Mandated NYS Infection Control Training for Healthcare Professionals

The New York State Nurses Association has been approved by the New York State Education Department (NYSED) and the New York State Department of Health (NYSDOH) to provide this course for licensed practical nurses, registered professional nurses, physicians, dentists, dental hygienists, optometrists, physician assistants, podiatrists, and specialist assistants. In 2008, medical residents, medical students, physician assistant students and specialist assistant students were added to the list of healthcare professionals required to complete infection control training every four years. This program is designed as an on-demand self-study learning program which will meet the New York State requirements for infection control education every four years.

Upon successful completion of this course, results are forwarded electronically to the NYSED Licensing Division **every day at 4:00 pm**. There is no need for you to send in the certificate - the information will be submitted to the NYSED Licensing Division for you. This saves valuable time and provides a secure and efficient record of course completion. **Please understand the NYSED requires a minimum of 3 business days to update your state record.** In addition, you will have access to an online certificate of completion that you can print for your own records **immediately** upon successful completion of the course.

***Note:** Physicians, physician assistants and specialist assistants will be required to have a copy of their certificate of successful completion to present to their employer and/or to the New York State Department of Health.

NYSNA Continuing Education

The New York State Nurses Association is accredited as a provider of nursing continuing professional development by the American Nurses Credentialing Center's Commission on Accreditation.

This module has been awarded **4.25 CHs** through the New York State Nurses Association Accredited Provider Unit.

The New York State Nurses Association is accredited by the International Association for Continuing Education and Training (IACET) and is authorized to issue the IACET CEU.

The New York State Nurses Association is authorized by IACET to offer **0.4 CEUs** for this module.

Participants must read the course material, pass an examination with at least 80%, and complete an evaluation in order to receive a certificate of completion. Contact hours/CEUs will be awarded until **July 26, 2023.**

All American Nurses Credentialing Center (ANCC) accredited organizations' contact hours are recognized by all other ANCC accredited organizations. Most states with mandatory continuing education requirements recognize the ANCC accreditation/approval system. Questions about the acceptance of ANCC contact hours to meet mandatory regulations should be directed to the professional licensing board within that state.

NYSNA has been granted provider status by the Florida State Board of Nursing as a provider of continuing education in nursing (Provider number 50-1437).

NYSNA wishes to disclose that no commercial support or sponsorship has been received.

How to Take This Course

Please take a look at the steps below; these will help you to progress through the course material, complete the course examination and receive your certificate of completion.

1. **REVIEW THE OBJECTIVES**

   The objectives provide an overview of the entire course and identify what information will be focused on. Objectives are stated in terms of what you, the learner, will know or be able to do upon successful completion of the course. They let you know what you should expect to learn by taking a particular course and can help focus your study.

2. **STUDY EACH SECTION IN ORDER**

   Keep your learning "programmed" by reviewing the materials in order. This will help you understand the sections that follow.

3. **COMPLETE THE COURSE EXAM**

   After studying the course, click on the "Course Exam" option located on the course navigation toolbar. Answer each question by clicking on the button corresponding to the correct answer. All questions must be answered before the test can be graded; there is only one correct answer per question. You may refer back to the course material by minimizing the course exam window.

4. **GRADE THE TEST**

   Next, click on "Submit Test." You will know immediately whether you passed or failed. If you do not successfully complete the exam on the first attempt, you may take the exam again. If you do not pass the exam on your second attempt, you will need to purchase the course again.

5. **FILL OUT THE EVALUATION FORM**

   Upon passing the course exam you will be prompted to complete a course evaluation. You will have access to the certificate of completion **after you complete the evaluation**. At this point, you should print the certificate and keep it for your records.

Objectives

At the completion of this course the learner will be able to:

- Describe the role of the healthcare professional in adhering to scientific and regulatory agency acceptable principles of infection control.
- Describe the mechanisms involved in the transmission of pathogenic organisms, including prevention and control strategies, in order to reduce the spread of infection in the healthcare setting.
- Identify work practice controls the healthcare professional can incorporate to reduce exposure to potentially infectious materials to themselves, staff and patients.
- Identify circumstances where the healthcare professional would utilize barriers and personal protective equipment (PPE) in order to reduce hazardous exposures in the health care settings.
- Describe how health care professionals can maintain a safe work environment using infection control principles and practices for cleaning, disinfection, and sterilization of patient care medical devices.
- Identify strategies that healthcare professionals can follow to prevent and maintain control of communicable and infectious diseases to patients, staff and themselves.
- Describe the scope of the problem, signs and symptoms, evaluation and prevention of sepsis.

Introduction

Regulated healthcare settings in New York State, such as hospitals, nursing homes, and diagnostic and treatment centers, have been required for many years to have infection control programs in place that are designed to protect patients, employees, and visitors. These facilities have established policies and procedures to address a number of concerns including: hand hygiene; prevention of infection associated with surgery; intravenous therapy (IV); use of urinary catheters and other invasive procedures; housekeeping; disinfection and sterilization of equipment; waste disposal; and other areas that may be a source of infection. Isolation and employee health policies also limit the potential for exposure to communicable diseases and provide a mechanism for follow-up when inadvertent exposures occur. Through surveillance of infection in these settings, and quality assurance and risk management programs, compliance with infection control standards are monitored and problems are identified early. Attention to the infection control program has had an important impact on reducing healthcare associated and occupationally acquired infections.

In 2010, the New York State Department of Health (DOH) mandated changes to all infection control training syllabi because lapses in infection control practices had been found in healthcare settings that placed individuals at risk for disease. In response to the investigations into these lapses in infection control practices, the Patient Safety Bill was signed into law by the governor of New York in August of 2008. New guidelines and practices have been changed according to evidence and research that the Centers for Disease Control and Prevention (CDC) along with state agencies now recommend.

It was the human immunodeficiency virus (HIV) and hepatitis B virus (HBV), and concern over how to protect against contracting these diseases from receipt of healthcare that helped to influence the training requirement you are meeting by taking this course.

In October 2017, Governor Andrew Cuomo signed into law amendments to Public Health Law § 239 and Education Law § 6505 requiring the addition of sepsis awareness and education training to the NYS-mandated Infection Control and Barrier Precautions coursework.

The strategy that offers the greatest opportunity for protecting the public in settings where they receive healthcare is one of assuring that infection control measures are routinely in place and routinely observed. Such practices must provide protection from cross contamination from patient to patient, as well as patient and healthcare worker exposure to pathogens through the direct provision of care. While bloodborne pathogens were the chief concern driving policy and legislation, other pathogens transmitted by contact (e.g., staphylococci, gram negative organisms), airborne and droplet transmission (e.g. flu, TB) also pose a risk. Attention to the principles of infection control will diminish the opportunity for these exposures as well.

Since 1992, the State of New York has required that certain healthcare professionals licensed in New York State receive training on infection control and barrier precautions. This requirement stipulates that the initial training include the seven core elements (identified below) developed by the New York State Education Department. Chapter 786 of the Laws of 1992 affects every dental hygienist, dentist, licensed practical nurse, optometrist, physician, physician assistant, podiatrist, registered professional nurse, and specialist assistant practicing in New York State. In 2008, medical residents, medical students, physician assistant students and specialist assistant students were added to the list of healthcare professionals required to complete infection control training every four years.

Being fully aware of the professional and legal responsibility of infection control in New York State helps protect one’s license. In March 1992, the New York State Board of Regents amended the Regents Rules, expanding the definition of unprofessional conduct to include failure to follow appropriate infection prevention techniques in healthcare practice. The New York State Department of Health has also adopted similar regulations. This training, required by Chapter 786 of the Laws of 1992, establishes that failure to adhere to such standards can be considered evidence of professional misconduct and could lead to disciplinary action.

Since this 1992 requirement was enacted in New York State, much has changed. The terrorist attacks of September 11, 2001 prompted the nation and healthcare providers to focus on the potential for weaponized biological agents. Since the events of September 11 and the subsequent bioterrorist use of *Bacillus anthracis*, we have learned more about infection control challenges posed by those agents. Infection control specifically related to bioterrorism is beyond the scope of this course.

The goal of this state-mandated infection control training is to:

1. Assure that licensed, registered, or certified health professionals understand how bloodborne pathogens may be transmitted in the work environment: patient to healthcare worker, healthcare worker to patient, and patient to patient.
2. Apply current scientifically accepted infection control principles as appropriate for the specific work environment.
3. Minimize the opportunity for transmission of pathogens to patients and healthcare workers.
4. Familiarize professionals with the law requiring this training and the professional misconduct charges that may be applicable for not complying with the law.

This course meets the 1992 educational requirement that identified the minimum core elements to be included in the required coursework in infection control. The minimum core elements consist of seven statements, each of which defines a general content area to be addressed. This online course meets the requirements of the original training requirements, as well as the revised requirements.

The Core Elements of Required Coursework in Infection Control, determined by the New York State Education Department are:

I. The responsibility to adhere to scientifically accepted principles and practices of infection control and to monitor the performance of those for whom the professional is responsible.
II. Modes and mechanisms of transmission of pathogenic organisms in the healthcare setting and strategies for prevention and control.
III. Use of engineering and work practice controls to reduce the opportunity for patient and healthcare worker contact with potentially infectious material for bloodborne pathogens.
IV. Selection and use of barriers and/or personal protective equipment for preventing patient and healthcare worker contact with potentially infectious materials.
V. Creation and maintenance of a safe environment for patient care through application of infection control principles and practices for cleaning, disinfection, and sterilization.
VI. Prevention and control of infectious and communicable diseases in healthcare workers.
VII. Prevention and control of sepsis.

The law requires that professionals' initial coursework in this mandatory infection control training include the seven elements listed above, and that infection control training must occur every four years thereafter.

As a healthcare professional in New York State, you are required to attest to having completed this requirement to the State Education Department at every subsequent registration period.

About the Authors

This course was designed by a team of experts whose professional experience covers the broad range of topics included in infection control and barrier precautions. The combined knowledge of this content and the most recent evidence retrieved from national and state agencies ensures relevant and accurate material.

This course was created in 2009 with revisions made in 2012 and 2015.

The most recent revisions were completed in May, 2018 by **Lisa Baum, MA, CSP** and **Lucille Contreras Sollazzo, BSN, RN-BC, NPD**. This course now reflects the current evidence and practice set forth with guidelines and standards from national and state agencies. Lisa Baum is the Occupational Health and Safety Representative and Lucille Contreras Sollazzo is the Associate Director of Nursing Education and Practice of the New York State Nurses Association.

The planners and authors declare they have no conflict of interest in this course.

Declaration of Vested Interest: None

Element I: Responsibility to Adhere to Scientifically Accepted Principles and Practices

The first element of the New York State mandatory infection control training addresses the responsibility to adhere to scientifically accepted principles and practices of infection control and to monitor the performance of those for whom the professional is responsible. This responsibility is a legal, professional and ethical requirement. Federal regulations, New York State regulations, and a variety of standards of professional practice all impact the responsibility of the professional to utilize current infection control standards.

Element I: Objective

At the end of this element you will be able to:

> Describe the role of the healthcare professional in adhering to scientific and regulatory agencies' acceptable principles of infection control.

Federal Regulations and Agencies

The **Occupational Safety and Health Administration** (OSHA) was established by Congress in 1970. It is part of the U.S. Department of Labor and is responsible for creating and enforcing workplace safety and health regulations. It mandates that employers provide to their employees a workplace free of recognized hazards. OSHA does not have a general standard to protect workers from infectious diseases other than bloodborne pathogens. It does, however, have a "General Duty Clause" that can be used to enforce guidelines when no specific standard exists. For example, in 1993 (updated in 2005), OSHA issued guidelines to protect workers from tuberculosis. Enforcement of these guidelines rests on the General Duty Clause.

Effective March 6, 1992, OSHA issued the Bloodborne Pathogen Standard (Occupational Safety and Health Administration, 1992) that helped to reduce healthcare worker exposure to blood or other potentially infectious materials and prevent occupational transmission of multiple pathogens. Notable elements of this standard require:

- A written exposure control plan designed to eliminate or minimize worker exposure to bloodborne pathogens.
- Compliance with standard precautions (an infection control principle that treats all human blood and other potentially infectious materials as infectious).
- Engineering controls and work practices to eliminate or minimize worker exposure.
- Personal protective equipment (if engineering controls and work practices do not eliminate occupational exposures).
- Prohibition of bending, recapping, or removing contaminated needles and other sharps unless such an act is required by a specific procedure or has no feasible alternative.
- Prohibition of shearing or breaking contaminated needles (OSHA defines contaminated as the presence or the reasonably anticipated presence of blood or other potentially infectious materials on an item or surface).
- Free hepatitis B vaccinations offered to workers with occupational exposure to bloodborne pathogens.
- Worker training in appropriate engineering controls and work practices.
- Post-exposure evaluation and follow-up, including post-exposure prophylaxis when appropriate.

In November 1999, OSHA issued a Compliance Directive to the Bloodborne Pathogen Standard. This action provided instructions to cite employers for failing to evaluate, purchase, and implement safer needles and other safer sharps devices.

On November 6, 2000, The Needlestick Safety and Prevention Act (P.L. 106-430) became law. The Needlestick Safety and Prevention Act amended the existing Bloodborne Pathogen Standard administered by OSHA to require the following:

- Expanded definition of engineering controls to include examples such as needleless systems, sharps with built-in safety features and mechanisms that effectively reduce the risk of an occupational exposure
- Exposure Control Plans must be reviewed and updated to reflect changes in technology that reduce or eliminate exposure to bloodborne pathogens; document review and implementation of new technology
- Employers must solicit the input of direct patient care employees in the identification, evaluation and selection of effective engineering and work-practice controls
- Develop and maintain a sharps injury log that includes, at a minimum:
    - information about the injury
    - the type and brand of device involved in the injury
    - the department or work area where the exposure occurred
    - an explanation of how the incident occurred
    - a system for maintaining the confidentiality of the injured employee on the log

Additionally, the law requires employers to implement a needleless/safety and needle stick prevention program. For detailed information on Bloodborne Pathogen Standards go to: https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10051

Both OSHA (n.d.) and NIOSH (2016) offer additional information on bloodborne pathogen exposure prevention. To review the material, visit their sites at: https://www.osha.gov/SLTC/bloodbornepathogens and https://www.cdc.gov/niosh/topics/bbp/sharps.html

OSHA has been serious about enforcement of this law. Since the 2000 Needlestick Safety and Prevention Act passed, OSHA has issued citations to healthcare facilities that have not been in compliance. In 2003, OSHA issued two citations that were ground breaking because of the size of the penalty and because of the detail and scope of the violation (Perry & Jagger, 2003).

Beaver Valley Nursing Home and Rehabilitation Center in Beaver Valley, Pennsylvania was fined over $90,000 for violations related to deficiencies in their exposure control plan and related to safety device evaluation (that is, not having front-line workers involved in the selection and evaluation of safety devices), post-exposure counseling and handling of sharps containers. The largest part of the violation and subsequent fine was for failure to use safety devices; the maximum penalty, $70,000 was issued. The nursing home had been surveyed three years earlier and multiple safety violations which had been identified in the earlier report had not been addressed (Perry & Jagger, 2003).

Also in 2003, Montefiore Medical Center in New York City was investigated and cited, in response to complaints by medical residents, for failure to use safety-engineering devices; improper handling of contaminated reusable sharps and failure to make available or use personal protective equipment. There were also recordkeeping and documentation deficiencies (Perry & Jagger, 2003).

In 2015, New York Presbyterian Hospital-Columbia University Medical Center was cited by OSHA regarding multiple violations of the Bloodborne Pathogens Standard including: unsafe handling of contaminated materials, insufficient

personal protective equipment, inadequate decontamination of contaminated surfaces, inadequate training, improper recordkeeping, and the lack of input from non-managerial direct-care healthcare workers in development of the hospital's Exposure Control Plan (OSHA, 2015 Jan. 30).

The **Food and Drug Administration** (FDA) is also involved in infection control through their efforts to reduce needlestick injuries. Under the FDA application clearance process (FDA, 1995), the manufacturers of medical devices (including needles used in patient care) must meet requirements for appropriate registration and for listing, labeling, and good manufacturing practices for design and production. The process for receiving clearance or approval to market a device requires device manufacturers to:

1. Demonstrate that a new device is substantially equivalent to a legally marketed device; or
2. Document the safety and effectiveness of the new device for patient care through a more involved premarket approval process.

The **Centers for Disease Control and Prevention** (CDC), a part of the United States Department of Health and Human Services, is recognized as the lead federal agency for protecting the health and safety of the population, providing credible information to enhance health decisions, and promoting health through strong partnerships. CDC serves as the national focus for developing and applying disease prevention and control, environmental health, and health promotion and education activities designed to improve the health of the people of the United States (CDC, 2013a). The CDC includes the Office of the Director, the National Institute for Occupational Safety and Health, and six centers or offices that focus on environmental health and injury prevention, health information services, health promotion, infectious diseases, global health, and terrorism preparedness and emergency response.

