe how general and medical waste are sorted; how solid medical waste is handled, stored, and disposed of; and how sharps, liquid medical waste, and hazardous chemical waste are handled and disposed of. If inappropriate practices are found, suggest changes and help the participants plan ways to implement them—for example, develop plans with the participants for properly sorting general and medical waste, handling medical waste and sharps, storing medical waste (if interim storage is needed), and disposing of sharps, other medical waste, and hazardous chemical waste.
- As you tour the waste-disposal site, assess the location, appropriateness, and safety of the incinerator or burial site, if applicable. If problems are found, suggest changes and help the participants plan ways to implement them, given the facility's situation and constraints.

Appendix F

Additional Trainer's Resources

Additional Trainer's Resources

Module 2: Importance and Purpose of Infection Prevention

Transmission of Bloodborne Infections *(page 50)*

The purpose of this exercise is to make the participants aware that anyone may carry a bloodborne infection; demonstrate how a few infections can quickly spread, resulting in many more infections; and act as a starting point for discussion of how to break the cycle of disease transmission to reduce the risk of infections in clients, health care workers, and the community. *Do not explain the purpose of the exercise to the participants in advance.*

☞ Training Tip

This exercise works best with larger groups, but it can be conducted with as few as five or six participants.

Advance preparation:

Before this session, prepare one bag (or envelope) of candy (or other item, such as beads, buttons, or poker chips) for each participant. Each bag should contain 10 pieces of the candy that is being used. The pieces of candy should be identical except for their color (multicolored hard candies in clear plastic wrap work well for this exercise). Choose one color of candy (such as red) to represent a bloodborne infection, and put 10 pieces of that color candy in only one of the bags; do not put any pieces of that color candy in any of the other bags. That bag will represent the one person in the group who has a bloodborne infection. (*Note:* One bag with the "bloodborne infection" candies will work well with a group of up to 10 participants. For 10–20 participants, use two bags; for more than 20 participants, use three bags.) The other bags should contain different-colored candy. Make sure that the participants do not see the contents of the bags until they are distributed.

Clear some space in the room so that all the participants can gather and mix together. Read the following instructions to the group. (*Note:* The text in brackets contain instructions to you and should **not** be read to the participants.)

Instructions:

1. This is an exercise to find out what people think is the most important infection prevention practice. To participate, you will need a pen or pencil.

2. I will give each of you a bag. You can look inside the bag, but do **not** let anyone else see what is in your bag.

[Distribute the bags at random, and give each participant a small piece of paper or an index card. If candy is used, tell the participants not to eat it.]

3. Move around and ask the other participants to name the most important infection prevention practice. After each person answers, exchange one piece of candy from each of your bags (give him or her one piece from your bag and ask him or her to give you one piece from his or her bag). Then write on the piece of paper/index card which infection prevention practice the person said was the most important.

[Allow 5–10 minutes for participants to ask each other the question; allow more time for larger groups.]

4. Return to your seats and look at the contents of your bag. Again, do **not** let anyone see what is in your bag.

[Write the color that corresponds to the bloodborne infection on a flipchart.]

5. Those who have a piece of candy of this color in your bag have been infected with a bloodborne virus, such as HIV or one of the hepatitis viruses. Those of you who do **not** have a piece of this color candy in your bag are not infected. If you have a piece of this color candy representing the bloodborne infection in your bag, do **not** tell anyone that you have it.

Discussion

After the exercise, facilitate a discussion by asking the participants the following questions. Make notes on the flipchart to reinforce important points:

- As you look around the room, can you tell who is infected? *[Discuss how it is often not possible to tell who is infected with a bloodborne infection, such as HIV or one of the hepatitis viruses, just by looking at someone, although often people think they can. Everyone with such an infection does not look or feel sick, or even know that he or she is infected. Emphasize the point that this is why everyone should be considered potentially infected for the purposes of infection prevention practices in health care settings, and why appropriate precautions should be taken to reduce the risk of infections with all clients, regardless of their presumed infection status.]*
- Would you like to continue exchanging items with others, as you did earlier? *[Mention that asking a question and passing around pieces of candy is used here to represent the mode of transmission step in the disease-transmission cycle. Remind the participants that this is the easiest step in the cycle to break, thus decreasing the risk of transmitting infections.* Note: *Here it is important to tell the participants that this exercise does not necessarily represent the true transmission dynamics of bloodborne infections—in other words, every exposure does not necessarily result in transmission, and you cannot get rid of an infection simply by giving it to someone else, as you might here if you gave away the specially colored piece of candy.]*
- Display a pair of gloves to the participants, and ask how the use of gloves could help decrease the risk of transmission of bloodborne and other infections in health care settings. Ask the participants to list some other barriers that fulfill the same purpose as gloves.
- Ask the participants with the colored pieces of candy representing bloodborne infections to raise their hands. Count out loud how many hands are up, and write this number on a flipchart. Then tell the participants how many bags contained the colored pieces of candy at the beginning

of the exercise, and write that number on the flipchart. Discuss the issue of how quickly blood-borne infections can spread, pointing out how a small number of infections at the start of the exercise resulted in more at the end. Reinforce the idea that even if the prevalence of blood-borne infections is low at this time, it is best to institute appropriate infection prevention practices now to help prevent the spread of serious infections. Mention that once we find out that someone has an infection, it is often too late to go back and correct all the inappropriate practices that exposed health care workers to potentially infectious materials.

Throughout the discussion, use the participants' responses and the points you make to:

- Show the natural concern that is felt when risk is unknown
- Show how it is not possible to tell if someone is infected
- Show that the rapid spread of infection can occur
- Stress the advantages of preventing infections rather that trying to cure them
- Identify ways to protect oneself and one's clients from infections by the use of barriers and other means to decrease exposure to potentially infectious materials

Finally, ask each participant to name the most common response he or she received to the question "What is the most important infection prevention practice?" List the responses on a flipchart. Tell the participants that at the end of the workshop, you will post the flipchart on the wall and see if everyone still has the same opinion.