It was the CDC that defined and disseminated the concept of *Universal Precautions* in 1987 as a set of precautions designed to prevent transmission of human immunodeficiency virus (HIV), hepatitis B virus (HBV), and other bloodborne pathogens when providing first aid or health care. Under universal precautions, blood and certain body fluids of all patients are considered potentially infectious for HIV, HBV, and other bloodborne pathogens.

Universal precautions took the place of and eliminated the need for the *Body Substance Isolation* (BSI) category "Blood and Body Fluid Precautions" in the 1983 CDC Guidelines for Isolation Precautions in Hospitals. However, implementing universal precautions does not eliminate the need for other isolation precautions, such as droplet precautions for influenza, airborne isolation for pulmonary tuberculosis, or contact isolation for methicillin-resistant *Staphylococcus aureus* (MRSA).

In 1996, the CDC published new guidelines, *Standard Precautions*, for isolation precautions in hospitals. Standard precautions synthesize the major features of BSI and universal precautions to prevent transmission of a variety of organisms. Standard precautions were developed for use in hospitals and may not necessarily be indicated in other settings where universal precautions are used, such as childcare settings and schools. In 2007, the CDC updated the 1996 publication with *The Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings* (Siegel, Rhinehart, Jackson, Chiarello, & Healthcare Infection Control Practices Advisory Committee, 2007).

The revisions were necessary for several reasons:

- Transition from acute care to other healthcare settings such as the home, ambulatory and free-standing care sites, and long-term care.
- New terminology, e.g., "nosocomial infections" is replaced with "healthcare-associated infections" (HAI) to reflect the different health care delivery patterns.
- Emerging pathogens, like Severe Acute Respiratory Syndrome (SARS), Middle East Respiratory Syndrome (MERS), Avian influenza and Candida auris (C. auris) have added increased concern

to known HAI pathogens such as Clostridium difficile (C. diff) and community-associated Methicillin-resistant Staphylococcus aureus (MRSA).

- Reaffirmation of use of the Standard Precaution approach to infection control.
- New additions to the Standard Precautions include:
    - Respiratory hygiene/cough etiquette.
    - Safe injection practices that emphasize the use of single-dose rather than multiple-dose vials or solutions (such as saline solutions); and the use of single disposable needle and syringe for each patient.
    - Lumbar puncture procedures, including the use of masks when performing high-risk procedures of the spinal canal (e.g., myelography and epidural anesthesia).
- Knowledge that environmental controls decrease the risk of life-threatening fungal infections.
- Knowledge about organizational characteristics such as nurse staffing levels and composition and establishment of cultures of safety that influence healthcare personnel adherence to recommended infection control practices.
- Multidrug-resistant organisms (MDROs) have created specific recommendations for surveillance and control of these organisms.

For more detailed information, the complete CDC document can be retrieved from the following link: http://www.cdc.gov/hicpac/pdf/isolation/Isolation2007.pdf

Another federal agency that is concerned with worker safety is the **National Institute for Occupational Safety and Health** (NIOSH). NIOSH was created in 1970 by the same act of Congress that created OSHA and is part of the Centers for Disease Control and Prevention (CDC). NIOSH is responsible for conducting research and making specific recommendations, and disseminating information on the prevention of workplace disease, injury, and disability.

In 2016, the CDC reviewed and updated their previously published 2003 guidelines, representing infection prevention expectations for safe care in dental settings. The *Summary of Infection Prevention Practices in Dental Settings: Basic Expectations for Safe Care* (https://www.cdc.gov/oralhealth/infectioncontrol/pdf/safe-care-checklist.pdf), is intended for use by anyone needing information about basic infection prevention measures in dental health care settings, but is not a replacement for the more extensive guidelines (CDC, 2016).

New York State Regulations

In addition to federal laws and regulations, New York State also has requirements related to infection control. All licensed healthcare facilities are responsible under existing regulations for monitoring and enforcing proper use of infection control practices and universal precautions by healthcare personnel functioning under their jurisdiction. Failure to comply with this requirement will result in a Department of Health citation, potential fines, and other disciplinary actions against the institution.

As a reminder, in 1992 New York State established provisions to protect the public from exposure to HIV, HBV and other pathogens during medical and dental procedures. The requirement for this training was also established.

Proof of completion of the required infection control training must be submitted by healthcare professionals to either the New York State Education Department (NYSED) or the New York State Department of Health (NYSDOH). Physicians with hospital privileges will present the necessary training documentation to the hospital (in lieu of the Department of Health) during the process of renewing hospital privileges. A waiver of this training requirement may be granted by the Department of Health to healthcare professionals who demonstrate that such training is not needed due to the nature of their work, or that they have met criteria for equivalency.

Issued in 1992, **The New York State Education Department, Rules of the Board of Regents**, Part 29.2 (a)(13), *Unprofessional Conduct* in the Area of Infection Control is vital to a complete understanding of the professional standards related to infection control practices. These rules addressed professional responsibility related to infection control. General provisions for healthcare professionals relate to the following professionals:

- Medicine
- Acupuncture
- Physical Therapy
- Physician Assistant
- Specialist Assistant
- Chiropractic
- Dentistry
- Dental Hygiene
- Pharmacy
- Podiatry
- Optometry
- Ophthalmic Dispensing
- Psychology
- Social Work
- Massage
- Occupational Therapy
- Speech Pathology
- Audiology
- Nursing (registered professional nurse, licensed practical nurse)

The general provisions for healthcare professionals (NYSED, Office of the Professions, 2011) state that unprofessional conduct shall include:

> Failing to use scientifically accepted infection prevention techniques appropriate to each profession for the cleaning and sterilization or disinfection of instruments, devices, materials and work surfaces, utilization of protective garb, use of covers for contamination-prone equipment and the handling of sharp instruments. Such techniques shall include but not be limited to:
>
> 1. Wearing of appropriate protective gloves at all times when touching blood, saliva, other body fluids or secretions, mucous membranes, non-intact skin, blood-soiled items or body fluid-soiled items, contaminated surfaces, sterile body areas, and during instrument cleaning and decontamination procedures;
> 2. Discarding gloves used following treatment of a patient and changing to new gloves if torn or damaged during treatment of a patient; hand hygiene and donning new gloves prior to performing services for another patient; and washing hands and other skin surfaces immediately if contaminated with blood or other body fluids;
> 3. Wearing of appropriate masks, gowns or aprons, and protective eyewear or chin-length plastic face shields whenever splashing or spattering of blood or other body fluids is likely to occur;
> 4. Sterilizing equipment and devices that enter the patient's vascular system or other normally sterile areas of the body;
> 5. Sterilizing equipment and devices that touch intact mucous membranes but do not penetrate the patient's body or using high-level disinfection for equipment and devices which cannot be sterilized prior to use for a patient;
> 6. Using appropriate agents, including but not limited to detergents, for cleaning all equipment and devices prior to sterilization or disinfection;
> 7. Using appropriate agents, including but not limited to detergents, for cleaning all equipment and devices which do not touch the patient or that only touch the intact skin of the patient;
> 8. Maintaining equipment and devices used for sterilization according to the manufacturer's instructions;
> 9. Adequately monitoring the performance of all personnel, licensed or unlicensed, for whom the licensee is responsible regarding infection control techniques;
> 10. Placing used disposable syringes, needles, scalpel blades, and other sharp instruments in appropriate puncture-resistant containers for disposal; and placing reusable needles, scalpel blades, and other sharp instruments in appropriate puncture-resistant containers until appropriately cleaned and sterilized;

11. Maintaining appropriate ventilation devices to minimize the need for emergency mouth-to-mouth resuscitation;
12. Refraining from all direct patient care and handling of patient care equipment when the healthcare professional has exudative lesions or weeping dermatitis and the condition has not been medically evaluated and determined to be safe or capable of being safely protected against in providing direct patient care or in handling patient care equipment;
13. Placing all specimens of blood and body fluids in well-constructed containers with secure lids to prevent leaking; and cleaning any spill of blood or other body fluid with an appropriate detergent and appropriate chemical germicide.

Any licensed healthcare professional who fails to use appropriate infection control techniques to protect patients or fails to ensure that healthcare workers under his or her supervision do so, may be subject to charges of professional misconduct.

Any patient or employee complaint regarding lax infection control practices in a private medical or dental office will prompt an investigation by the NYS Departments of Health and/or Education. Substantiated lapses in infection control in a private practice setting may result in charges of professional misconduct against any licensed professional in the practice who was directly involved, was aware of the violation, or who has responsibility for ensuring that office staff is adequately trained and follow patient protection measures.

Effective in 1993, Part 92, Infection Control Requirements, of Title 10 (Health) of the Official Compilation of the Codes, Rules and Regulations of New York addresses unprofessional conduct related to infection control issues for physicians, physician assistants and specialist assistants.

> For physicians, registered physician assistants, and specialist assistants, the definition of unprofessional conduct shall include the failure to use scientifically accepted infection control practices to prevent transmission of disease pathogens from patient to patient, physician to patient, registered physician assistant or specialist assistant to patient, employee to patient, and patient to employee, as appropriate to physicians, registered physician assistants and specialist assistants. Such practices include:
>
> a) Adherence to scientifically accepted standards for: hand washing; aseptic technique; use of gloves and other barriers for preventing bi-directional contact with blood and body fluids; thorough cleaning followed by sterilization or disinfection of medical devices; disposal of non-reusable materials and equipment; and cleaning between patients of objects that are visibly contaminated or subject to touch contamination with blood or body fluids;
>
> b) Use of scientifically accepted injury prevention techniques or engineering controls to reduce the opportunity for patient and employee exposure; and
>
> c) Performance monitoring of all personnel, licensed or unlicensed, for whom the licensee is responsible regarding infection control techniques.

<u>Professional Conduct Standards and Implications</u>

The individual professional is responsible to adhere to infection control standards as clearly stated in law, as well as agency policies and procedures. The professional is also responsible for monitoring others and insuring that standards are carried out.

Consequences of failing to follow accepted standards of infection control include increased risk of adverse health outcomes for patients and healthcare workers. Additionally, the professional may be subject to charges of unprofessional conduct. Charges of unprofessional conduct are investigated by the

Office of the Professions, New York State Education Department, or the Department of Health. A charge of professional misconduct can be made even when there is no adverse effect on the patient.

Reporting Unprofessional Conduct

Complaints and reports are made to the New York State Department of Health if physicians, physician assistants, or specialist assistants are involved. All other complaints are reported to the specific professional licensing board at the New York State Education Department. Individuals and organizations are required to report and failure to do so may result in charges against the individual failing to report.

The complaint will be investigated. After investigation, if the charge of professional misconduct is substantiated, the professional may be subject to disciplinary action, revocation of the professional license and/or legal action for liability.

Additional New York State Regulations and Agencies

New York State Public Employees Safety and Health Act (PESH) oversees workplace protection of public employees in New York State.

New York Standards for Hospitals State Health Code regulates all Article 28 facilities licensed by the state. Part 405 prescribes many health standards to which hospitals must comply (e.g., infection control standards).

Professional Organizations

Multiple professional organizations exist that address issues of infection control. The following are organizations that speak generically to infection control:

- **Association for Professionals in Infection Control and Epidemiology, Inc. (APIC)**

  The Association for Professionals in Infection Control & Epidemiology is a multi-disciplinary, voluntary, international member organization that is committed to improving healthcare and patient safety by preventing and minimizing risks of infection and other adverse outcomes. APIC provides clinical education, practice guidance, information resources and management, certification, research and public policy advocacy. APIC works to advance healthcare epidemiology through education, collaboration, research, practice, and credentialing (APIC, n.d.).

  APIC is a strong proponent of scientifically based programs and policy designed to protect and enhance public health and patient safety. APIC members, often working on the front lines in infection control and public health capacities, recognize the critical need for enhanced prevention measures as well as increased surveillance and benchmarking for infectious diseases and other adverse outcomes. APIC collaborates with other professional associations, consumer groups, and thought leaders, as well as regulatory and accrediting bodies, to maximize the synergy of shared interests and resources with the goal of improving patient outcomes (APIC, n.d.).

  The American Journal of Infection Control is APIC's official publication.

- **Society for Healthcare Epidemiology of America (SHEA)**

  The Society for Healthcare Epidemiology of America (SHEA) was organized in 1980 to foster the development and application of the science of healthcare epidemiology. Healthcare epidemiology is broadly defined as any activity designed to study and/or improve patient care outcomes in any type of healthcare institution or setting. Healthcare epidemiology, as practiced by SHEA members, includes a variety of disciplines and activities directed at enhancing the quality of health care and preventing and controlling adverse outcomes. Among these activities are epidemiologic and laboratory investigation, surveillance, risk reduction programs focused on device and procedure management, policy development and implementation, education and information dissemination, and cost-benefit assessment of prevention and control programs (SHEA, n.d.).

  Infection Control and Hospital Epidemiology is SHEA's official publication.

- **The Joint Commission**

  The Joint Commission evaluates and accredits nearly 21,000 healthcare organizations and programs in the United States. An independent, not-for-profit organization, the Joint Commission sets professionally based standards and evaluates the compliance of healthcare organizations against these benchmarks (The Joint Commission, 2018).

  This accrediting agency focuses on promoting positive health outcomes and measuring the effectiveness of educational efforts relative to infection control. To earn and maintain accreditation, a healthcare organization must undergo an on-site survey by a Joint Commission survey team at least every three years; laboratories must be surveyed every two years.

- **American Hospital Association (AHA)**

  The American Hospital Association is a national organization that represents all types of hospitals, healthcare systems, networks, and other providers of care. They advocate and represent their members' interests and perspectives in health policy development, legislative and regulatory debates, and judicial matters. The AHA provides education for healthcare leaders and is a source of information on healthcare trends and issues.

Additional organizations have published guidelines regarding infection control; some have standards that are specific to their practices including:

- The Association of Operating Room Nurses (AORN) and the Society of Gastroenterology Nurses have guidelines for the care, reprocessing and storage of patient instruments and medical devices.

- American Society of Healthcare Central Service Personnel of the American Hospital Association has published recommended practices for decontamination of medical devices, instruments, and equipment.

- The Association for Advancement of Medical Instrumentation provides standards and written publications concerning medical devices, instruments, and equipment.

- The American Dental Association has published extensive guidelines for prevention of occupational exposure in the workplace.

The various professional disciplines, generally in their codes of ethics, include provisions about protecting the health of the patient. Some examples include:

- The American Nurses Association's (2015) *Code of Ethics for Nurses*, states, "The nurse promotes, advocates for, and protects the rights, health, and safety of the patient."

- The American Medical Association's (2001) *Principles of Medical Ethics*, states, "A physician shall be dedicated to providing competent medical care, with compassion and respect for human dignity and rights."

- The American Dental Association's (2018) *Principles of Ethics and Code of Professional Conduct* states, "The dentist has a duty to refrain from harming the patient." This principle expresses the concept that dentists have a duty to protect the patient from harm. Included in this principle is the dentist's primary obligation to keep knowledge and skills current. These ethical principles specifically address bloodborne pathogens.

Things to Remember

Universal Precautions – are a set of precautions designed to prevent transmission of human immunodeficiency virus (HIV), hepatitis B virus (HBV), and other bloodborne pathogens when providing first aid or health care.

Standard Precautions – combines the major features of Universal Precautions (UP) and Body Substance Isolation (BSI) and are based on the principle that all blood, body fluids, secretions, excretions (except sweat), non-intact skin, and mucous membranes may contain transmissible infectious agents. Standard Precautions include infection prevention practices that apply to all patients, regardless of suspected or confirmed infection status, in any setting in which health care is delivered.

Standard precautions include:

- Hand hygiene
- Use of gloves, gown, mask, eye protection, or face shield, depending on the anticipated exposure
- Safe injection practices

New additions to Standard Precautions:

- Respiratory Hygiene/Cough Etiquette
- Safe Injection Practices (single use vials)
- Special Lumbar Puncture Procedure

Element II: Transmission, Prevention and Control of Infection

This element of the New York State mandatory infection control training discusses the modes and mechanisms of transmission of pathogenic organisms in the healthcare setting and strategies for prevention and control. Healthcare professionals will likely be well versed in this element of the required training; consider it a review.

Element II: Objective

At the end of this element you will be able to:

> Describe mechanisms involved in the transmission of pathogenic organisms, including prevention and control strategies in order to reduce the spread of infection in the healthcare setting.

Overview of Infection Transmission

An **infection** entails the replication of organisms in the tissues of a host, with the development of an overt clinical manifestation, commonly known as disease.

The concept of the “Chain of Infection," well known to healthcare professionals, includes six elements or links in the chain that are needed for an infection to occur: pathogen, reservoir, portal of exit, means of transmission, portal of entry, and susceptible host (see *Figure 1*).

Effective infection control strategies prevent disease transmission by interrupting one or more links in this chain.