ADAPTED FROM: AVSC International. 1998. *"Sexually Transmited Diseases Counseling and Clinical Knowledge Workshop: Russia,"* Section 5, pp. 15–16.

Module 14: Implementation Plans and Closure

Spider's Web of Yarn *(page 492)*

To prepare for this exercise, write each of the following infection prevention practices that various staff perform on an index card. (If you have access to a copy machine, you may copy these pages and cut them into cards.) There should be enough cards for each participant; there may be duplicates of the cards. If you need more cards, make up your own situations similar to those shown below. Note that some of the infection prevention practices are appropriate and some are not; when creating your own situations, be sure to include both appropriate and inappropriate practices.

Receptionist takes the requisition slip for disinfecting/sterilizing chemicals over to the central store before the end of the day, because the messenger has not shown up yet, and if the slip does not get in today, there will be a delay in the supplies delivery.

Physician removes his gloves, throws them on the floor after a surgical procedure, and then walks out of the operating theater.

Attendant has to clean the examination tables, so he adds detergent to a chlorine solution.

Housekeeper collects the waste from smaller containers when they are three-quarters full, keeping solid waste to a minimum in client-care areas.

Midwife disposes of needles and syringes in a puncture-resistant container immediately after use.

Nurse recaps used needles using both hands.

Pharmacist labels the bottle containing bleach with the percentage of available chlorine so that the staff can calculate the amounts of water and bleach needed to make a 0.5% chlorine solution for decontamination.

Manager decides to order alcohol instead of glutaraldehyde for disinfecting instruments and other items, because alcohol is less expensive, and she has always seen items soaked in alcohol.

Cleaner continues to use the autoclave even though steam is escaping around the door.

Lab technician wears gloves when handling all blood samples.

Instructions:

1. Shuffle the cards and spread them out like a fan in your hand.

2. Ask each participant to take a card and hold it in front of him or her so that the other participants can read it.

3. Explain to the participants that they will take part in an exercise that requires everyone to play a role.

4. Begin to unwind the ball of yarn, giving one participant the end of the yarn. Carry the ball across the circle so that a participant on the opposite side receives the yarn and holds on to it.

5. Continue back and forth, creating a web.

6. Once the web is complete, tell the participants that, by working together, they have created a beautiful design.

7. Read each index card in order, as it appears on the previous pages. (If you have created some cards of your own, be sure to mix up the ones containing the appropriate and inappropriate practices.) If the action you read is inappropriate, the participant holding that index card should drop his or her piece of yarn. If the action you read is appropriate, the participant holding that index card should continue to hold his or her piece of yarn. Continue until you read all the actions.

8. Ask the participants to look at the web and state what happened to it. Then ask them:
   - What did the group just do (description of the exercise)?
   - What did you notice happening to the web during the exercise? *[If not mentioned by a participant, point out that even when the first person did not do his or her job correctly, the web began to fall apart.]*
   - How does what happened in this exercise relate to the principles of teamwork needed to initiate improved infection prevention practices at your facility?

9. Ask the participants to share some of their experiences with working on teams. Did everyone contribute? If so, how did the team function? If all the members did not contribute, how did the team function?

10. Ask the participants to share their insights from this exercise regarding how they might get all the members of their team to contribute in order to successfully improve infection prevention practices.

Appendix G

Suggested Text for Transparencies and Flipcharts

Suggested Text for Transparencies and Flipcharts

The following text, charts, and illustrations may be used to create transparencies or flipcharts for use during the infection prevention training course. This material may be used in addition to any other material you wish to display on transparencies or flipcharts.

Transparencies may be created either by enlarging and photocopying the material you wish to use onto a transparency; retyping or redrawing the material you wish to use (if you have access to a typewriter or computer) and photocopying it onto a transparency; or writing directly on a transparency.

Module 1: Introduction to the Infection Prevention Course

Course Objectives

- Identify the risk of transmitting infections via the health care setting
- Explain the importance of infection prevention
- Explain the approaches for reducing the risk of infections
- Identify infection prevention problems at your facility
- Develop a plan to address three priority problems

Module 2: Importance and Purpose of Infection Prevention

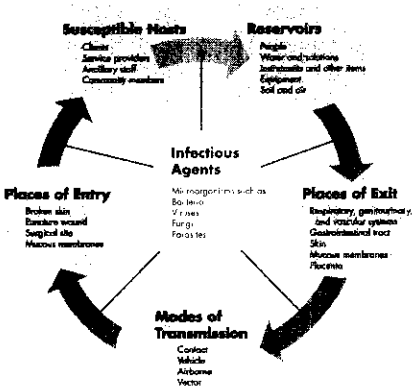
Module 2 Objectives

- Identify who is at risk of infections
- Describe the disease-transmission cycle
- Explain how infections are transmitted
- Describe the importance and purpose of good infection prevention
- Correct misinformation and misconceptions about infection transmission
- Define *microorganisms*
- Explain *standard precautions*
- Explain the staff's role in infection prevention

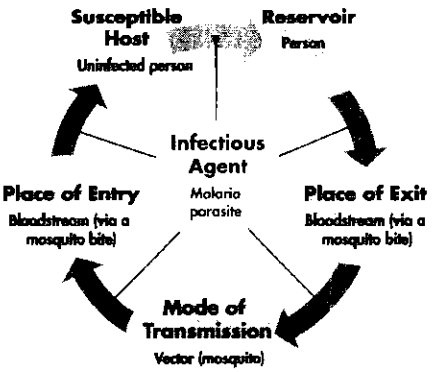
Who Is at Risk?