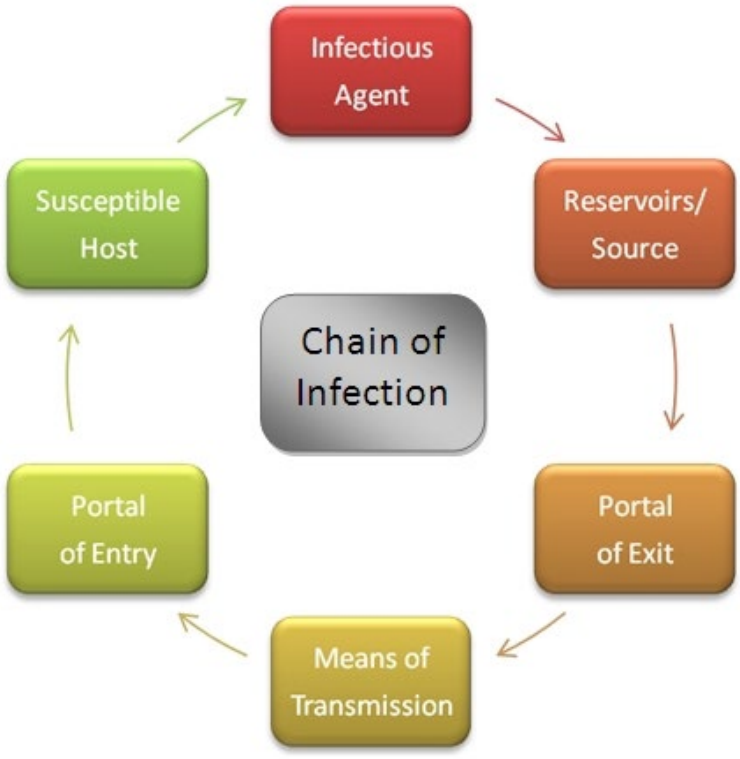


Figure 1. Illustration of the six links included in the Chain of Infection

The Pathogen

The presence of a pathogen, or **infectious agent**, is required for an infection to occur. Pathogens are found in the patient, healthcare workers, and the environment; there are countless microorganisms. Common pathogens include:

- **Bacteria** – single celled microorganisms (e.g., TB, MRSA, streptococcus, E. Coli, pseudomonas, C. difficile).
- **Viruses** – submicroscopic, need a host to grow (e.g., herpes, influenza, HIV, HBV, HCV, varicella zoster).
- **Fungi** – molds and yeasts that live on plants and animals (e.g., candida, aspergillus, cryptococcus).
- **Parasites** – seen less frequently in healthcare (e.g., protozoa, tapeworm or roundworm and arthropods such as lice or ticks).

Prions are a less common pathogen. Prions are abnormal, pathogenic agents that are transmissible and are able to induce abnormal folding of specific normal cellular proteins called prion proteins that are found most abundantly in the brain. The functions of these normal prion proteins are still not completely understood. Prions are believed to be the pathogen that results in transmissible spongiform encephalopathies (TSEs) (CDC, 2015b).

Infectious agents differ in their growth and survival requirements. Knowledge of potential reservoirs enables healthcare workers to identify sources and focus on prevention and control efforts. The source is the place from which the pathogen passes to the host, through a vehicle of transmission. Other sources of infecting microorganisms can be the patient's own flora, which may be difficult to control, and inanimate environmental objects that have become contaminated, including equipment and medications.

Role and Nature of Reservoirs/Source

Any person, animal, arthropod, plant, soil or substance (or combination of these) in which an infectious agent normally lives and multiplies, on which it depends primarily for survival, and where it reproduces itself in such a manner that it can be transmitted to a susceptible host is considered a reservoir or source. All microorganisms have a reservoir and a source. They may be the same or they may be different.

Reservoirs are places where the organism lives and grows. Reservoirs can be animate such as people or animals, i.e., a healthcare worker or a wound in a patient. Reservoirs can be inanimate, that is, a non-living thing such as a used tourniquet, medical device or a bathtub.

Reservoirs can occur in an acute state or a carrier state. The *acute state* is characterized by clinical infectivity with clinical manifestation of the disease. Subclinical or asymptomatic infections are also reservoirs, but are less likely to be recognized as such. A *carrier* is a person who might have an organism present and may transmit an organism although she or he is not ill and has no symptoms. Carrier states can be chronic, convalescent, or intermittent. In the chronic carrier state, a chronic pathogen is present with no sign of the disease. In the convalescent state the acute infection is over; however, transmission of infection can continue. Transmission can also occur intermittently; the organism is shed only intermittently rather than continuously.

Portals of Exit

Portals of exit are the path by which pathogens leave a reservoir in the body. Portals of exit include:

A. Sites where the microorganism exits the infected person’s body

- Respiratory tract
- Gastrointestinal tract
- Genitourinary tract
- Skin/mucous membrane
- Transplacental
- Blood

B. Mechanisms
   - Drainage
   - Excretions
   - Secretions

Portals of Entry

Portals of entry are the means by which an infectious agent enters the susceptible host. Portals of entry include:

A. Sites where the microorganism is introduced onto or into the host
   - Respiratory tract
   - Gastrointestinal tract
   - Genitourinary tract
   - Non-intact skin/mucous membrane
   - Transplacental
   - Parenteral

B. Mechanisms by which the pathogen is carried on an object that breaks the integrity of the normal host defenses
   - Percutaneous injury
   - Vascular access and other invasive devices
   - Surgical incision
   - Permucosal contact

Modes of Transmission

Modes of transmission refer to any mechanism by which a pathogen is spread by a source or reservoir to a susceptible host (see *Figure 2)*. There are five (5) main routes of transmission:

1. Contact transmission (direct or indirect)
2. Droplet transmission
3. Airborne transmission
4. Common vehicle transmission
5. Vector-borne transmission

Figure 2. Illustration of the Modes of Transmission how a pathogen is spread (Droplets image courtesy of Public Health Image Library, 2018.)

1. **Contact transmission** (direct or indirect) is the most important and frequent mode of transmission of nosocomial infections in hospitals. It is divided into two subgroups: direct-contact transmission and indirect-contact transmission.

   Direct-contact transmission involves a direct body surface-to-body surface contact and physical transfer of microorganisms between a susceptible host and an infected or colonized person, such

as occurs when a healthcare provider turns a patient, gives a patient a bath, or performs other patient care activities that require direct personal contact. Direct-contact transmission also can occur between two patients, with one serving as the source of the infectious microorganisms and the other as a susceptible host. Direct contact involves any actual physical contact between people or person-to-person spread such as through shaking hands.

Indirect-contact transmission involves contact of a susceptible host with a contaminated intermediate object such as contaminated instruments, needles, or dressings, or contaminated hands that are not washed and gloves that are not changed between patients.

2. **Droplet transmission**, theoretically, is a form of contact transmission; however, the mechanism of transfer of the pathogen to the host is quite distinct from either direct- or indirect-contact transmission. Droplets are generated from the source person primarily during coughing, sneezing, or talking, and during the performance of certain procedures such as suctioning and bronchoscopy. Transmission occurs when droplets containing microorganisms generated from the infected person are propelled a short distance through the air and deposited on the host's conjunctivae, nasal mucosa, or mouth. Droplets do not remain suspended in the air, so special air handling and ventilation are not required to prevent droplet transmission. This mode of transmission must not be confused with airborne transmission.

3. **Airborne transmission** occurs by dissemination of either airborne droplet nuclei (i.e., small-particle residue of evaporated droplets containing microorganisms that remain suspended in the air for long periods of time) or dust particles containing the infectious agent. Microorganisms carried in this manner can be dispersed widely by air currents and may become inhaled by a susceptible host within the same room or over a longer distance from the source patient, depending on environmental factors; therefore, special air handling and ventilation are required to prevent airborne transmission.

   Both **droplet** and **airborne** transmission can happen simultaneously. For instance a cough can contain both droplets and smaller, lighter infectious particulates that can stay airborne for a longer period of time and may travel farther than larger, heavier droplets (Jones & Brosseau, 2015).

4. **Common vehicle** - the pathogen contaminates a material, product or substance that serves as an intermediate means by which an infectious agent is transported to two or more susceptible hosts. This can be items such as food, water, medications, devices, and equipment.

5. **Vector-borne** refers to a pathogen that is mechanically transmitted to a host by contact with insects, rodents or other vermin (e.g., a deer tick which spreads Lyme disease).

Susceptible Host

A susceptible host is a person who lacks effective resistance to a particular pathogenic microorganism. This lack of resistance is influenced by genetics, hormonal factors, nutritional factors, age, medical conditions, vaccination status and behavioral patterns.

Factors Influencing Outcome of Exposure

A variety of factors influence the outcome of an exposure:

- impairment of host defenses
- virulence of the pathogen
- size of the inoculum
- route of exposure
- duration of the exposure

Impairment of host defenses can include factors such as advanced age, prematurity, medication-induced immunosuppression or chronic disease. Host factors that influence the outcome of exposures include natural barriers and host immunity:

A. Natural barriers include:

- Intact skin, which is the first line of defense
- Respiratory cilia, which act to remove organisms that invade respiratory tract. Mucous serves to entrap and remove the pathogen
- Gastric acid acts upon bacteria
- Tears wash away potential contaminants from the eyes
- Flow of urine which can expel pathogens from the urinary tract
- Normal flora in the intestinal tract

B. Host immunity, includes:

- Inflammatory response (e.g., neutrophils)
- Humoral immunity (e.g., antibodies)
- Cell-mediated immunity (e.g., macrophages)
- T-cell lymphocytes

The virulence of the pathogenic organism also impacts the strength of the pathogen or power to cause infection. The more virulent the organism the less is needed to cause infection. The size of inoculum is another factor: the larger the size, the greater the exposure. The route of exposure impacts the outcome of an exposure. For example, if a healthcare worker is talking to a patient with hepatitis C, (which is spread through contact with blood and blood products), and the only route of exposure during this activity is through droplets, then the route of this exposure will likely have minimal possibility of infection to the healthcare worker. The duration of the exposure is another factor; typically the longer the exposure, the greater the risk of infection.

Environmental factors also play a role in transmission of infection. Contamination of the environment, work surfaces, equipment, etc., can play a significant role in the spread of infectious agents such as *C. difficile* in a healthcare setting.

Prevention: Breaking the "Chain of Transmission"

The recognition and control of reservoirs is the first step in breaking the chain of infection. Recognition includes observing for signs and symptoms of disease such as a fever, redness, pain, or swelling. Diagnostic testing, including laboratory, radiological and other testing or procedures may be helpful in detecting infection in a reservoir.

Controlling the reservoir can include antimicrobial therapy such as antibiotics. It can also include eliminating or controlling inanimate environments that support the growth of pathogenic organisms. For example, eliminating standing water where mosquitoes breed can help to decrease the numbers of adult mosquitoes that can spread the West Nile virus.

Consider all patients as potentially infectious. Use standard precautions at all times; implement other precautions as necessary. Standard precautions include:

1. Use of barriers such as personal protective equipment - gloves, masks, goggles, etc.
2. Safe injection practices
3. Respiratory protection/cough etiquette
4. Use of masks during spinal/epidural access procedures

Additional precautions, such as use of respirators, based on whether or not the pathogen can be transmitted by contact, droplet or airborne routes, may also be necessary.

For patients infected with infectious organisms other than bloodborne pathogens, early identification, prompt isolation or cohorting (placing patients with the same infection in the same room), and appropriate treatment are key to controlling the spread of infectious agents.

Other methods that limit the spread of pathogenic organisms in the healthcare setting include:

A. Environmental controls, including:
   - cleaning, disinfection and sterilization of patient care equipment (more in Element V)
   - housekeeping
   - appropriate ventilation which provides for adequate exchange patterns
   - waste management
   - linen and laundry management
   - sanitary food service areas

B. Support and protection of the host, including:
   - vaccination/immunization,(e.g., influenza, hepatitis B, MMR, pneumococcal, DPT, HIB, and polio)
   - pre- and post-exposure prophylaxis
   - protecting skin and immune system integrity

C. Public health strategies such as social distancing during pandemics and needle exchanges

D. Engineering and work practice controls (more in Element III)

E. Training and education of healthcare workers

F. **Hand hygiene**

   Hand hygiene is critical. **It is the single most effective means of reducing the spread of infection**.

The CDC (2002) reported that healthcare associated infections were reduced when hand antisepsis was performed more frequently by hospital personnel. Multiple research studies have documented that the prevalence of healthcare associated infections decreased as adherence to recommended hand hygiene measures improved. Guilhermetti, Hernandes, and Fudushique (2001) reported that the transient carriage on the hands of healthcare workers is the most frequent mode of transmission of methycillin-resistant *Staphylococcus aureus* (MRSA) in hospitals. Drusin, Ross, Rhodes, Krauss, and Scott (2000) studied an outbreak of nosocomial ringworm in a neonatal intensive care unit. It was discovered that a nurse, who had a rash on her hands that was infected with *Microsporum canis* due to a scratch from her cat, was the index case. She was spreading the infection through direct contact with patients.

Transmission of healthcare associated pathogens from one patient to another via the hands of healthcare workers requires the following sequence of events (CDC, 2002):

- Organisms present on the patient's skin or those shed onto inanimate objects in close proximity to the patient must be transferred to the hands of healthcare workers.
- These organisms must then be capable of surviving for at least several minutes on the hands of personnel.
- Next, hand washing or hand antisepsis by the worker must be inadequate or omitted entirely, or the agent used for hand hygiene must be inappropriate.
- Finally, the contaminated hands of the caregiver must come in direct contact with another patient, or with an inanimate object that will come into direct contact with the patient.

Hand hygiene is intended to decrease colonization with transient flora and includes hand washing and hand disinfection. The major groups of microorganisms found on the skin are either organisms that normally reside on it (resident flora) or they are contaminants (transient flora). Unless introduced into body tissues by trauma or medical devices such as intravenous catheters, the pathogenic potential of the resident flora is low. Transient flora, which are easily removed by hand hygiene, cause most hospital infections resulting from cross-transmission (Pittet, 2001).

Healthcare associated pathogens can be recovered not only from infected or draining wounds, but also from frequently colonized areas of normal, intact patient skin. The perineal or inguinal areas are usually most heavily colonized, but the axillae, trunk, and upper extremities (including the hands) also are frequently colonized (CDC, 2002). However, even in the execution of "clean activities" such as touching a patient's hand, lifting a patient, taking a pulse, temperature or blood pressure reading can put the healthcare worker at risk for contamination with the following organisms: *Staphylococcus aureus, Proteus mirabilis, Klebsiella spp., Acinetobacter spp., Enterococci, and Clostridium difficile*, among others (CDC, 2002).

Barriers to Hand Hygiene

Despite this elemental intervention, one that most healthcare professionals learned early in their educational programs, many healthcare workers do not attend to strict hand hygiene procedures. A variety of factors influence adherence to hand hygiene procedures.

Although there are documented barriers to hand hygiene, many efforts have been made to improve access to hand hygiene products and educating healthcare workers on the need to clean their hands to prevent the spread of infection to themselves and patients.

Please visit https://www.cdc.gov/handhygiene/providers/index.html (CDC, 2018b) to review valuable information provided by the CDC. Hand hygiene guidelines, when and how to perform hand hygiene, and research and data are some of the resources available to the health care provider.

Hand Hygiene and Hand Washing Terms

A variety of hand hygiene and hand washing agents are available and a variety of terms are used to describe their benefits. They include (CDC, 2002):

Alcohol-based hand rub:	An alcohol-containing preparation designed for application to the hands for reducing the number of viable microorganisms on the hands. In the United States, such preparations usually contain 60%-95% ethanol or isopropanol.
Antimicrobial soap:	Soap (e.g., detergent) containing an antiseptic agent.
Antiseptic agent:	Antimicrobial substances that are applied to the skin in order to reduce the number of microbial flora. Examples include alcohols, chlorhexidine, chlorine, hexachlorophene, iodine, chloroxylenol (PCMX), quaternary ammonium compounds, and triclosan.
Antiseptic hand-rub:	Applying an antiseptic hand-rub product to all surfaces of the hands to reduce the number of microorganisms present.
Antiseptic hand-wash:	Washing hands with water and soap or other detergents containing an antiseptic agent.

Cumulative effect:	A progressive decrease in the numbers of microorganisms recovered after repeated applications of a test material.
Decontaminate hands:	To reduce bacterial counts on hands by performing antiseptic hand-rub or antiseptic hand-wash.
Detergent:	Detergents (surfactants) are compounds that possess a cleaning action. They are composed of both hydrophilic and lipophilic parts and can be divided into four groups: anionic, cationic, amphoteric, and nonionic detergents. Although products used for hand washing or antiseptic hand-wash in healthcare settings represent various types of detergents, the term "soap" is used to refer to such detergents in this guideline.
Hand antisepsis:	Refers to either antiseptic hand-wash or antiseptic hand-rub.
Hand hygiene:	A general term that applies to hand washing, antiseptic hand-wash, antiseptic hand-rub, or surgical hand antisepsis.
Hand washing:	Washing hands with plain (non-antimicrobial) soap and water.
Persistent activity:	The prolonged or extended antimicrobial activity that prevents or inhibits the proliferation or survival of microorganisms after application of the product. This activity may be demonstrated by sampling a site several minutes or hours after application and demonstrating bacterial antimicrobial effectiveness when compared with a baseline level. This property also has been referred to as "residual activity." Both substantive and non-substantive active ingredients can show a persistent effect if they substantially lower the number of bacteria during the wash period.
Plain soap:	Detergents that do not contain antimicrobial agents or contain low concentrations of antimicrobial agents.
Substantivity:	Substantivity is an attribute of certain active ingredients that adhere to the stratum corneum (i.e., remain on the skin after rinsing or drying) to provide an inhibitory effect on the growth of bacteria remaining on the skin.
Surgical hand antisepsis:	Antiseptic hand-wash or antiseptic hand-rub performed preoperatively by surgical personnel to eliminate transient and reduce resident hand flora. Antiseptic detergent preparations often have persistent antimicrobial activity.
Visibly soiled hands:	Hands showing visible dirt or visibly contaminated with proteinaceous material, blood, or other body fluids (e.g., fecal material or urine).
Waterless antiseptic agent:	An antiseptic agent that does not require use of exogenous water. After applying such an agent, the hands are rubbed together until the agent has dried.

The objective of **hand washing** is to prevent cross-transmission by removing dirt and loose transient flora. **Hygienic hand-wash** refers to the same procedure when an antiseptic agent is added to the detergent**. Hand disinfection** refers to the use of an antiseptic solution to clean the hands, either medicated soap or alcohol. Some experts refer to the action of "degerming" as the use of detergent-based antiseptics or alcohol. Hygienic hand-rub is rubbing hands with a small quantity (2 to 3 ml) of a highly effective, fast-acting antiseptic agent (Pittet, 2001).

Hand hygiene with non-medicated soap and water removes some transient flora mechanically; preparations containing antiseptic or antimicrobial agents not only remove flora mechanically but also chemically kill contaminating and colonizing flora, with long-term residual activity. Alcohol-based preparations have more rapid action than products containing other antiseptics (e.g., chlorhexidine gluconate or providone iodine) (Pittet, 2001).

Because alcohols have excellent activity and the most rapid bactericidal action of all antiseptics, they are the preferred agents for hygienic hand-rubs, so-called "waterless hand disinfection." In addition, alcohols are more convenient than aqueous solutions for hygienic hand rubs because of their excellent spreading quality and rapid evaporation. At equal concentrations, n-propanol is the most effective alcohol and ethanol the least. Alcohol-based hand-rubs are well suited for hygienic hand disinfection for the following reasons:

- Optimal antimicrobial spectrum (active against all bacteria and most clinically important viruses, yeasts, and fungi)
- No wash basin necessary for use and easy availability at bedside
- No microbial contamination of healthcare workers' clothing
- Rapidity of action

After extensive reduction following hand disinfection with an alcohol preparation, it takes the resident skin flora several hours to become completely restored. Since alcohol alone has no lasting effect, another compound with antiseptic activity may be added to the disinfection solution to prolong the effect (Pittet, 2001).

The selection of correct hand washing agents should be based on the task performed. In non-patient areas, plain soap is satisfactory. This provides for the physical removal of transient flora; it does not kill microorganisms, but suspends them so they are easily washed or rinsed off. In high-risk areas, maximum reduction of bacterial counts is needed, so an antimicrobial or antiseptic agent must be used to reduce colonizing flora.

Hand Hygiene Efficacy

Factors which influence hand hygiene efficacy include:

- Mechanical friction is needed to remove gross contamination.
- Warm running water rinses away loosened debris and organisms.
- Soap removes matter by emulsifying oils that hold organisms. Soap comes in many forms and provides the opportunity to reduce exposures; however, soap can also be a source of potential contamination or cross-contamination. Bars of soap might sit in pools of stagnating water. Small bars and disposal of used bars is recommended. Refillable soap dispensers should not be “topped off." They must be emptied and cleaned before refilling. Disposable, non-refillable dispensers are preferable.
- Avoid using agents which cause excessive dryness, cracking and dermatitis, as this discourages workers from washing hands as often, as well as providing a break in intact skin and increasing the risk of infection spread.
- Locate sinks close to area where care is delivered.
- Have designated hand-washing sinks.
- Have foot, knee or elbow pedals when possible.
- ***Wash before and after any contact with the patient even if gloves are worn***.
- Wash hands whenever they become soiled with potentially infectious material.
- Wash after touching contaminated matter.

- Use waterless, alcohol-based agents when water is unavailable.
- Wash hands after removing gloves.

During Routine Patient Care: When to use Soap and water or alcohol-based hand sanitizer	
Wash with soap and water	**Use an Alcohol-Based Hand Sanitizer**
• When hands are visibly dirty • After known or suspected exposure to *Clostridium difficile* if your facility is experiencing an outbreak or higher endemic rates • After known or suspected exposure to patients with infectious diarrhea during *norovirus* outbreaks • If exposure to *Bacillus anthracis* is suspected or proven • Before eating • After using a restroom	• For everything else  (CDC, 2018b)

Image "Clean Hands Count", courtesy of CDC, Clean Hands Count Campaign, 2018.

Isolation Precautions

According to the Healthcare Infection Control Practices Advisory Committee (HICPAC), which is a federal advisory committee made up of 14 external infection control experts, there are two tiers of isolation precautions (Siegel et al., 2007): standard precautions and transmission-based precautions.

Standard Precautions (Tier One)

Precautions designed for the care of all patients in hospitals, regardless of their diagnosis or presumed infection status. Implementation of these "Standard Precautions" is the primary strategy for the prevention of healthcare associated transmission of infectious agents among healthcare personnel and the patients with whom they work. The second tier includes precautions designed only for the care of specified patients.

Standard Precautions expands and synthesizes the major features of Universal Precautions (Blood and Body Fluid Precautions designed to reduce the risk of transmission of bloodborne pathogens) and Body Substance Isolation (designed to reduce the risk of transmission of pathogens from moist body substances) and applies them to all patients receiving care in hospitals, regardless of their diagnosis or presumed infection status.

Standard Precautions apply to:

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

Standard Precautions are designed to reduce the risk of transmission of microorganisms from both recognized and unrecognized sources of infection in hospitals. Because a healthcare worker cannot

always know when a patient's body fluids are infectious, Standard Precautions should be used with all patients in the healthcare setting, regardless of their infection status. Standard Precautions are designed to prevent unprotected contact between the healthcare worker and blood and all body fluids whether or not they contain visible blood.

When a specific diagnosis is made, additional precautions are taken based on how the specific disease is transmitted.

New additions to Standard Precautions:

1. **Respiratory Hygiene/Cough Etiquette, which includes:**

    - Education of healthcare facility staff, patients, and visitors;
    - Posted signs, in language(s) appropriate to the population served, with instructions to patients and accompanying family members or friends;
    - Protective measures (e.g., covering the mouth/nose with a tissue when coughing and prompt disposal of used tissues, placing a surgical mask on the coughing person when tolerated and appropriate);
    - Hand hygiene after contact with respiratory secretions; and
    - Spatial separation, ideally greater than three feet, of persons with respiratory infections in common waiting areas when possible.
    - Droplet and aerosol transmission precautions including adequate respiratory protection.

2. **Safe Injection Practices**

    - Single dose vials are preferred over multiple dose vials; and a single, disposable needle or syringe must be used to administer medication to individual patients.

3. **Special Lumbar Puncture Procedures**

    - Use of masks for insertion of catheters or injection of material into spinal or epidural spaces via lumbar puncture procedures (e.g., myelogram, spinal or epidural anesthesia).

Transmission-Based Precautions (Tier Two)

Transmission-based Precautions are for patients known or suspected to be infected with highly transmissible or epidemiologically important pathogens spread by airborne or droplet transmission or by contact with dry skin or contaminated surfaces. Additional precautions beyond Standard Precautions are needed to interrupt transmission in hospitals. The primary strategy for the prevention of healthcare-associated transmission of infectious agents begins with Standard Precautions among patients and healthcare personnel.

There are **three** types of Transmission-based Precautions:

1. Airborne Precautions
2. Droplet Precautions
3. Contact Precautions

They may be combined for diseases that have multiple routes of transmission. When used either singularly or in combination, they are to be used *in addition* to Standard Precautions.

Airborne Precautions are designed to reduce the risk of airborne transmission of infectious agents. Airborne Precautions apply to patients known or suspected to be infected with epidemiologically important pathogens that can be transmitted by the airborne route.

In addition to Standard Precautions, use Airborne Precautions or the equivalent for patients known or suspected to be infected with microorganisms transmitted by airborne droplet nuclei (i.e., small-particle residue [5 µm or smaller in size] of evaporated droplets containing microorganisms that remain suspended in the air and that can be dispersed widely by air currents within a room or over a long distance).

Place the patient in a private room that has:

- Monitored negative air pressure in relation to the surrounding areas.
- Twelve (12) air changes per hour. (Six [6] air changes per hour in buildings older than, or renovated prior to 1994.)
- Appropriate discharge of air outdoors or monitored high-efficiency filtration of room air before the air is circulated to other areas in the hospital.

Keep the room door closed and the patient in the room. When a private room is unavailable, place the patient in a room with a patient who has an active infection with the same microorganism, but with no other infection (unless otherwise recommended). When a private room is not available and cohorting is not desirable, consultation with infection control professionals is advised before patient placement.

Note: **Cohorting** is another system in which individuals infected with the same organism room together. It is important to transfer or discharge infected individuals if unable to provide adequate precautions or isolation strategies. Segregation of symptomatic individuals is another approach to preventing the spread of infection. Patients with same diseases transmitted exclusively or in part by airborne route, patients who soil articles in the environment with body substances and patients colonized or infected with organisms that are multidrug resistant may be subject to this kind of isolation.

Hospitals and other healthcare organizations have specific policies and procedures regarding the various precautions and isolations systems. Healthcare workers must know and follow their agency's policies and procedures. Infection control departments in healthcare settings are generally available for consultation.

Wear respiratory protection, an N95 respirator or a Powered Air Purifying Respirator (PAPR), when entering the room of a patient with known or suspected infectious pulmonary tuberculosis. An N95 respirator means that the respirator screens out 95 percent of the particles. An important consideration is the “tightness and the fit” because that determines the overall effectiveness of the respirator. “Fit testing” is required to assure that a proper fit has been achieved and must be repeated on an annual basis or with any facial shape changes. As with “face masks,” most N95 respirators are a single use item and should be discarded after use (NIOSH, 2004).

There is the rare possibility that a widespread, airborne pathogenic pandemic could result in a shortage of disposable N95 respirators. In that case, NIOSH has issued guidance for the limited reuse of disposable N95 respirators. This guidance can be found at: https://www.cdc.gov/niosh/topics/hcwcontrols/recommendedguidanceextuse.html. However, the safest and most efficient way to deal with a potential shortage of disposable respirators is to have readily available reusable elastomeric respirators. According to NIOSH, "They are a cost-efficient and sustainable alternative when the demand for disposable respirators is excessive" (Bach, 2017). Elastomeric respirators, when properly fit tested and equipped with N95 cartridges, provide protection equal to or better than disposable N95 respirators. The CDC offers more information on the differences between surgical masks, disposable N95 respirators, elastomeric respirators and powered air purifying respirators (PAPRs). It can be found at: https://blogs.cdc.gov/niosh-science-blog/2017/07/06/elastomerics/. Please note that respirators with exhalation valves cannot be used in sterile field areas.

The OSHA Respiratory Protection Standard (OSHA 29 CFR 1910.134) requires that the employer have a written respiratory protection program if employees may be required to wear respirators. Note that

surgical and procedure masks are not considered respirators and, therefore, do not require fit testing and are not covered under the Respiratory Protection Standard. N95 respirators and respirators providing higher levels of protection, such as PAPRs, are covered under the standard.

Susceptible persons should not enter the rooms of patients known or suspected to have measles (rubeola) or varicella (chickenpox) if other immune caregivers are available. If susceptible persons must enter the room of a patient known or suspected to have measles or varicella, they should wear respiratory protection (at minimum an N95 respirator). Persons immune to measles or varicella need not wear respiratory protection.

Limit the movement and transport of the patient from the room to essential purposes only. If transport or movement is necessary, minimize patient dispersal of droplet nuclei by placing a surgical mask on the patient, if possible.

Droplet Precautions are designed to reduce the risk of droplet transmission of infectious agents.

In addition to Standard Precautions, use Droplet Precautions, or the equivalent, for a patient known or suspected to be infected with microorganisms transmitted by droplets (large-particle droplets [larger than 5 µm in size] that can be generated by the patient during coughing, sneezing, talking, or during the performance of aerosolizing procedures).

Place the patient in a private room. When a private room is unavailable, place the patient in a room with a patient who has an active infection with the same microorganism, but with no other infection. When a private room is not available and cohorting is not achievable, maintain spatial separation of at least three feet between the infected patient and other patients and visitors. Special air handling and ventilation are not necessary, and the door may remain open.

In addition to wearing a mask as outlined under Standard Precautions, wear a mask when working within three feet of the patient. The mask is generally donned upon room entry.

Limit the movement and transport of the patient from the room to essential purposes only. If transport or movement is necessary, minimize patient dispersal of droplets by masking the patient, if possible.

Contact Precautions are designed to reduce the risk of transmission of epidemiologically important microorganisms by direct or indirect contact. Contact Precautions apply to specified patients known or suspected to be infected or colonized (presence of microorganism in or on the patient but without clinical signs and symptoms of infection) with epidemiologically important microorganisms than can be transmitted by direct or indirect contact.

In addition to Standard Precautions, use Contact Precautions or the equivalent for specified patients known or suspected to be infected or colonized with epidemiologically important microorganisms that can be transmitted by direct contact with the patient (hand or skin-to-skin contact) that occurs when performing patient care activities requiring touching the patient's skin, or indirect contact by touching contaminated environmental surfaces or patient care items in the patient's environment.

Place the patient in a private or single-patient room. When a single-patient room is not available, consultation with infection control personnel is recommended (Siegel et al., 2007) to assess the various risks associated with other patient placement options (e.g., cohorting, keeping the patient with an existing roommate who has the same microorganism, but no other infection). When a private room is not available and cohorting is not achievable, consider the epidemiology of the microorganism and the patient population when determining patient placement. Remember, consultation with infection control professionals is advised before patient placement.

In addition to wearing gloves as outlined under Standard Precautions, wear gloves (clean, non-sterile gloves are adequate) when entering the room. During the course of providing care for a patient, change gloves after having contact with infective material that may contain high concentrations of microorganisms

(e.g., fecal material and wound drainage). Remove gloves before leaving the patient's room and wash hands immediately with an antimicrobial agent or a waterless antiseptic agent. After glove removal and hand washing, ensure that hands do not touch potentially contaminated environmental surfaces or items in the patient's room to avoid transfer of microorganisms to other patients or environments.

In addition to wearing a gown as outlined under Standard Precautions, wear a gown (a clean, non-sterile gown is adequate) when entering the room if you anticipate that your clothing will have substantial contact with the patient, environmental surfaces, items in the patient's room, or if the patient is incontinent or has diarrhea, an ileostomy, a colostomy, or wound drainage not contained by a dressing. Remove the gown before leaving the patient's environment. After gown removal, ensure that clothing does not contact potentially contaminated environmental surfaces to avoid transfer of microorganisms to other patients or environments.

(See Element IV PPE for information on safe PPE donning and doffing techniques.)

Limit the movement and transport of the patient from the room to essential purposes only. If the patient is transported out of the room, ensure that precautions are maintained to minimize the risk of transmission of microorganisms to other patients and contamination of environmental surfaces or equipment.
The CDC has published guidelines for isolation precautions and prevention of transmission of infectious agents in the healthcare setting (Siegel et al., 2007).

When possible, dedicate the use of noncritical patient-care equipment to a single patient (or cohort of patients infected or colonized with the pathogen requiring precautions) to avoid sharing between patients. If the use of common equipment or items is unavoidable, then adequately clean and disinfect them before use for another patient. As always, refer to your healthcare facility’s policies related to isolation protocols.

✓ Things to Remember

Infection Transmission and the Chain of Infection →

Six elements or links in the chain are needed for an infection to occur.

1. Pathogen or infectious agent
2. Reservoir
3. Portal of exit
4. Portal of entry
5. Mode of transmission
6. Susceptible host

Transmission of infection through various means →

- Direct contact – touching contaminated area
- Indirect contact from person-to-person by an object (e.g., a drinking glass)
- Droplets – coughing, sneezing, exhaling
- Airborne – travel through the air by themselves or on dust particles
- Common vehicle – many people through one source (e.g., food source)
- Vector-borne – spread by insects

Prevention: Breaking the Chain →

- Hand hygiene - **the single most effective means of reducing the spread of infection**
- Barrier protection – personal protective equipment (Element IV)
- Sterilization or disinfection of patient equipment (Element V)
- Environmental practices (Element III)
- Protection of the host – immunizations/vaccinations
- Isolation/cohorting
- Engineering and work practice controls
- Training and education of healthcare workers

Standard Precautions (Element II) along with Transmission-Based Precautions →

Standard Precautions

- All blood, body fluids, secretions, excretions (except sweat), non-intact skin, and mucous membranes may contain transmissible infectious agents.
- Prevention practices that apply to **all** patients, regardless of suspected or confirmed infection status, in any setting in which healthcare is delivered.

Transmission-Based

- Airborne Precautions
- Droplet Precautions
- Contact Precautions

Element III: Engineering and Work Practice Controls

This third element of the New York State mandatory infection control training addresses the use of engineering and work practice controls to reduce the opportunity for patient and healthcare worker exposure to potentially infectious material.