- Clients
- Service providers and ancillary staff
- The community

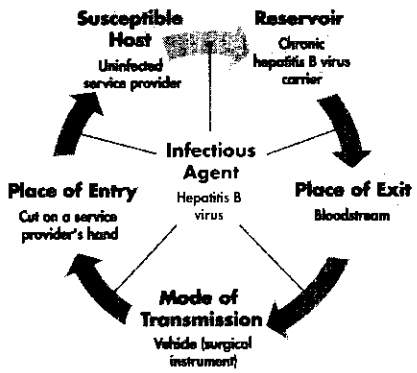
Figure 2-1. The Disease-Transmission Cycle



Example of Transmission of Malaria



Example of Transmission of Hepatitis B



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Following Infection Prevention:

- Prevents postprocedure infections
- Results in high-quality, safe services
- Prevents infections in staff
- Protects the community
- Prevents the spread of antibiotic-resistant microorganisms
- Lowers the cost of health care

Misconceptions Are Common about the:

- Ways infections are transmitted
- Incidence of hospital-acquired infections
- Prevalence of infections in the community
- Risks faced by health care workers
- Feasibility of following appropriate practices

Misconceptions about Infection Transmission May Lead to:

- Clients being denied services
- Service providers being worried about providing services
- Increased risk of infections in clients
- Staff not protecting themselves
- Ineffective practices being performed

Standard Precautions

- Practices designed to help minimize clients' and staff's risk of exposure to infectious materials
- Help break the disease-transmission cycle at the mode of transmission step

Standard Precautions

1. Wash your hands
2. Wear gloves, eyewear, and gowns
3. Correctly process instruments and other items
4. Keep the facility clean
5. Properly dispose of waste
6. Handle, transport, and process linen correctly
7. Prevent injuries with sharps

Module 3: Handwashing and Use of Gloves

Module 3 Objectives

- Explain the importance of handwashing
- List appropriate times to wash hands
- Explain the kinds of handwashing and when to use each
- Describe the steps of handwashing
- List ways to improve handwashing compliance
- Describe the kinds of gloves and when to use each

Resident versus Transient Microorganisms

Resident microorganisms:
- Normally live on our skin
- Not easily removed by friction or washing with soap

Transient microorganisms:
- Acquired during the course of our work and daily living
- Easily removed by friction and washing with soap

Wash Your Hands:

- After arriving at work
- Before and after examining each client
- After touching anything that might be contaminated
- Before putting on gloves for clinical procedures
- After removing gloves
- After using the toilet or latrine
- Before leaving work

Three Kinds of Handwashing

1. Handwashing with plain soap and running water
2. Handwashing with antiseptic soap and running water
3. Alcohol handrub

Three Kinds of Gloves

1. Surgical gloves
2. Single-use examination gloves
3. Utility or heavy-duty household gloves

Exercise 3-2: Appropriate Use of Gloves in Service Delivery

Task/Procedure	Are Gloves Needed? (Yes/No)	Preferred Type of Glove (Surgical, Examination, Utility)	Alternate Type of Glove if the Preferred Type Is Not Available
Taking blood pressure			
Drawing blood			
Performing a pelvic exam			
Handling medical or hazardous chemical waste			
Performing a vasectomy			
Giving a Depo-Provera injection			
Handling or cleaning used instruments and other items			

Exercise 3-2: Appropriate Use of Gloves in Service Delivery (continued)

Task/Procedure	Are Gloves Needed? (Yes/No)	Preferred Type of Glove (Surgical, Examination, Utility)	Alternate Type of Glove if the Preferred Type Is Not Available
Taking a patient's temperature			
Removing Norplant implants			
Inserting an IUD			
Performing a minilaparotomy tubal ligation			
Cleaning spilled blood or other body fluids			
Performing manual vacuum aspiration			

Module 4: Antiseptics and Disinfectants

Module 4 Objectives

- Define *antiseptic* and *disinfectant*
- List their common uses
- List locally available antiseptic and disinfectant solutions
- Identify ways to protect them from contamination

Antiseptics versus Disinfectants

Antiseptics:

- Use on skin and mucous membranes to kill microorganisms
- **Not** for use on inanimate objects

Disinfectants:

- Use to kill microorganisms on inanimate objects
- **Not** for use on skin or mucous membranes
- High-level versus low-level disinfectants

Antiseptics Are Used for:

- Surgical handscrub
- Skin, cervical, and vaginal preparation before a clinical procedure
- Handwashing in high-risk situations

Disinfectants Are Used for:

- High-level disinfectants - Processing instruments and other items
- Low-level disinfectants - Cleaning surfaces

Antiseptics Appropriate for Use in Clinical Procedures

Antiseptic	Use		
	Surgical Handscrub	Preprocedure Skin Preparation	Mucous Membranes, Such as the Vagina and Cervix
Alcohol	Yes	Yes	No
Chlorhexidine gluconate with or without cetrimide	Yes	Yes	Yes. However, products containing chlorhexidine may not be the best antiseptics for use in the genital area because of the small potential for irritation. If an iodophor is not available, a product containing chlorhexidine is the best alternative.

continued

Antiseptics Appropriate for Use in Clinical Procedures (continued)

Antiseptic	Use		
	Surgical Handscrub	Preprocedure Skin Preparation	Mucous Membranes, Such as the Vagina and Cervix
Hexachlorophene	No	No	No
Iodine, including tincture of iodine (iodine and alcohol)	No	Yes	No
Iodophors	Yes	Yes	Yes
Para-chloro-*meta*-xylenol (PCMX, chloroxylenol)	Yes, but not recommended for routine use	Yes, but not recommended for routine use	Yes. Caution: PCMX preparations containing alcohol should not be used on mucous membranes

Chemicals for Use in High-Level Disinfection

Use:
- Chlorine
- Glutaraldehyde

Do not use:
- Hydrogen peroxide
- Formaldehyde
- Alcohol
- Iodophors
- Sporicidin
- Antiseptics
- Low-level disinfectants

To Prevent Contamination of Solutions:

- Pour antiseptics into small containers for use
- Label containers each time they are washed, dried, and refilled
- Avoid storing gauze, cotton wool, and cotton balls in antiseptics
- Always pour antiseptics out of the container without touching the rim or the solution itself
- Keep bottles closed
- Store antiseptic and disinfectant solutions in a cool, dark area