Element III: Objective

At the end of this element you will be able to:

- Identify engineering controls the healthcare professional can incorporate to reduce the risk of healthcare professional and patient exposure to potentially infectious material.
- Describe high-risk practices and procedures that increase the opportunity for healthcare worker and patient exposure to potentially infectious material.
- Describe work practices, such as safe injection practices, that decrease the risk of exposure to infectious material.

Engineering and Work Practice Controls

All hazardous conditions, including the risk of infectious pathogens, are best controlled through the implementation of engineering and work practice controls.

Engineering controls are interventions that, by design and function, remove or isolate the hazard from the healthcare worker and patient. Engineering controls used in a healthcare setting for infection control include, but are not limited to: puncture-resistant sharps disposal containers, needleless systems, safer needle devices such as self-sheathing needles and retractable syringes, and ventilation systems that filter and/or draw contaminated air away from patients and workers.

Work practice controls include policies, procedures and training regarding work practices that reduce or eliminate the likelihood of exposure by altering the manner in which a task is performed. Work practice controls used in a healthcare setting for infection control include, but are not limited to: hand hygiene, safe injection practices, and training on the proper use of engineering controls and selection of personal protective equipment.

In this section we will review the use of engineering and work practice controls as they relate to bloodborne pathogens and tuberculosis.

Bloodborne Pathogens

Exposure to bloodborne pathogens can happen through percutaneous exposure, via mucous membranes or non-intact skin or through parenteral exposure.

Percutaneous exposure typically occurs through handling/disassembly/disposal/reprocessing of contaminated needles or other sharp objects or when performing procedures where there is poor visualization.

Mucous membrane/non-intact skin exposure occurs when blood or body fluids come in contact with the eyes, nose, mouth or other mucous membranes through contact with contaminated hands, contact with open skin lesions/dermatitis, or splashes or sprays of blood or body fluids.

Parenteral exposure can occur through injection with infectious material during administration of parenteral medication, sharing of blood monitoring devices or infusion of contaminated blood products or organ transplant.

Evaluation/Surveillance of Exposure Incidents

In the event that an exposure incident occurs, or when assessing the possibility of exposure, the following steps should be taken:

- Identify who is at risk for exposure
- Identify what devices can cause an exposure including devices that have higher disease transmission and/or injury rates (e.g., hollow bore needles, butterfly IV catheters, devices with recoil action, blood glucose monitoring devices)
- Identify areas/settings where exposures occur
- Identify circumstances by which exposures occur

Percutaneous Exposure

Although regulations such as the OSHA Bloodborne Pathogens Standard have resulted in a dramatic decrease in BBP transmission, percutaneous exposure to bloodborne pathogens continues to occur at an alarming rate. The Centers for Disease Control estimates that approximately 385,000 healthcare workers incur a sharps-related injury in U.S. hospitals each year (CDC, 2011). Many additional sharps injuries may go unreported.

Healthcare workers use many types of needles and other sharp devices and equipment to provide patient care. Most reported needlestick injuries involve nursing staff, but laboratory staff, physicians, housekeepers, and other healthcare workers are also injured (NIOSH 2011). A study by Makary et al. (2007) concluded that needlestick injuries among surgical residents are still common and frequently underreported. They suggest that not only are strategies for reduction of injuries necessary, but improved reporting is needed.

Despite the frequency of percutaneous injuries, data from hospitals participating in the CDC National Surveillance System for Hospital Healthcare Workers (NaSH) and from hospitals included in the Exposure Prevention Information Network (EPINet) research database (from the IHCWSC at the University of Virginia) show that injures are closely related to certain devices and pose an increased risk of bloodborne pathogen exposure.

Figure 3 shows the extent to which hollow-bore needles and other sharp devices contributed to the burden of percutaneous injuries in participating NaSH hospitals (NIOSH, 2011).

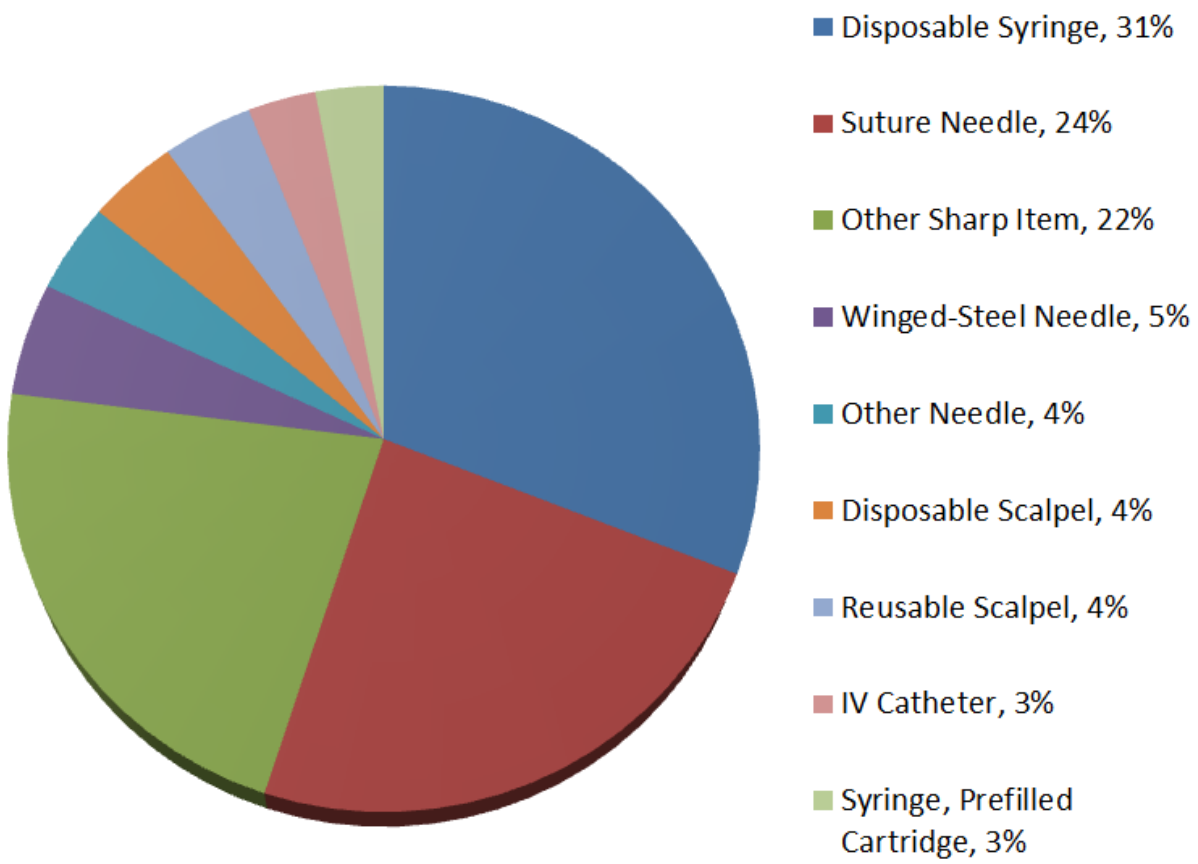


Figure 3. Devices associated with percutaneous injuries in participating NaSH hospitals included in the EPINet database hospitals. Adapted from *Sharps injuries,* NIOSH (2011). Retrieved from http://www.cdc.gov/niosh/stopsticks/sharpsinjuries.html with permission.

The reduction in percutaneous injury rates can be attributed to a number of factors, foremost is the 1999 Revision of the OSHA Bloodborne Pathogen Standard, and the 2000 Needlestick Safety and Prevention Act. As mentioned earlier in this course, OSHA has issued citations to healthcare facilities for not utilizing engineering controls in the form of sharps with engineered sharps injury protections that remove or isolate bloodborne pathogen hazards from the workplace when injecting medications or utilizing catheters or other medical devices. These citations, with their accompanying fines, have contributed to the reduction in percutaneous injuries (OSHA, 2012).

Additional factors that may have contributed to the decrease in needlestick injuries are increased education of healthcare workers related to the risks associated with sharps injuries, and increased training in the proper use of safety devices (Perry & Jagger, 2003).

Engineering Controls - Safer Devices: Desirable Characteristics

Improved engineering controls are often among the most effective approaches to reducing occupational hazards related to infection control. Such controls include eliminating the unnecessary use of needles and implementing devices with safety features. A number of sources have identified the desirable characteristics of safety devices (Chiarello, 1995; ECRI Institute, 1999; FDA, 1992; Fisher, 1999; Jagger,

Hunt, Brand-Elnagger, & Pearson, 1988; FDA, NIOSH & OSHA, 1999; Pugliese, 1998; Quebbeman & Short, 1995).

These characteristics include the following:

- The device is needleless.
- The safety feature is an integral part of the device.
- The device preferably works **passively** (i.e., it requires no activation by the user). If user activation is necessary, the safety feature can be engaged with a single-handed technique and allows the worker's hands to remain behind the exposed sharp.
- The user can easily tell whether the safety feature is activated.
- The safety feature cannot be deactivated and remains protective through disposal.
- The device performs reliably.
- The device is easy to use and practical.
- The device is safe and effective for patient care.

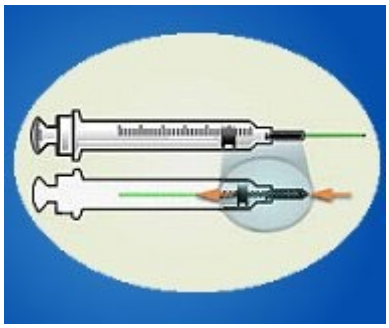


Figure 4. Syringe with a Retractable Needle
Adapted from: Occupational Safety & Health Administration with permission.

The International Sharps Injury Prevention Society (ISIPS) (2018) provides lists of devices that are designed to prevent percutaneous injury and exposures to bloodborne pathogens in healthcare settings at their website: http://www.isips.org/page/safety_product_list

Although each of these characteristics is desirable, some are not feasible, applicable, or available for certain healthcare situations. For example, needles will always be necessary where alternatives for skin penetration are not available. Also, in some cases a safety feature that requires activation by the user might be preferable to one that is passive. Each device must be considered on its own merit and ultimately on its ability to reduce the risk of exposure. The desirable characteristics listed above should serve only as a guideline for device design and selection.

Examples of safety device designs:

- Needleless connectors for IV delivery systems (a blunt cannula for use with pre-pierced ports and valved connectors that accept tapered or luer ends of IV tubing)
- Protected needle IV connectors (i.e., the IV connector needle is permanently recessed in a rigid plastic housing that fits over IV ports)
- Needles that retract into a syringe or vacuum tube holder
- Hinged or sliding shields attached to phlebotomy needles, winged-steel needles, and blood gas needles
- Protective encasements designed to receive an IV stylet as it is withdrawn from the catheter
- Sliding needle shields attached to disposable syringes and vacuum tube holders
- Self-blunting phlebotomy and winged-steel needles (a blunt cannula seated inside the phlebotomy needle is advanced beyond the needle tip before the needle is withdrawn from the vein)
- Retractable finger/heel-stick lancets
- Blunt suture needles
- Mechanical pipette

As illustrated by the examples of safety device designs, many devices with safety features decrease the frequency of needlestick injuries, but for many reasons they do not completely eliminate the risk. In some

cases the safety feature cannot be activated until after the needle is removed from the patient or the needle may be inadvertently dislodged during a procedure, thereby exposing the unprotected sharp. Some healthcare workers fail to activate the safety feature, or the safety feature may fail. With some devices, users can bypass safety features.

For example, even with some needleless IV delivery systems, a needle can be used to connect parts of the system. Understanding the factors that influence the safety of a device and promoting practices that will maximize prevention effectiveness are important components in prevention planning. Even devices with safety features must be utilized properly in order to be effective. Practices that the healthcare provider engages in that derail the safety device or ignore the safety device will be covered later, in the section of this course on work practice controls.

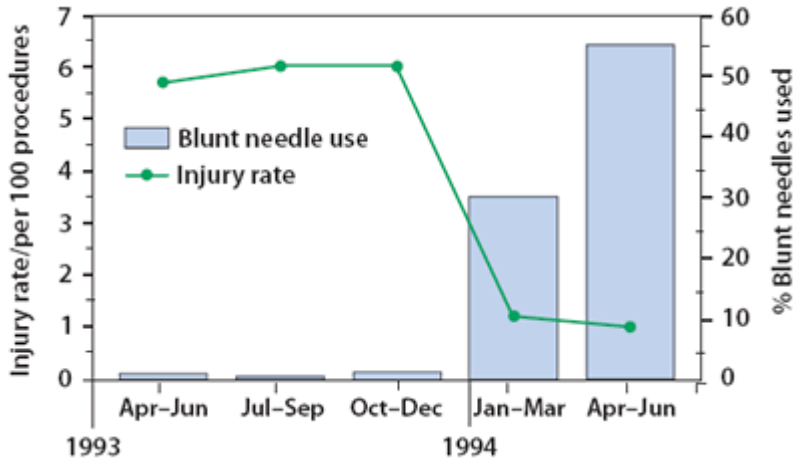


Figure 5. Demonstrates the marked decrease in the rate of percutaneous injury when blunt needle use increased for gynecological surgery.
Adapted from: *Blunt Needle Use and Injury Rates*. NIOSH, 2007. Retrieved from http://www.cdc.gov/niosh/docs/2008-101/pdfs/2008-101.pdf with permission.

Selecting/Evaluating Needle Devices

An increasing number and variety of needle devices with safety features are now available, but many of these devices have had only limited use in the workplace. Healthcare organizations and workers may find it difficult to select appropriate devices. Although these devices are designed to enhance the safety of healthcare workers, they should be evaluated to ensure that:

- the safety feature works effectively and is reliable
- the device is acceptable to the healthcare worker
- the device does not adversely affect patient care

As employers implement the use of needle devices with safety features, they can use several guidelines to select and evaluate these products. These guidelines are derived partly from publications and other resources offering plans, evaluation forms, and related information in this new area (Chiarello, 1995; ECRI, 1999; Fisher, 1999; Pugliese & Salahuddin, 1999; Service Employees International Union [SEIU], 1998). While healthcare settings are implementing the use of needle devices with safety features, they should seek help from the appropriate professional organizations, trade groups and manufacturers in obtaining information about devices and procedures suitable for specific settings (e.g., dental offices).

The major elements of a process for selecting and evaluating needle devices with safety features are listed below:

1. Form a multidisciplinary team that includes workers to:
    - Develop, implement, and evaluate a plan to reduce needlestick injuries in the institution.
    - Evaluate needle devices with safety features.
2. Identify priorities based on assessments of how needlestick injuries are occurring, patterns of devices used in the institution, and local and national data on injury and disease transmission trends. Give the highest priority to needle devices with safety features that will have the greatest impact on preventing occupational infection (e.g., hollow-bore needles used in veins and arteries).
3. When selecting a safer device, identify its intended scope of use in the healthcare facility and any special technique or design factors that will influence its safety, efficiency, and user acceptability. Seek published, Internet, or other sources of data on the safety and overall performance of the device.
4. Conduct a product evaluation, making sure that the participants represent the scope of eventual product users. The following steps will contribute to a successful product evaluation:
    - Train healthcare workers in the correct use of the new device.
    - Establish clear criteria and measures to evaluate the device with regard to both healthcare worker safety and patient care. (Sample safety feature evaluation forms are available from the CDC: http://www.cdc.gov/oralhealth/infectioncontrol/forms.htm)
    - Conduct onsite follow-up to obtain informal feedback, identify problems, and provide additional guidance.
5. Monitor the use of a new device after it is implemented to determine the need for additional training; solicit informal feedback on healthcare worker experience with the device (e.g., using a suggestion box); and identify possible adverse effects of the device on patient care.

Ongoing review of current devices and options will be necessary. As with any evolving technology, the process will be dynamic, and with experience, improved devices with safety features will emerge. As previously noted, ISIPS (2018) has compiled a list of safety-engineered sharps devices and other products designed to prevent occupational exposures to bloodborne pathogens. The list may be accessed here: http://www.isips.org/page/safety_product_list.

Although the focus in this section is on needle devices with safety features, sharps disposal containers are also important engineering controls to consider in a comprehensive needlestick injury prevention program.

Sharps Disposal Containers

NIOSH (1998) determined that sharps disposal containers can be evaluated on four criteria:

1. Functionality
2. Accessibility
3. Visibility
4. Accommodation

Functionality

Containers should remain functional during their entire usage. They should be durable, closable, leak resistant on their sides and bottoms, and puncture resistant under normal use and stresses imposed during storage, handling, installation, use, closure, and transport within the user facility before final disposal. If present, handles should be sufficiently sturdy to avoid breaking when the sharps disposal container is in use or during transportation before final disposal.

Closure mechanisms should be designed to minimize exposure to contents and injury to the hand during engagement of the closure mechanism or during transport. Once activated, the final closure mechanism of a sharps disposal container should be resistant to manual opening. Containers (including those designed to be kicked or wheeled) should be stable when placed on a horizontal surface and when used as described in the product labeling.

A sufficient quantity of sharps disposal containers should be available in the appropriate size and shape. Sharps disposal containers should be of sufficient size to accommodate the largest sharp used at the workstation it serves. Containers should also be shaped to accommodate the particular type of sharp that requires disposal. At a minimum, one sharps disposal container should be provided at each area where sharps are predictably generated or located. The OSHA Bloodborne Pathogens Standard requires that, “Sharps containers must be readily accessible and located as close as feasible to the area where sharps will be used.”

Accessibility

Containers should be accessible to workers who use or dispose of sharps devices, and they should be conveniently placed and (if necessary) portable within the workplace. The disposal opening should prevent spills of the contents (e.g., objects or liquid) while in use in the intended upright position.

Security may be a concern in some areas of facilities using sharps disposal containers. For instance, to prevent children and others from putting their hands into the containers, the facility should consider selecting containers with guards that prevent hands or fingers from entering the containers. Where safety features are added to restrict child access these features should not interfere with the worker's vision of the inlet opening.

Proper sharps disposal container location and placement should ensure that containers are readily visible and within easy horizontal reach of the user. Sharps disposal containers should have no obstructions to their accessibility. Injuries may result if sharps disposal containers are located in awkward, unsafe locations. Placement of the sharps disposal container outside the patient room also increases the possibility of injury.

Examples of inappropriate installation include:

- placement in the corners of rooms
- on the backs of room doors
- under cabinets
- on the insides of cabinet doors
- under sinks
- in areas where people might sit or lie beneath the container
- near light switches, room environmental controls, or utility system access ways
- near mail boxes
- where the container is subject to impact and dislodgement by pedestrian traffic, moving equipment, gurneys, wheelchairs, or swinging doors

Visibility

Containers should be plainly visible to the workers who use them. Workers should be able to see the degree to which the container is full, proper warning labels, and color-coding. Sharps disposal containers should carry a hazard warning labeling. Such labels and device colors should imply danger. Either the device color or a warning label should be visible to the user to warn of a potential hazard before sharps are placed in the container.

The current fill status of the container should be easily observable by the user before sharps are placed in the container. Container fill status should be obvious under lighting conditions at the installation location. OSHA's Bloodborne Pathogens Standard [29 CFR 1910.1030, section (g) (1)(I)(C)] contains very specific requirements about the labeling of containers for contaminated sharps: "These labels shall be fluorescent orange or orange-red or predominantly so, with lettering or symbols in a contrasting color."

Accommodation

Sharps disposal container designs should be accommodating to the user, the facility, and the environment. Accommodation is a measurement of ease of storage and assembly, minimal worker training requirements, ease of operation, and flexibility in design. Container design should promote one-handed disposal; containers should be designed so that they are simple to use. Mounting systems should be safe, durable, stable, cleanable, and (where appropriate) lockable. Placement in and removal from mounting systems should be simple and uncomplicated and should not compromise safety and security. To ensure proper fit and functioning of the container mounting system, mounting systems should be used only for the sharps disposal containers for which they were designed. Modifying mounting systems to accommodate containers for which they were not designed is not a safe or effective practice.

Splatter Shields

Some medical equipment, such as centrifuges, have a risk of splattering blood. Any equipment that may splatter blood or other bodily fluids should be equipped with engineering controls, such as a locked lid, to protect users from splatters.

Work Practice Controls

Some work practices **increase** opportunities for exposure to infectious material such as re-capping needles through a 2-handed technique.

Key to developing and implementing successful work practice controls is the evaluation and revision of the way in which high-risk tasks are performed.

Needlestick injuries have been associated with certain work practices such as:

- recapping
- transferring body fluids between containers
- failing to properly dispose of used needles in puncture-resistant sharps containers

Past studies of needlestick injuries have shown that 10% to 25% occurred when recapping a used needle (Krasinski, LaCouture, & Holzman, 1987; McCormick & Maki, 1981; McCormick, Meisch, Ircink, & Maki, 1991; Ruben, Norden, Rockwell, & Hruska, 1983; Yassi & McGill, 1991). Although recapping by hand has been discouraged for some time and is prohibited under the OSHA Bloodborne Pathogens Standard (29 CFR 1910.1030) unless no alternative exists, 3% of needlestick injuries in NaSH hospitals are still related to this practice (see *Figure 6*). Injury may occur when a healthcare worker attempts to transfer blood or other body fluids from a syringe to a specimen container, such as a vacuum tube, and misses the target.

Also, if used needles or other sharps are left in the work area or are discarded in a sharps container that is not puncture resistant, a needlestick injury may result.

Injuries from sharps devices are closely related to certain work practices that cause an increased risk of bloodborne pathogen exposure. Most needle stick injuries occur as a result of staff involved in fast-paced, stressful situations and sometimes remain unreported. The cost to institutions is enormous.

Activities associated with percutaneous injuries in EPINet hospitals can be seen in *Figure 6.*

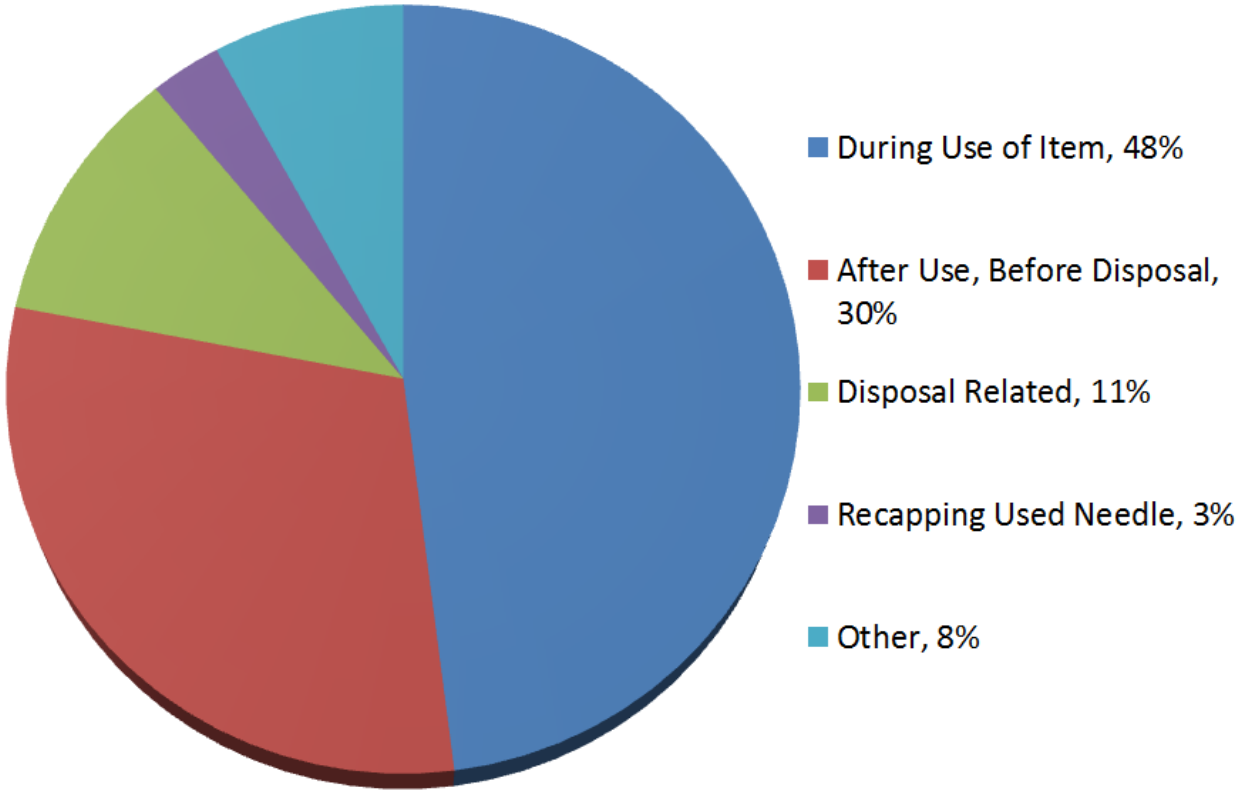


Figure 6. Activities associated with percutaneous injuries in EPINet hospitals, by % total percutaneous injuries. Adapted from *Sharps Injuries,* NIOSH (2011). Retrieved from http://www.cdc.gov/niosh/stopsticks/sharpsinjuries.html with permission.

Percutaneous exposures occur when the skin is pierced, causing a point of entry for blood or other infectious material. Percutaneous injury can occur through:

- handling
- disassembly
- disposal of blood, body fluids and contaminated items
- reprocessing of needles and other sharps
- manipulating needles and other sharps by hand
- recapping
- removing scalpel blades

During some procedures, such as blind suturing, there is opportunity for injury due to poor visualization, which can expose the patient as well as the healthcare worker. Whenever the non-dominant hand is

opposing or next to a sharp or when bone or metal fragments are present, the risk of percutaneous injury is greater.

Mucous membrane/non-intact skin exposures also increase the risk of exposure to infection. Direct contact with blood or body fluid can occur, as well as through splashing or sprays of blood or body fluid. The contact can result from contaminated hands, contact with open skin lesions or conditions like dermatitis.

Safe Injection Preparation and Administration Practices

Unsafe injection practices can result in patient exposure to hepatitis B and C as well as HIV/AIDS and can result in the necessity of having patients tested for these diseases. Malpractice suits against healthcare providers and referral of providers to state licensing boards for disciplinary actions have occurred because of the untoward exposure of patients to these infectious agents.

Frequently Asked Questions for Providers was released by the CDC (2008) to address the many problems relating to injection safety. Safe injection practices prevent harm to the recipient of the injection, the healthcare provider and the community. Since then, the CDC and the Safe Injection Practice Coalition (SIPC) have led a public health campaign to raise awareness among patients and healthcare providers about safe injection practices. The One and Only Campaign aims to eradicate outbreaks resulting from unsafe injection practice (One and Only Campaign, 2011).

Image courtesy of the One and Only Campaign (n.d.).

Healthcare providers are cautioned to remember that it is not necessary for blood to be visible on a used syringe, a blood glucose monitoring device, a multidose medication vial or on IV tubing for the risk of infection to be present. Infectious materials are not necessarily visible. All used injection supplies should be considered as potentially contaminated and handled as such, and they must be appropriately discarded in the designated sharps disposal containers.

Work practice controls for medication administration should include the following practices, and while some of these practices may seem like common sense, they can never be overstated:

- Medication rooms should be “clean” and nowhere close to areas that may be contaminated with infectious agents, blood or body fluids.
- A new sterile needle and syringe is required to draw up medication being careful not to have contact with any non-sterile item or environment.
- Aseptic technique and proper hand hygiene are required prior to handling any medication.
- When vials of medication have already been opened, the tops should be disinfected with alcohol prior to piercing.
- Needles or “spikes” should never be left in a medication vial or an IV bag/bottle for multiple uses as this creates a direct route for microorganisms to enter the vial.
- Vials of medication should be discarded when they expire or if there are any concerns that their sterility may have compromised.
- Medications should never be administered from the same syringe to more than one patient, even if it is administered into IV tubing and regardless of the distance from the IV insertion site. The

components in the syringe are directly or indirectly exposed to the patient's blood; therefore, they cannot be used for another patient.

- Syringes and needles that intersect through any port in the IV system also become contaminated and cannot be used for another patient or used to re-enter a non-patient specific multi-dose vial.
- Separation from the patient's IV by distance, gravity and/or positive infusion pressure does not ensure that small amounts of blood are not present in these items.
- Vials of medication should be dedicated to a **single** patient and should never be used for more than one patient even if they are multi-dose vials. The needle and syringe used to access the vial must be sterile. Remember to label and initial each multi-dose vial with the date it was first accessed and the date of expiration. On the expiration date, dispose the unused medication and discard the vial.
- Never combine leftover contents for later use.
- The practice of using a single common IV bag, of 0.9% saline, for example, as a flushing solution after administration of an IV medication, for more than one patient, is contraindicated.
- Capillary blood sampling devices that are packaged as single-patient use should never be used on more than one patient.
- Lancets should never be reused and a best practice is to consider the single use lancets that retract after puncture.
- Allows follow safe injection practices that prevent disease transmission from patient to healthcare worker.

Evaluation of Work Practice Controls

Work practice controls begin with an evaluation of the task being done to determine if it is being accomplished in the safest way possible. Work practice controls that help to reduce the risk of exposure to infections include efforts to modify procedures in order to avoid injury.

Some examples include:

- utilizing a safer device whenever possible
- avoiding unnecessary use of needles and other sharp objects
- avoidance of recapping unless absolutely medically necessary
- when recapping, use only a one-hand technique or safety device
- passing sharp instruments by use of designated "safe zones"
- disassembling sharp equipment by use of forceps or other devices
- using forceps, suture holders, or other instruments for suturing
- using forceps rather than fingers for holding tissue
- not leaving sharps on a field
- avoid leaving exposed sharps on patient procedure/treatment work surfaces, such as beds or bedside tables
- proper activation of safety features (never circumvent safety features)
- hand hygiene including appropriate circumstances in which alcohol-based sanitizers and soap and water should be used
- prompt cleaning of blood and body fluid spills (e.g., chest and wound drainage systems) including initial removal of bulk material followed by disinfection with an appropriate disinfectant

- containing the spill so that exposure to other individuals, equipment, or instruments is prevented until cleaned up
- wearing appropriate personal protective equipment (PPE) for spill cleanup – gloves are mandatory, gowns/aprons and face protection are used depending on extent of spill
- wiping up blood with disposable cloth, pour diluted bleach solution (1/4 cup household bleach to 1 gallon water) or other EPA approved agent directly onto the surface, let sit 10 minutes, then wipe with second disposable cloth
- bagging the medical waste according to policy and procedure in your facility; the bag should be labeled with biohazard sign
- worker training and education, for example, this New York State mandatory training in infection control for licensure or re-licensure of certain health professionals, as well as annual reviews in most healthcare facilities
- monitoring for safe work practices (this is an individual professional responsibility as well as the employer's responsibility)
- proper selection, donning, doffing and disposal of personal protective equipment
- proper protection of work surfaces in direct proximity to the patient

Identifying Those at Risk for Exposure

Healthcare Workers

Those at risk for exposure include healthcare workers who are performing a procedure, any assistants in a procedure, those who are near or are observing the performance of a procedure and ancillary personnel. Based on this definition, most of the more than 8 million healthcare workers in the United States are at risk for exposure.

Needlestick injuries represent one of the most prevalent risks of bloodborne pathogen exposure to healthcare workers. OSHA (2008) estimates that about 5.6 million workers in the healthcare industry and related occupations are at risk of occupational exposure to bloodborne pathogens, including human immunodeficiency virus (HIV), hepatitis B virus (HBV), hepatitis C virus (HCV), and others.

Between 1985 and 2013, 58 "documented" cases and 150 "possible" cases of occupational human immunodeficiency virus (HIV) transmission cases were reported to the Centers for Disease Control and Prevention (CDC, 2015). Nurses and laboratory technicians were most often involved.

Multiple studies have been conducted to estimate the rate of HIV transmission to workers who were exposed to HIV infected blood through percutaneous injury. Of 6,498 exposures studied, 21 infections followed, for an average transmission rate of 0.3% per injury. Additionally, studies have indicated that the risk of HIV transmission increased when the worker was exposed to a large quantity of blood from a patient, as indicated by (1) a visibly bloody device; (2) a procedure that involved placing a needle in a patient's vein or artery; or (3) a deep injury (NIOSH, 1999).

Table 1

Number of confirmed or possible cases of occupationally acquired HIV infection among health care workers reported to CDC — United States, 1985–2013

Occupation	Confirmed (N = 58)		Possible (N = 150)	
	No.	(%)	No.	(%)
Nurse	24	(41.4)	37	(24.7)
Laboratory technician, clinical	16	(27.6)	21	(14.0)
Physician, nonsurgical	6	(10.3)	13	(8.7)
Laboratory technician, nonclinical	4	(6.9)	—	—
Housekeeper/maintenance	2	(3.4)	14	(9.3)
Technician, surgical	2	(3.4)	2	(1.3)
Embalmer/morgue technician	1	(1.7)	2	(1.3)
Hospice caregiver/attendant	1	(1.7)	16	(10.7)
Respiratory therapist	1	(1.7)	2	(1.3)
Technician, dialysis	1	(1.7)	3	(2.0)
Dental worker, including dentist	—	—	6	(4.0)
Emergency medical technician/paramedic	—	—	13	(8.7)
Physician, surgical	—	—	6	(4.0)
Technician/Therapist, other	—	—	9	(6.0)
Other health care occupations	—	—	6	(4.0)

Abbreviation: HIV = human immunodeficiency virus.
Source: Division of HIV/AIDS Prevention, National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention, CDC.

Adapted from CDC (2015a) *Notes from the Field: Occupationally Acquired HIV Infection Among Health Care Workers — United States, 1985–2013*. Retrieved from http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6353a4.htm

Hepatitis B (HBV) infections have declined significantly due to widespread immunization of healthcare workers with the hepatitis B vaccine, the use of standard precautions and the OSHA Bloodborne Pathogens Standard. There has been more than a 95% reduction in new cases of HBV (CDC, 2006).