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Module 5: Aseptic Technique

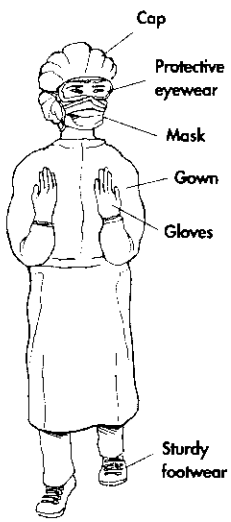
Module 5 Objectives

- Explain the general concept of *aseptic technique*
- Describe and explain the importance of:
  - surgical handscrub (and options)
  - putting on and removing surgical gloves
  - wearing surgical attire
  - preparing a client for clinical procedures
  - maintaining a sterile field
  - performing surgery in ways that minimize the risk of infections
  - using prophylactic antibiotics
  - maintaining a safer environment

Options for Surgical Handscrub

- Surgical handscrub - antiseptic and water
- Surgical handscrub - soap and water followed by alcohol or alcohol handrub
- Alcohol handrub - alcohol and emollient

Surgical Attire



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Exercise 5-2: Matching Exercise

Cap	Mask
Face shield	Sturdy footwear
Glove	Waterproof apron
Gown	

Piece of Surgical Attire	Description
1.	Prevents droplets containing microorganisms from the service provider's mouth from coming in contact with the client
2.	Protects the service provider's hands from infectious material and protects clients from microorganisms on the service provider's hands
3.	Protects the mucous membranes of the service provider's eyes, nose, and mouth from splashes of blood or other body fluids

Exercise 5-2: Matching Exercise (continued)

Cap	Mask
Face shield	Sturdy footwear
Glove	Waterproof apron
Gown	

Piece of Surgical Attire	Description
4.	Prevents the spread of microorganisms to the client from hair shed by the service provider
5.	Protects the service provider from splashes of blood or other body fluids, and protects the client from microorganisms on the service provider's torso and arms
6.	Protects the service provider from injury by contaminated sharps that may fall or fluids that may spill
7.	Protects the front of the service provider's body when heavy contamination with blood or other fluids is likely

Shaving Before Surgical Procedures

- Shaving is no longer recommended
- If shaving must be done:
  1. Use antimicrobial soap or shave dry
  2. Shave in the operating theater, immediately before the procedure

To Maintain a Sterile Field:

- Place only sterile items within the sterile field
- Open or transfer sterile items without contaminating them
- Recognize what is and is not sterile
- Act in ways that do not contaminate the sterile field
- Recognize and maintain the service provider's sterile area
- Do not place sterile items near open windows or doors

Module 6: Use and Disposal of Needles and Other Sharps

Module 6 Objectives

- List ways that sharps cause injuries
- Describe and demonstrate procedures for:
  1. Safe use and disposal of sharps
  2. Use of multidose vials

Causes of Injuries with Sharps

- Recapping hypodermic needles
- Manipulating sharps before disposal
- Accidentally sticking another staff member
- Leaving sharps in areas where they are unexpected
- Surgical procedures with limited visibility or in confined spaces
- Handling or disposing of waste
- Unexpected client motion during injections

To Prevent Injuries Due to Sharps:

- Handle all sharps minimally after use
- Use extreme care whenever sharps are handled
- Dispose of sharps in puncture-resistant containers immediately after use
- Wear utility gloves when disposing of sharps containers or when washing sharps
- Pass sharps using the "hands-free technique"
- Use the "one-hand" technique to recap needles

To Reduce the Risk of Transmitting Infections between Clients:

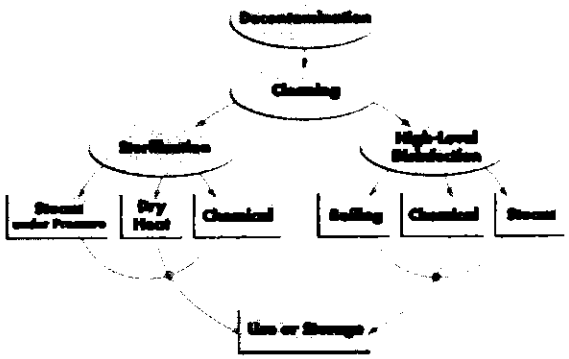
- **Always** use a new or correctly processed needle *and* syringe
- **Never** reuse the same syringe to give injections to multiple clients, even if the needle is changed
- **Never** use the same IV line and fluid bag/bottle with multiple clients

Module 7: Introduction to Processing of Instruments and Other Items

Module 7 Objectives

- Define the steps of processing instruments and other items
- List the order for conducting these processes and explain the importance of following this order
- Identify how to organize a processing area

Figure 7-1. The Steps of Processing Instruments and Other Items



Exercise 7-1: Instrument Processing Bingo

	COLUMNS			
	A	B	C	D
ROW 1	Decontamination	Cleaning	Sterilization	HLD
	Cleaning	Sterilization	HLD	Decontamination
	Sterilization	HLD	Decontamination	Cleaning
	HLD	Decontamination	Cleaning	Sterilization
ROW 2	Decontamination	Cleaning	Sterilization	HLD
	Cleaning	Sterilization	HLD	Decontamination
	Sterilization	HLD	Decontamination	Cleaning
	HLD	Decontamination	Cleaning	Sterilization
ROW 3	Decontamination	Cleaning	Sterilization	HLD
	Cleaning	Sterilization	HLD	Decontamination
	Sterilization	HLD	Decontamination	Cleaning
	HLD	Decontamination	Cleaning	Sterilization
ROW 4	Decontamination	Cleaning	Sterilization	HLD
	Cleaning	Sterilization	HLD	Decontamination
	Sterilization	HLD	Decontamination	Cleaning
	HLD	Decontamination	Cleaning	Sterilization

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"Clean" versus "Dirty" Areas

Areas in which "clean" activities take place:

- Operating theaters
- Procedure rooms
- Work areas for sterilizing, high-level disinfecting, and storing instruments and other items

Areas in which "dirty" activities take place:

- Rooms where instruments and other items are washed

Figure 7-2. Single Room for Processing Instruments and Other Items

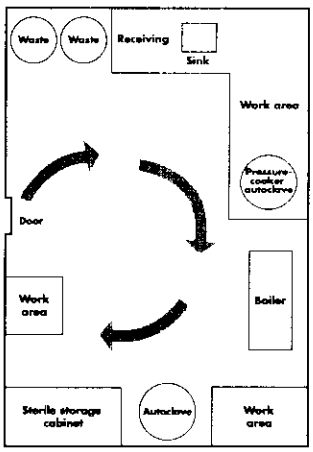
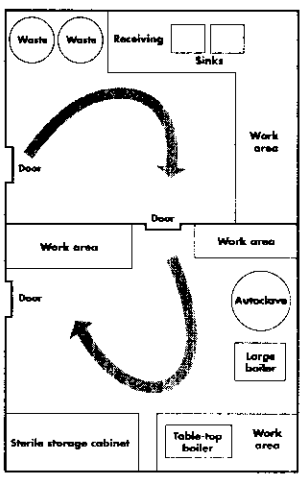


Figure 7-3. Separate Rooms for Processing Instruments and Other Items



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Module 8: Decontamination and Preparation of Chlorine Solutions

Module 8 Objectives

- Define *decontamination*
- Calculate how to make a 0.5% chlorine solution
- Describe the steps of decontamination
- Identify ways to decontaminate reusable needles and syringes, gloves, linen, storage containers for instruments and other items, laparoscopes, and MVA instruments

Decontamination

- The first step in processing items
- Makes items safer to handle
- Makes items easier to clean
- Soak items in a 0.5% chlorine solution for 10 minutes immediately after use

Figure 8-1. Preparing a Dilute Chlorine Solution

Using Liquid Bleach

Chlorine in liquid bleach comes in different concentrations. You can use any concentration to make a dilute chlorine solution by using the following formula:

$$\left[\frac{\text{\% chlorine in liquid bleach}}{\text{\% chlorine desired}}\right] - 1 = \text{Total parts of water for each part bleach*}$$

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

$$\left[\frac{3.5\%}{0.5\%}\right] - 1 = [7] - 1 = 6 \text{ parts water for each part bleach}$$

Therefore, you must add 1 part bleach to 6 parts water to make a 0.5% chlorine solution.

* "Parts" can be used for any unit of measure (e.g., ounce, liter, [illegible] or any container used for measuring such as a pitcher).

** In countries where French products are available, the amount of active chlorine is usually expressed in degrees chlorométrique. One degree chlorométrique is equivalent to [illegible] % active chlorine.

Figure 8-1. Preparing a Dilute Chlorine Solution (continued)

Using Bleach Powder

If using bleach powder,* calculate the ratio of bleach to water by using the following formula:

$$\left[\frac{\text{\% chlorine desired}}{\text{\% chlorine in bleach powder}}\right] \times 1{,}000 = \text{Number of grams of powder for each liter of water}$$

Example: To make a 0.5% chlorine solution from calcium hypochlorite powder containing 35% active chlorine:

$$\left[\frac{0.5\%}{35\%}\right] \times 1{,}000 = 0.0143 \times 1{,}000 = 14.3$$

Therefore, you must dissolve 14.3 grams of calcium hypochlorite powder in each liter of water used to make a 0.5% chlorine solution.

* When bleach powder is used, the resulting chlorine solution is likely to be cloudy.

Exercise 8-1: Calculation Exercises

Bleach Powder

Type of bleach	% active chlorine	Amount of bleach needed per liter of water to make a 0.5% chlorine solution
Calcium hypochlorite	70%	____ grams
Calcium hypochlorite	35%	____ grams
(Locally available bleach) _____	__%	____ grams

continued

Exercise 8-1: Calculation Exercises (continued)

Bleach Powder

Type of bleach	% active chlorine	Amount of bleach needed per liter of water to make a 0.5% chlorine solution
Calcium hypochlorite	70%	____ grams
Calcium hypochlorite	35%	____ grams
(Locally available bleach) _____	__%	____ grams

Steps of Decontaminating Instruments and Other Items

- Immediately after use, place items in a 0.5% chlorine solution
- Soak for 10 minutes; do **not** soak longer
- Rinse with water or clean immediately
- Replace solution daily or when it becomes heavily contaminated
- Wear heavy-duty utility gloves

To Decontaminate Reusable Needles and Syringes:

- Fill the assembled needle and syringe with a 0.5% chlorine solution
- Flush several times
- Drop the needle and syringe into the solution
- Soak for 10 minutes
- Rinse by flusbing three times with water, or clean immediately

To Decontaminate Gloves:

- Before removing gloves, dip hands in a 0.5% chlorine solution
- Carefully remove gloves without touching the outer surface with bare hands or snapping the gloves
- If gloves are disposable or not intact, dispose of them properly
- If gloves are to be reused, soak in chlorine solution for 10 minutes; rinse or clean immediately

To Decontaminate MVA Instruments:

- Flush the assembled cannula and syringe with a 0.5% chlorine solution one or two times
- Drop it into the chlorine solution
- Soak for 10 minutes
- Rinse by flushing three times with water, or clean immediately

Module 9: Cleaning Instruments and Other Items

Module 9 Objectives

- Define *cleaning* and explain why it is important
- Explain why detergent is used
- Describe the steps of the cleaning process
- Identify ways to clean reusable needles and syringes, gloves, linen, environmental surfaces, and MVA instruments

Cleaning

- Scrubbing items with a brush, detergent, and water before further processing
- Removes blood, body fluids, tissue, and dirt
- Reduces the number of microorganisms (including endospores)
- Sterilization and HLD may not be effective without proper cleaning

Steps of Cleaning

- Wear utility gloves, goggles, a mask, and protective eyewear
- Scrub vigorously with a brush, detergent, and water
- Hold items under the water, and be sure to get in the grooves, teeth, and joints
- Rinse thoroughly to remove all detergent
- Air-dry or dry with a clean towel

To Clean Reusable Needles and Syringes:

- Disassemble the needle and syringe, and wash with detergent and water
- Insert a wire through the needle to make sure it is not clogged
- Reassemble and rinse by flushing at least three times
- Detach the needle and inspect it to make sure it is clean and not damaged
- Check the syringe to make sure the seal is good and the markings are readable
- Air-dry the needle, air- or towel-dry the syringe

To Clean Gloves:

- Wash with detergent and water
- Handle carefully, wash separately, and do **not** scrub with a brush
- Rinse until all detergent is gone
- Check for holes
- Air-dry or dry with a clean towel

To Clean Linen (Caps, Gowns, Masks, and Surgical Drapes):

- Wash with detergent and hot water (machine washing is recommended)
- Rinse
- Air- or machine-dry

To Clean MVA Instruments:

- Disassemble the syringe completely
- Wash the parts of the syringe and the cannula with detergent and water
- Scrub the syringe with a soft brush. Do **not** use a brush or other object to clean the inside of the tip of the cannula
- Rinse
- Air-dry

Module 10: Sterilization and Storage

Module 10 Objectives

- Define *sterilization*
- Explain the steps of the three sterilization procedures
- Describe how to maintain an autoclave
- Demonstrate wrapping instruments and gloves
- Describe how to monitor the effectiveness of sterilization
- Identify ways to sterilize reusable needles and syringes, gloves, linen, and MVA instruments

Sterilization

- Eliminates **all** microorganisms, including endospores
- Recommended when items will come in contact with the bloodstream or tissues under the skin
- Three types:
  - Steam under pressure (autoclaving or moist heat)
  - Dry heat
  - Soaking in chemicals

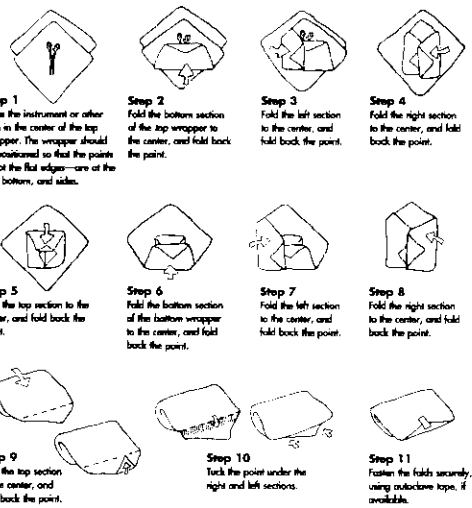
Tips for Steam Sterilization

- Open or disassemble all items
- Temperature: 121°C (250°F); pressure: 106 kPa
- Time: wrapped items - 30 minutes; unwrapped items - 20 minutes
- Packs or unwrapped items must dry completely before removal from the autoclave

Storage after Steam or Dry-Heat Sterilization

- Proper storage is as important as sterilization; store all items dry
- Shelf-life is **not** time-dependent. Under optimal conditions, wrapped items may be considered sterile as long as they remain intact and dry.
- Store sterile packs in closed cabinets in low-traffic, dry areas
- Use unwrapped items immediately or store in a covered, sterile container for up to one week

Steps of Wrapping Instruments and Other Items for Steam Sterilization



Step 1
Place the instrument or other item in the center of the top wrapper. The wrapper should be positioned so that the points —not the flat edges—are at the top, bottom, and sides.

Step 2
Fold the bottom section of the top wrapper to the center, and fold back the point.

Step 3
Fold the left section to the center, and fold back the point.

Step 4
Fold the right section to the center, and fold back the point.

Step 5
Fold the top section to the center, and fold back the point.

Step 6
Fold the bottom section of the bottom wrapper to the center, and fold back the point.

Step 7
Fold the left section to the center, and fold back the point.

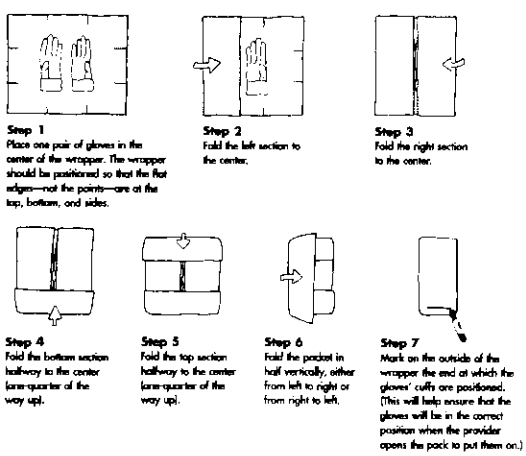
Step 8
Fold the right section to the center, and fold back the point.

Step 9
Fold the top section to the center, and fold back the point.

Step 10
Tuck the point under the right and left sections.

Step 11
Fasten the folds securely, using autoclave tape, if available.

Steps of Wrapping Gloves for Steam Sterilization



Step 1
Place one pair of gloves in the center of the wrapper. The wrapper should be positioned so that the flat edges—not the points—are at the top, bottom, and sides.

Step 2
Fold the left section to the center.

Step 3
Fold the right section to the center.

Step 4
Fold the bottom section halfway to the center (one-quarter of the way up).

Step 5
Fold the top section halfway to the center (one-quarter of the way up).

Step 6
Fold the packet in half vertically, either from left to right or from right to left.

Step 7
Mark on the outside of the wrapper the end at which the gloves' cuffs are positioned. (This will help ensure that the gloves will be in the correct position when the provider opens the pack to put them on.)