After a single needlestick exposure to HBV infected blood or body fluid, the rate of HBV transmission to susceptible healthcare workers ranges from 6-30%. This applies only to those healthcare workers who are not immunized against HBV or who have not had prior infection. Those persons who have antibodies to HBV either from pre-exposure vaccination or prior infection are not at risk.

However, the CDC identifies that only a fraction of healthcare workers are exposed to HBV through percutaneous injuries. While needlesticks are among the most common modes of HBV transmission, these exposures probably account for only a minority of HBV infections among healthcare workers. In several investigations of nosocomial hepatitis B outbreaks, most infected healthcare workers could not

recall an overt percutaneous injury, although in some studies, up to one third of infected healthcare workers recalled caring for a patient who was HBsAg-positive. In addition, HBV has been demonstrated to survive in dried blood at room temperature **on environmental surfaces for at least one week**. It is possible that HBV infections occurring in healthcare workers with no history of non-occupational exposure or occupational percutaneous injury might have resulted from direct or indirect blood or body fluid exposures that inoculated HBV into cutaneous scratches, abrasions, burns, other lesions, or on mucosal surfaces (CDC, 2011b).

The rate of infection in healthcare workers with hepatitis C (HCV) after needlestick or other percutaneous injury averages 1.8% (Alter, 1997). Currently, no vaccine exists to prevent HCV infection. Preventing needlestick injury is the best approach to reducing the risk of infection with HCV. According to the CDC, HCV is not transmitted efficiently through occupational exposures to blood. The average incidence of anti-HCV seroconversion after accidental percutaneous exposure from an HCV-positive source is 1.8%, with one study indicating that transmission occurred only from hollow-bore needles compared with other sharps. Transmission rarely occurs from mucous membrane exposures to blood, and no transmission in healthcare providers has been documented from intact or non-intact skin exposures to blood. Data are limited on survival of HCV in the environment. In contrast to HBV, the epidemiologic data for HCV suggest that environmental contamination with blood containing HCV is not a significant risk for transmission in the healthcare setting, with the possible exception of the hemodialysis setting where HCV transmission related to environmental contamination and poor infection control practices have been implicated (CDC, 2011b).

Exposure to needlestick injury increases the risk of acquiring serious or fatal infections. More than 20 other infections, other than HIV, HBV, and HCV, can be transmitted through needlesticks including: tuberculosis, syphilis, malaria, and herpes (CDC, 1998). The ramifications of such an injury touch every aspect of a person's life, physically, emotionally, professionally, socially, and spiritually.

Patients

In addition to healthcare workers, patients in healthcare settings are also at significant risk for infection. In the United States annually, approximately 2 million patients are infected in a healthcare delivery setting. Hospital Acquired, or Healthcare Associated, Infections (HAIs), are infections that patients acquire in hospitals, long-term care facilities, ambulatory settings and home care. These infections have treatment costs exceeding $4.5 billion (Bures, Fishbain, Uyehara, Parker, & Berg, 2000).

In the United States, the reporting of diseases is mandated by state laws and regulations. These laws and regulations, as to which infectious diseases are reportable, vary from state to state. The National Nosocomial Infections Surveillance (NNIS) System is a cooperative effort that began in 1970 between the CDC and participating hospitals to create a national nosocomial infections database. The database is used to:

- describe the epidemiology of nosocomial infections
- describe antimicrobial resistance trends
- produce nosocomial infection rates to use for comparison purposes

The data are collected uniformly by trained infection control personnel using surveillance protocols that target inpatients at high risk of infection and are reported routinely to CDC where they are aggregated into the database.

Participation in the NNIS System is voluntary and involves only acute care general hospitals in the United States. Long-term care facilities such as rehabilitation, mental health, and nursing homes are not included in the NNIS System. By law, CDC assures participating hospitals that any information that would permit identification of any individual or institution will be held in strict confidence.

General Public

Children, pets, and individuals who handle disposables and trash are also at risk of infection from used or contaminated sharps. The New York State Department of Health (NYSDOH, 2013) recommends reviewing the publication, *Safe Sharps Disposal*, to safeguard the public against accidental injury from sharps. The publication can be accessed at www.health.ny.gov/publications/0909.pdf. The DOH reminds the public that millions of individuals use sharps such as lancets and syringes, and IV therapy in the home, to provide for healthcare needs. It is imperative that healthcare personnel educate patients about safe handling techniques and proper disposal procedures. Sharps can be taken in a covered and puncture-proof container to any hospital or nursing home in the state of New York. In addition, your local public works department may have hazardous waste collection days or drop-off days – please contact your local services for more information.

Application of Controls to Reduce or Eliminate Hazards Related to Tuberculosis (TB)

The use of both engineering controls and work practice controls can help to reduce or eliminate the spread of TB.

Engineering controls related to the control of TB infection include:

- Use of negative pressure airborne infection isolation rooms (AIIRs)
- Isolation room ventilation rate of at least six exchanges per hour in buildings older than, or renovated prior to,1994; at least twelve air exchanges per hour for buildings built or renovated after 1994
- Portable ventilators should be used if appropriate rooms are not available
- Ultraviolet light to kill airborne TB bacteria

Work practice controls related to TB include the following:

- Early identification/triage
- Early isolation
- Maintaining negative pressure ventilation in rooms occupied by patients with active TB disease by verifying the air exchange rate and negative pressure regularly
- Keeping AIIR room doors closed at all times to maintain negative pressure
- Healthcare worker TB skin or blood test surveillance every six months in high-risk areas, annually for others
- Patient/family education
- Consistent use of personal protective equipment

While personal protective equipment is covered in the following chapter, work practice controls for TB infection control must include proper training on when, and what type of, respiratory protection is necessary to protect healthcare workers from TB. A NIOSH approved N95 respirator (or higher level of respiratory protection) should be worn whenever:

- Entering rooms of patients with suspected or confirmed TB
- Performing high hazard procedures on patients with suspected or confirmed TB, such as aerosolized medication administration, bronchoscopy, or sputum induction
- Transporting patient with suspected or confirmed TB in a closed vehicle, even if the patient is wearing a mask

✓ Things to Remember

1. **Engineering Controls** are interventions designed to:

   - remove or isolate the healthcare worker and the patient from the hazard
   - remove the hazard from the workplace

   Examples of engineering controls include:

   - puncture resistant sharps disposal containers
   - sharps with engineering that provide for protection from injury such as self-sheathing or retractable needles
   - needleless systems
   - air exchange ventilation systems
   - directional air flows (e.g. negative pressure or hoods that pull airborne contaminants away from breathing zone)

   Percutaneous exposure can be decreased by eliminating work practices such as:

   - performing procedures where bone or metal fragments are produced
   - blind suturing
   - having the non-dominant hand next to a sharp

2. **Work Practice or Administrative Controls** include:

   - policies, procedures and training regarding work practices
   - practices that alter the manner in which a task is performed to reduce or eliminate the likelihood of exposure

   Selected examples of work practice controls include:

   - correctly utilizing a safer device
   - passing sharp instruments by use of designated "safe zones"
   - disassembling sharp equipment by use of forceps or other devices
   - using forceps, suture holders, or other instruments for suturing
   - not leaving sharps on a field
   - not leaving exposed sharps on patient procedure/treatment work surfaces
   - hand washing
   - spill protocols for safely cleaning up blood or potentially infectious material spills

3. **Control the Spread of Tuberculosis Using Engineering and Work Practice Controls**

   Engineering Controls and TB

   - negative pressure isolation rooms that provide 12 air exchanges per hour (Six exchanges per hour prior to 1994)
   - portable ventilators if the appropriate isolation rooms are not available
   - ultraviolet light

   Work Practice Controls and TB

   - early isolation
   - closed isolation room doors

- TB skin or blood test surveillance
- patient/family education
- training on proper personal protective equipment use

Element IV: Barriers and/or Personal Protective Equipment

The fourth element of the New York State mandatory infection control training discusses selection and use of barriers and/or personal protective equipment (PPE) for preventing patient and healthcare worker contact with potentially infectious material. While engineering and work practice controls should be implemented as the first defense against the spread of infectious agents, personal protective equipment may also be needed to provide full protection.

Objectives of Element IV

At the end of this element you will be able to:

- Describe the circumstances that require the use of barriers and personal protective equipment to prevent patient or healthcare worker contact with potentially infectious material.
- Identify specific barriers or personal protective equipment for patient and healthcare worker protection from exposure of potentially infectious material.

Definitions

Barrier:	Equipment such as gloves, gowns, aprons, respirators, or protective eyewear, which, when worn, can reduce the risk of exposure of the healthcare workers' skin or mucous membranes by creating a barrier between potentially infectious materials and the healthcare worker.
Personal Protective Equipment (PPE):	Specialized clothing or equipment worn by a healthcare worker for protection against a hazard. OSHA requires the use of PPE to reduce employees' exposures to hazards when engineering and administrative controls are not feasible or effective in eliminating these exposures. Employers are required to determine all exposures to hazards in their workplace and determine if PPE should be used to protect healthcare workers.

Types and Selection of PPE/Barriers

The choice of PPE is based on reasonably anticipated interaction and exposure between the healthcare worker and patient. Federal and state laws and regulations as well as facility policies and procedures provide guidance on the need for and selection of PPE.

Gloves

Gloves are the most commonly used PPE. There are three main reasons for wearing gloves:

1. To reduce the potential that the healthcare worker will become infected with microorganisms from a patient.
2. To reduce the likelihood that personnel will transmit their own microorganisms to patients.
3. To reduce the possibility that personnel will become colonized with microorganisms that can be transmitted to other patients.

Gloves are for single use only; they are disposable. **Gloves must be changed between patients**. ***Hands are washed after removal of gloves.***

There is a choice of sterile or non-sterile gloves; the decision is based on medical standards and the specific procedure to be performed. For procedures needing clean contact, non-sterile gloves are

used. Routine patient care activities, including the care of patients with communicable diseases, non-surgical procedures to body systems such as oral care, tube feeding, etc., can be carried out with non-sterile gloves. For procedures needing surgical asepsis, or surgical technique, sterile gloves are used. These procedures include: surgical procedures; procedures involving sterile body cavities; procedures with susceptible hosts; preparation and administration of medications and fluids; and procedures that require manual dexterity or precision on the part of the healthcare worker.

Some characteristics to consider in choosing the appropriate glove:

- Flexibility
- Dexterity
- Strength
- Use
- Durability
- Ease in application and removal
- Chemical resistance
- Imperviousness to blood and body fluid

Gloves are made from a variety of materials:

- Latex or natural rubber disposable gloves

  (Note: Because of the recognized hazards and dangers to healthcare workers of repeated latex exposure and the increase in cases of latex allergy, the use of latex products should be eliminated when possible. If latex gloves are used, only ***powder-free gloves*** *should be used.)*

- Non-latex disposable gloves
- Vinyl-synthetic polymer gloves
- Nitrile rubber utility gloves
- Polyethylene clear plastic film gloves such as those used in food handling

Cover Garb

If clothing is likely to come in contact with infective fluids, cover garb is used to prevent soiling of clothing when performing these patient care activities. Cover garb should only be worn once, then either disposed of or laundered.

Cover garb can be impervious or fluid resistant, fluid impermeable or permeable. It can also be disposable or reusable. A decision on what level of garb protection is needed is based on a hazard assessment. For instance, a fluid resistant gown may be adequate for a low pathogenic infectious agent whereas a completely impermeable gown may be necessary for a highly pathogenic agent. Types of cover garb include:

- Isolation/precaution gowns
- Surgical gowns
- Aprons
- Laboratory coats
- Shoe, leg and head covers

Masks

Masks are used to prevent transmission of some infectious agents through the air. They can be placed on a symptomatic patient to limit the spread of droplets via sneezes and coughing. They also may protect the wearer from inhaling large particle aerosols (droplets). They do not provide adequate protection from inhalation of small particulate aerosols. Types of masks include:

- Procedure masks
- Surgical masks

Respirators

Respirators, unlike masks, are subject to the requirements of the OSHA Respiratory Protection Standard (OSHA 29 CFR 1910.134). Respirators are either air-purifying respirators, which use filters, cartridges, or canisters to remove contaminants from the air you breathe, or atmosphere-supplying respirators, which provide you with clean air from an uncontaminated source (e.g., respirators attached to oxygen tanks). Commonly used respirators in the healthcare setting are N95 particulate filtering respirators and powered air purifying respirators (PAPRs).

As previously noted in Element II, there is the rare possibility that a widespread, airborne pathogenic pandemic could result in a shortage of disposable N95 respirators. In that case, NIOSH (2014) has issued guidance for the limited reuse of disposable N95 respirators. This guidance can be found at: https://www.cdc.gov/niosh/topics/hcwcontrols/recommendedguidanceextuse.html. However, the safest and most efficient way to deal with a potential shortage of disposable respirators is to have readily available reusable elastomeric respirators. According to NIOSH, "They are a cost-efficient and sustainable alternative when the demand for disposable respirators is excessive" (NIOSH, July 6, 2017). Elastomeric respirators, when properly fit tested and equipped with N95 cartridges, provide protection equal to or better than disposable N95 respirators. Bach (2017) discusses the differences between surgical masks, disposable N95 respirators, elastomeric respirators and powered air purifying respirators (PAPRs) here: https://blogs.cdc.gov/niosh-science-blog/2017/07/06/elastomerics/. Please note that respirators with exhalation valves cannot be used in sterile field areas.

Respirator wearers must be medically cleared before they can be approved to wear a respirator. Respirators must be properly fitted; they must fit tightly against the face, and the fit of the mask must be tested by qualified personnel and checked at regular intervals. Respirators are to be used by one individual (for as long as the fit is right) and the respirator is not contaminated. Healthcare workers must be trained in the use of respirators initially and then an annual review must be provided. Ongoing monitoring of the use of respirators is needed. Some respirators, such as N95s, are typically disposable and must be disposed of between patients.

Face Shields/Eye Protection

Face shields must be used when there is a risk of splashes of infectious agents onto the face and, in particular, the mucus membranes.

Eye protection, such as goggles or safety glasses, must be used with a face shield if the face shield does not fully cover the eyes. Eye protection can also be worn with a mask or respirator if that provides full coverage for all routes of entry on the face. Or, if only the eyes need to be protected, eye protection can be worn alone. Eye protection can be vented to prevent fogging or non-vented if there is a risk of the infectious agent entering the eyes through the vented opening. A thorough hazard assessment should determine which type of eye protection is necessary.

The choice of which PPE to use is based on a variety of factors, including the interaction between the healthcare worker and the patient, the type of pathogen, and whether contact may be through splashes, respiratory droplets or airborne particulates.

- When coming in contact with blood or body fluid splash, utilize gloves, gown, face shield or mask and protective eyewear;
- When coming into contact with minimal bleeding or drainage, use gloves;
- If a large volume of bleeding or drainage is anticipated and likely to soak through the contact area, use gloves and an impermeable gown;
- In the case of aerosolized infectious agents (droplets or airborne particulates), a mask or respirator, face shield and/or eye protection may be necessary; use an N95 or higher protection respirator if TB is suspected or airborne infectious particulates are present.

When choosing PPE based on the need for patient protection, consider the following:

- If sterile barriers are needed for invasive procedures, use gowns, gloves, and dressings
- For the prevention of droplet contamination, use a mask
- In order to prevent drainage/lesions of the healthcare worker from contacting the patient, utilize dressings, gowns, and gloves

Proper Application of Barriers/PPE for Protection

Facility policies and procedures will provide the healthcare worker with guidance. OSHA requires that designated PPE must be available and conveniently located. Other PPE requirements include:

- Proper fit – gloves, respirators, etc.
- Integrity of barrier – quality control standards for imperviousness, impermeability – must change if integrity compromised
- Users must be trained on proper PPE selection, donning/doffing procedures and proper disposal

An employer may make a determination regarding the use of disposable versus reusable barriers/PPE based on cost, ease of processing, integrity of barrier, and medical waste regulations.

There is potential for cross-contamination if PPE is not changed between patients. The individual healthcare professional is accountable and responsible for her or his own practices. Monitoring healthcare workers that one supervises for compliance with infection control policies and procedures is required.

Implications of over/under-utilization of barriers/PPE include cost, patient isolation, cross contamination, and worker exposure.

Donning and Doffing PPE

Properly putting on (donning) and taking off (doffing) PPE is critically important as there is a high risk of contaminating oneself when removing PPE. The following information from the CDC (2014) provides clear guidance on proper donning and doffing protocol.

Review **Appendix D** (*Sequence for Putting On Personal Protective Equipment*) and **Appendix E** (*How to Safely Remove Personal Protective Equipment*).

OSHA's requirements for selection and use of PPE, OSHA 29 CFR 1910.132-138, can be found at https://www.osha.gov/law-regs.html. All healthcare employers are required to comply with these OSHA standards.

✓ Things to Remember

1. OSHA requires the use of PPE to reduce employees' exposures to hazards when engineering and administrative controls are not feasible or effective in fully eliminating the risk of exposure. The type of **PPE** to use depends on the interaction occurring between the healthcare worker and the patient, the type of pathogen, and the risk of exposure.

   The **barrier** separates the person from the hazard.