Tips for Dry-Heat Sterilization

- It is not necessary to open or disassemble items
- Start timing when the oven reaches the desired temperature
- Use 170°C (340°F) for 1 hour, 160°C (320°F) for 2 hours
- High temperatures can dull sharps; use 160°C (320°F) or lower for sharp items

Tips for Chemical Sterilization

- Open or disassemble items and be sure they are completely covered with the solution
- Follow the manufacturer's instructions for soaking
- Do not add or remove any items once timing has started
- Rinse with sterile water
- Store all items dry and use within one week

Sterilization Monitoring

- Mechanical indicators
- Chemical indicators
- Biological indicators

To Sterilize Reusable Needles and Syringes:

Steam:
- Flush the needle with boiled water just before wrapping
- Sterilize as indicated

Dry heat:
- Do **not** sterilize needles at temperatures higher than 160°C (320°F)

*Do **not** use chemicals*

To Sterilize Gloves:

Steam:
- Sterilize gloves by themselves. Place packs loosely in a wire basket or drum, on their edge with the thumbs up, away from the autoclave walls, and on the upper shelves
- Do **not** use gloves for 24–48 hours after steam sterilization

*Do **not** use dry heat or chemicals*

To Sterilize Linen (Caps, Gowns, Masks, and Surgical Drapes):

Steam:
- Packs should **not** be more than 30 x 30 x 50 cm (12 x 12 x 20 in.) or 5 kg (12 lb)
- Place packs containing sheets, towels, and table covers on their sides

*Do **not** use dry heat or chemicals*

To Sterilize MVA Instruments:

Note: Sterilization of the syringe is not necessary. The cannula should be sterilized.

Chemical:

- Soak the syringe and cannula in a chemical solution. Be sure that they are completely submerged and filled with the solution.

*Do **not** use steam or dry heat to sterilize the syringe or cannula*

Module 11: High-Level Disinfection and Storage

Module 11 Objectives

- Define *high-level disinfection (HLD)*
- Explain the steps of the three HLD procedures
- Differentiate between the chemicals that should and should not be used for HLD
- Identify ways to HLD reusable needles and syringes, linen, and MVA instruments

High-Level Disinfection (HLD)

- Eliminates all microorganisms, but does not kill all endospores
- Use for items that will come in contact with broken skin or intact mucous membranes
- Three types:
  - Boiling
  - Use of chemicals
  - Steaming

Exercise 11-1: Recommended Processing Procedures for Selected Instruments and Other Items

Instrument/Item	Is High-Level Disinfection Appropriate?	Is Sterilization Appropriate?
Fitting diaphragms	Yes, since fitting diaphragms will come incontact with intact mucous membranes.	It is not necessary, but fitting diaphragms can be autoclaved.
Surgical gloves for cesarean delivery		
Instruments for pelvic examination and IUD insertion		
Instruments for vasectomy and tubal ligation		

continued

Exercise 11-1: Recommended Processing Procedures for Selected Instruments and Other Items (continued)

Instrument/Item	Is High-Level Disinfection Appropriate?	Is Sterilization Appropriate?
Reusable needles and syringes		
Instruments for insertion of Norplant implants		
Laparoscopes		
MVA syringes		
MVA cannulae		

Tips for HLD by Boiling

- Items must be completely covered with water
- Open or disassemble items
- Boil for 20 minutes from when the water reaches a rolling boil
- Do **not** add or remove any items once timing begins
- Store all items dry and use within one week

Tips for HLD Using Chemicals

- Open or disassemble all items and be sure that they are completely covered with the solution
- Soak for 20 minutes
- Do **not** add to or remove any items once timing begins
- Rinse with boiled water
- Store all items dry and use within one week

Chemicals for Use in HLD

1. **Chlorine**
   - Cheapest effective disinfectant
   - Effective against many microorganisms
   - Can be corrosive: do not use on laparoscopes
   - Can be irritating to people
   - Prepare a new solution daily
2. **Glutaraldehyde**
   - Effective against many microorganisms
   - Not corrosive when used as directed
   - Irritating to people
   - Use prepared solution for up to two weeks

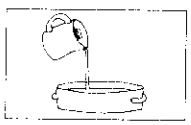
Do *Not* Use for HLD:

- Alcohol
- Benzalkonium chloride (Zephiran)
- Carbolic acid (Lysol, Phenol)
- Chlorhexidine gluconate (Hibitane, Hibiscrub)
- Chlorhexidine gluconate with cetrimide (Savlon, Cetavlon)
- Formaldehyde
- Hydrogen peroxide
- Iodophors
- Mercury-containing compounds
- PCMX (chloroxylenol, Dettol)
- Sporicidin

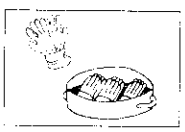
Steps of HLD by Steaming

1 Decontaminate and clean gloves to be high-level disinfected.

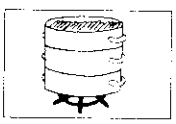
2 Place water in the bottom tray (which has no holes).



3 Fold back the cuffs of the gloves in pairs and place the gloves in the tray(s) that have holes. The number of gloves that will fit in each tray depends on the size of the tray (usually 5–15 pairs). If more than one layer of gloves is being steamed, loosely layer the gloves in a criss-cross design. Gloves should *not* be packed tightly in the tray(s).



4 Stack the tray(s) of gloves on top of the bottom tray.

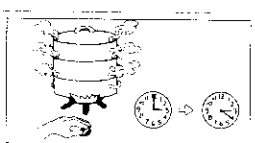


continued

Steps of HLD by Steaming (continued)

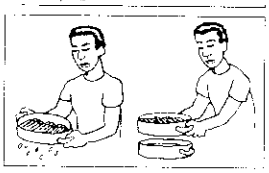
5 Place the lid on the top tray and bring the water to a boil. When steam comes out between the trays, the water is boiling. Reduce the heat, but maintain the water at a rolling boil (steam should continue to come out between the trays). High heat wastes fuel and causes the water to evaporate more quickly.

6 Steam the gloves for 20 minutes. Use a timer or make sure to record the time.



7 Remove each tray of gloves, shake off the excess water, and place the tray(s) on a second tray that does not have holes or contain water (a second bottom tray). (Do not place the tray containing the gloves directly on the countertop, since this may contaminate the gloves; remember, there are holes in the bottom of the tray.)

8 Use the gloves immediately or allow them to dry for 4–6 hours (drying may be difficult in areas of high humidity).



9 Storage: Store the gloves in a covered tray or put them in a high-level disinfected container and use within one week.

Tips for HLD by Steaming

- Begin timing when steam comes out between the trays
- Steam for 20 minutes
- After steaming, do not place trays directly on countertop
- Use all items immediately or store dry for up to one week

To High-Level Disinfect MVA Instruments:

Syringe:
- HLD is **not** necessary
- May use chemical HLD

Cannula:
- *Boiling:* The cannula does not need to be submerged. The pot/boiler must be covered.
- *Chemicals:* Completely submerge and fill the cannula in the solution
- *Steaming:* Follow the routine steps

Module 12: Housekeeping

Module 12 Objectives

- Explain *housekeeping* and its purpose
- List general housekeeping guidelines
- Compare housekeeping activities in client-care and non-client-care areas
- Explain:
  - Why fumigation and UV light are inappropriate
  - How to prepare a disinfectant cleaning solution
  - Importance and method of cleaning up spills of blood

Housekeeping

- General cleaning and maintenance of cleanliness
- Reduces the number of microorganisms and, thus, the risk of infections
- Provides an appealing environment

General Guidelines for Housekeeping

- Schedules should be posted and followed
- Wear utility gloves and shoes when cleaning client-care areas
- Minimize scattering of dust and dirt
- Scrub when cleaning
- Wash from top to bottom
- Change cleaning solutions when they are dirty

Ineffective Housekeeping Practices

- Fumigation (disinfectant fogging) with formalin, formaldehyde, or paraformaldehyde
- Use of ultraviolet (UV) light

Housekeeping in Client-Care Areas

Each morning:
- Damp-wipe and/or mop

Between clients:
- Wipe tables and equipment with cleaning solution
- Clean visibly soiled areas of the floor, walls, or ceiling with cleaning solution
- Clean up spills immediately
- Remove waste, if necessary

At the end of the clinic session or day:
- Wipe all surfaces and clean floor with cleaning solution
- Remove sharps-disposal containers, if necessary
- Remove waste

Each week:
- Clean ceilings with cleaning solution

Steps of Preparing a Disinfectant Cleaning Solution

- Prepare a 0.5% chlorine solution
- Add detergent and mix until the solution is mildly foamy or bubbly

Module 13: Waste Disposal

Module 13 Objectives

- Differentiate between the three types of waste
- State the importance of correctly disposing of waste and who is at risk during waste disposal
- Explain sorting, handling, interim storage, and disposal of medical waste
- List guidelines for medical-waste disposal and explain the special procedures for other types of waste
- Explain how to build a drum incinerator and a burial site

Types of Waste

1. **General waste** - nonhazardous, poses no risk of injury or infection
2. **Medical waste** - material generated in diagnosis, treatment, and/or immunization, including:
   - Blood, other body fluids, and materials containing them
   - Organic waste (e.g., tissue, placenta)
   - Sharps
3. **Hazardous chemical waste** - chemicals that are potentially toxic or poisonous

Proper Handling and Disposal of Medical Waste:

- Minimizes the spread of infections and reduces the risk of injury
- Helps provide a pleasing atmosphere
- Reduces odors
- Reduces insects and animals
- Reduces contamination of the soil or ground water

Four Aspects of Waste Management

1. Sorting
   - General versus medical waste
2. Handling
   - Wear utility gloves and shoes
   - Handle as little as possible
3. Interim storage
   - Place in minimally accessible area
4. Final disposal
   - Burn or bury

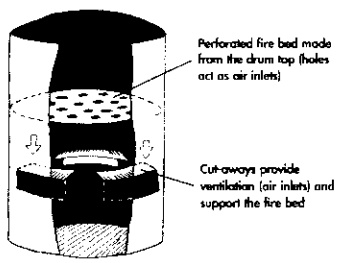
Guidelines for Disposal of Medical Waste

- Use washable, leak-proof containers
- Keep containers in convenient places
- Empty containers daily or when three-quarters full
- **Never** put hands into containers
- Always dispose of medical waste correctly
- Wear utility gloves and shoes
- Wash the gloves and your hands afterward

Disposal Procedures for Sharps

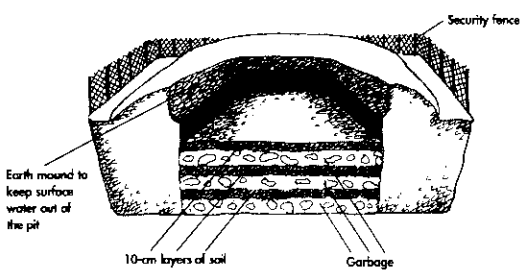
- Dispose of all sharps in puncture-resistant containers
- Close containers when three-quarters full
- Burn or bury the container
- Wash the gloves and your hands afterward

Drum Incinerator



ADAPTED FROM: Coad, A. (ed.). 1994. *Managing medical wastes in developing countries: Report of a consultation on medical wastes management in developing countries, WHO, Geneva, September 1992.* World Health Organization, p. 19.

Burial Site with Fence



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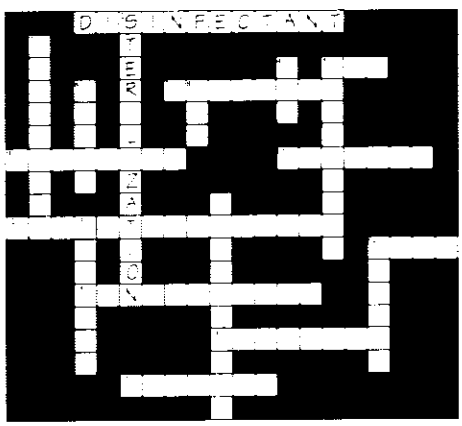
Module 14: Implementation Plans and Closure

Module 14 Objectives

- List obstacles to improving practices and ways to address them
- List three practices that need to be implemented or changed at your facility
- List ways to implement or change practices
- Explain why everyone must do their part for infection prevention to be effective

Infection Prevention Crossword Puzzle



Three Main Obstacles to Improving Infection Prevention Practices

1. Lack of knowledge
2. Resistance to changing old habits
3. Inadequate supplies, equipment, and space

Points to Remember

- Change is a process
- Do not try to change everything at once
- Some people are resistant to change
- Do not get discouraged by small steps backward
- Help people adjust to new practices
- Do not give up
- Do not expect others to do things that you do not do yourself