2. **Characteristics to Consider for Personal Protective Equipment**

   Gloves **must** be changed between patients.

   Types:

   - non-latex disposable
   - vinyl-synthetic polymer
   - nitrile rubber utility gloves
   - polyethylene clear plastic film gloves (food handling gloves)

   Masks

   - Used to prevent transmission of infectious agents through airborne droplets
   - May be surgical or procedure and are typically disposable
   - Must be changed between patients

   Respirators

   - Used to prevent transmission of airborne particulates
   - Include N95, PAPR
   - Must be fit tested
   - User must be medically cleared
   - If respirators are required, employer must meet the requirements of OSHA's Respiratory Protection Standard

   Types of Cover Garb

   - Isolation/precaution gowns
   - Surgical gowns
   - Aprons
   - Laboratory coats
   - Head, foot and leg covers

3. **Proper Application of Barrier Controls**

   - Must be readily available and in a convenient location
   - Proper fit – gloves, masks, respirators
   - Consider the integrity of the barrier – must change if integrity compromised
   - Disposable vs. reusable barriers/PPE
     - consider cost
     - ease of processing

    - integrity of barrier
    - medical waste regulations

- Potential for cross-contamination if not changed between patients
- Workers must be trained on the proper use, donning and doffing of PPE

Element V: Cleaning, Disinfection and Sterilization

The fifth element of this New York State mandatory infection control course discusses the creation and maintenance of a safe environment for patient care through application of infection control principles and practices for cleaning, disinfection, and sterilization.

Element V: Objective

At the end of this element you will be able to:

> Describe how healthcare professionals can maintain a safe work environment using infection control principles and practice through cleaning, disinfection, and sterilization.

Guideline for Disinfection and Sterilization in Healthcare Facilities, 2008

The CDC *Guideline for Disinfection and Sterilization in Healthcare Facilities, 2008* (Rutala, Weber, & the Healthcare Infection Control Practices Advisory Committee, 2008) was updated to provide evidence-based recommendations. This information supersedes the 1985 CDC *Guideline for Handwashing and Environmental Control* and provides recommendations on the preferred methods for cleaning, disinfection and sterilization of patient care medical devices. The document provides guidelines for the use of products by healthcare personnel in hospitals and ambulatory care as well as home care environments. For a more in-depth look at disinfection and sterilization please review the CDC guidelines which are available at: https://www.cdc.gov/infectioncontrol/pdf/guidelines/disinfection-guidelines.pdf.

Not all of the topical changes and new additions to the CDC guidelines will be covered in this course, and the reader should refer to the aforementioned document for additional information.

Some of the changes in the CDC document (Rutala et al., 2008) include:

- Deletion of formaldehyde alcohol for high-level disinfection because it is not commonly used, is irritating, and toxic.
- Addition of new chemical sterilants such as hydrogen peroxide and peracetic acid.
- 3% phenolics and iodophors are no longer used for high-level disinfection because they have not proven effective to inactivate bacterial spores, *M. tuberculosis*, and some fungi.
- Isopropyl alcohol and ethyl alcohol are now excluded from the list of high-level disinfectants.
- 2% glutaraldehyde dilutions at 1:16 dilution are no longer used as a high-level disinfectant.
- Exposure time has changed from 10-30 minutes to 12 or more minutes to achieve high-level disinfection depending on the FDA and scientific literature.

New subjects in the document include:

- New pathogens and how to inactivate them
- Bioterrorist agents and blood-borne pathogens
- Toxicological, environmental, and occupational concerns with disinfection and sterilization practices
- Disinfection of patient-care equipment used in ambulatory and home care (will be covered in this course)
- How to inactivate antibiotic-resistant bacteria
- New sterilization practices

- Disinfection of complex medical instruments such as endoscopes

Prions, proteins that cause Creutzfeldt-Jakob disease (CJD) and other related diseases that are unusually resistant to conventional disinfection and sterilization are not specifically discussed in any detail by the 2008 CDC Guidelines. Further information on infection control related to prions can be found at the World Health Organization's website: http://www.who.int/csr/resources/publications/bse/WHO_CDS_CSR_APH_2000_3/en/

Healthcare professionals are urged to contact the CDC or Association for Professionals in Infection Control and Epidemiology (APIC) if they would like more information about prions and sterilization methods currently in use.

The infection control principles and practices that are used to maintain a safe environment for patients must be tailored to the specific setting in which patients are treated. Hospitals have long been the site of much attention related to infection control; however, as health care has extended to multiple settings outside of the hospital, it is clear that proper infection control must be applied to those settings as well. The reader is urged to consider the setting in which she or he is currently practicing and utilize the following information in relation to that particular clinical setting.

Medical equipment, devices, and instruments must be managed and reprocessed using the recommended approaches regardless of the patient's diagnosis **except** for cases of suspected prion disease.

Definitions

Cide or cidal:	Terms that use the suffix -cide or -cidal are used to denote *killing action*. A viru*cide*, fungi*cide,* bacteri*cide*, spori*cide*, and tuberculo*cide* can kill the microorganism defined by the prefix (virus, fungi, bacteria, etc.) (Rutala et al., 2008).
Cleaning:	The removal of visible soil (e.g., soil, organic debris, body fluids, lubricants, and inorganic material) from objects using water, detergents or soaps or enzymatic products, and washing or scrubbing the object (Rutala et al., 2008). Cleaning prior to disinfection and sterilization is absolutely necessary because when inorganic or organic materials remain on the surface of an instrument, the effectiveness of the disinfection or sterilization is affected.
Contamination:	The presence of microorganisms on inanimate objects (e.g., clothing, furniture, surgical instruments) or in substances (e.g., water, food, milk).
Decontamination:	The process of removing disease-producing microorganisms and rendering the object safe for handling through physical or chemical means. **Cleaning, disinfection, and sterilization** are all decontamination processes. These processes differ in the number and types of microorganisms killed. By knowing the differences between these processes, you will know how to choose the right way to reprocess reusable instruments and equipment.
Disinfection:	A process that results in the elimination of *many or all* pathogenic microorganisms on inanimate objects with the exception of bacterial spores. This is accomplished with liquid chemicals or pasteurizing agents (Rutala et al., 2008).
High-level disinfection:	Kills bacteria, mycobacteria (TB), fungi, viruses and some bacterial spores with the exception of high level bacterial spores. A chemical germicide, that the FDA markets as a sterilant is used.
Intermediate-level disinfection:	Kills bacteria, mycobacteria (TB), most fungi and most viruses. Does not kill resistant bacterial spores.

Low-level disinfection:	Kills most bacteria, some fungi and some viruses. Will not kill bacterial spores and is less active against some gram-negative rods (pseudomonas) and mycobacteria.
Prions:	They are transmissible pathogenic agents that cause a variety of neurodegenerative diseases of humans and animals, and Creutzfeldt-Jakob disease in humans. Prions are extremely resistant to inactivation by sterilization processes and disinfecting agents (Rutala et al., 2008).
Spaulding Classification:	Classifications used where the items to be sterilized or disinfected are classified in terms of their intended use, which is either critical, semi-critical, or non-critical.
Sterilization:	A process that completely eliminates or destroys all forms of microbial life. Sterilization is accomplished by the use of physical or chemical methods. Physical methods include the use of sterilizers under steam pressure, dry heat, ethylene oxide (ETO), and other gases. Chemical methods include the use of liquid chemicals and a prolonged soaking time (Rutala et al., 2008).

Potential for Contamination

The potential for contamination is dependent on the type of device, equipment, or environmental surface. Contamination occurs both internally and externally.

External Contamination

Contact or external transmission is the most common route by which pathogens are transmitted in healthcare settings. Contact transmission occurs most commonly when microorganisms from a patient are transferred to the hands of a healthcare worker who does not comply with infection control precautions and then touches another patient. Hand washing is essential and cannot be overemphasized.

Less commonly, environmental surfaces (e.g., bed rails, countertops) become contaminated and serve as an intermediate reservoir for pathogens; transmission can occur when a worker touches the surface then touches a patient or when a patient touches the surface. The presence of hinges, crevices on devices or surfaces can affect external contamination.

Internal Contamination

Contamination can occur internally through, for example, endoscopic equipment. Lumens of the endoscopes can transmit organisms internally to the patient. The use of endoscopes is widespread, and although the infection rate reported is low, more healthcare-associated outbreaks have been linked to endoscopes than any other medical device (Rutala et al., 2008). Flexible endoscope reprocessing has a narrow margin of safety.

Even slight deviations from recommended reprocessing protocols can contribute to survival of microorganisms and thereby increase the risk of infection to patients (Alfa, Olson, & DeGagne, 2006). Proper infection control practices, regardless of the clinical setting (e.g., in-patient, ambulatory clinic, homecare, etc.) must be followed in order to decrease the likelihood of infection.

Since 1996, the FDA has required device manufacturers to recommend at least one reprocessing method on the product labeling (FDA, 2015). It is critical that any automated endoscope reprocessor be used only with specific models of endoscopes that have been studied and validated to be effective by the manufacturer. Despite these FDA requirements, in New York State between 1996 and 1998, there were cases of serious infection secondary to inadequately reprocessed endoscopes (FDA, 2015). This was a result of inconsistencies between the endoscope manufacturers' instructions regarding specific models

and instructions provided by the manufacturers of automated endoscope reprocessors. Other infections resulted from faulty use of the reprocessors (FDA, 2015).

Transmission by Contaminated Equipment

Transmission of disease to patients and healthcare workers may be associated with equipment or device contamination. The following are factors that have contributed to contamination in reported cases (Chaufour et al., 1999):

- inadequate cleaning
- inadequate disinfection/sterilization processes
- contamination of disinfectant or rinse solutions
- reuse of disposable equipment
- failure to reprocess or dispose of equipment between patients

Proper sterilization is effective only when the device has been properly cleaned first!

Infection Control Issues in Reprocessing or Handling

The reuse/reprocessing of single-use items can be subject to breaks in infection control practices. The FDA has issued guidelines which allow reprocessing when a facility can establish that an item:

- can be cleaned or sterilized adequately
- is not adversely affected by reprocessing
- remains safe and effective for its intended use
- have available written manufacturer's recommendations

Whenever reprocessing of single use items is practiced, the facility must develop specific policies and procedures that address responsibilities. Reprocessed single-use devices have comprehensive regulatory requirements that are continually updated.

The classification system of Class I, Class II, and Class III refers to non-critical, semi-critical and critical use for the device. The device classification depends on the *intended use* of the device and also upon *indications for use*. A scalpel's *intended use*, for example, is to cut tissue (FDA, 2018). The classifications are discussed in more detail later in Element V.

The handling and cleaning of contaminated items is another area in which infection control practices can be compromised. OSHA guidelines for prevention of transmission of blood-borne pathogens address the following:

- Handling
- Designated collection points and biohazard label
- Transport in puncture-resistant cleanable containers
- Processing area separate from sterile or clean supplies
- Designated area for cleaning, soaking, rinsing soiled items
- Contaminated items should not be placed directly on unprotected environmental surfaces
- PPE
- Decontamination
- Manual or mechanical cleaning is always the first step
- Pre-soaking

- Use designated pre-soaking areas
- Do as soon as possible after use
- Pre-soak for specified, but minimal amount of time

Cleaning

Items must be thoroughly cleaned before processing, because organic material (e.g., blood and proteins) may contain high concentrations of microorganisms. Also, such organic material may inactivate chemical germicides and protect microorganisms from the disinfection or sterilization process. Cleaning should always precede high-level disinfection and sterilization. The effectiveness of sterilization can be affected if cleaning is not done prior to processing (Rutala et al., 2008).

Proper cleaning is the key!

- Clean items under running warm water to prevent aerosolization of microorganisms.
- Clean items according to manufacturer's recommendations.
- Clean items with nonabrasive implements.
- Use brushes for items with lumens or holes.
- Rinse thoroughly with running tap water or deionized/distilled water.
- Dry items thoroughly prior to lubrication, disinfection, or sterilization.
- Specific area should be designated for cleaning **– never** clean items in patient areas, hand washing sinks or clean/sterile areas.

Reprocessing

Reprocessing methods include two levels:

1. **Disinfection** - eliminates *many or all* pathogenic microorganisms on inanimate objects with the exception of bacterial endospores.

2. **Sterilization** - completely eliminates/destroys all forms of microbial life through either physical or chemical methods.

Steps of reprocessing:

1. Pre-cleaning: Removes debris, lubricants from the internal and external surfaces of a device or equipment and should be done as soon as possible after use.

2. Cleaning: **Manual** cleaning involves washing or scrubbing, and **mechanical** cleaning uses automated washers.

    - Remember: Disposable cleaning equipment should never be reused. Solutions used for cleaning should be changed.

    - It is essential to always follow the manufacturer's recommendations.

3. Disinfection (allow sufficient contact time with chemical solution)

4. Sterilization (allow sufficient exposure time to heat, chemicals or gases)

Spaulding Classifications

The level of reprocessing method must be based on the *intended use* of the item and risk of infection.

The following are the Spaulding Classifications:

Critical instruments/devices are those that are directly introduced into the human body, blood stream, or normally sterile areas of the body. These include items such as *implants, scalpels, needles, cardiac catheters, other surgical instruments, dental instruments and endoscopic accessories*. They require *sterilization*. Most of the items in this category should be purchased sterile or be sterilized with steam if possible (Rutala et al., 2008).

Semi-critical instruments/devices are those that come in contact with mucous membranes or non-intact skin. These items include *flexible endoscopes, laryngoscopes, endotracheal tubes, respiratory therapy and anesthesia equipment, diaphragm fitting rings and other similar devices*. *High-level disinfection* is required. For instruments such as thermometers, oral or rectal, and smooth, hard surfaces such as hydrotherapy tanks, intermediate level disinfection is required.

Non-critical instruments/devices are those that come in direct contact with the patient, but usually unbroken skin. These items include *stethoscopes, tabletops, floors, bedpans, furniture, etc.* They require *low-level disinfection.*

Environmental surfaces have the least risk of disease transmission. They require *routine cleaning*.

Don't forget!

- Critical instruments must be sterilized.
- Semi-critical instruments require high-level disinfection if there is contact with mucous membranes or non-intact skin.
- Non-critical instruments require low-level disinfection.

Microorganisms vary greatly in their resistance to chemical germicides and sterilization processes and Table 2 provides an illustration of the degree of resistance.

Table 2 ***Decreasing order of resistance of microorganisms to disinfection and sterilization and the level of disinfection or sterilization***		
Resistant		**Level**
	Prions (e.g., Creutzfeldt-Jakob Disease)	Prion reprocessing
	Bacterial spores (*Bacillus subtilis*)	Sterilization
	Coccidia (*Cryptosporidium*)	
	Mycobacteria (*M. tuberculosis, M. terrae*)	High
	Nonlipid or small viruses (polio, coxsackie)	Intermediate
	Fungi (e.g., *Aspergillus, Candida*)	
	Vegetative bacteria (*S. aureus, P. aeruginosa*)	Low
	Lipid or medium-sized viruses (HIV, herpes, hepatitis B)	
Susceptible		
Adapted from Favero & Bond (2001) and Russell (1998) as cited in Rutala et al. (2008) Retrieved from https://www.cdc.gov/infectioncontrol/guidelines/disinfection/index.html with permission.		

The Disinfection Process

The selection and use of disinfectants for critical and non-critical items is dependent on level of antimicrobial activity needed:

High level: glutaraldehyde, 3%-6% hydrogen peroxide, bleach
Intermediate level: alcohol, bleach, phenolics
Low level: phenolics, iodophor, quaternary ammonium

Table 3 ***Common Generic Chemical Disinfectants***		
Chemical Disinfectant	**Required Concentration**	**Antimicrobial Activity**
Glutaraldehyde based formulations	>2%	High
Formaldehyde	1-8%	High-Low
H_2O_2	6%	High-Intermediate
Alcohol	70%	Intermediate
Iodophor	Variable	Intermediate-Low
Adapted from Rutala et al., 2008. Retrieved from https://www.cdc.gov/infectioncontrol/guidelines/disinfection/index.html with permission.		

In order for disinfectants to be used safely and effectively, they must be approved by the Environmental Protection Agency (EPA). Each healthcare organization must maintain a safety data sheet (SDS) on the agents involved. The SDS provides information on the safe handling, use and storage of the agent.

- The label on the product must be read carefully, and manufacturer's recommendations must be followed exactly.

- Note expiration dates.
- Disinfectants should be used in well-ventilated areas, with no contact to the worker's skin or mucous membranes.
- Utilize PPE as indicated by the manufacturer; recommended strengths and times cannot be altered.
- Follow the manufacturer's recommendations regarding post-disinfection storage and handling of the agent.

Once items have been disinfected, general guidelines are to rinse and dry items thoroughly; use sterile water to rinse objects that received high-level disinfection; dry with sterile towels or filtered hot compressed air of 70 - 90% ethyl or isopropyl alcohol. Store in designated clean area where recontamination cannot occur. Store the items in closed cabinets, rigid washable covered containers, or tear-resistant bags.

The Sterilization Process

The selection and use of sterilization methods for critical items to render them sterile depends upon a number of factors:

- Following manufacturer's written recommendations
- Using specified time required to achieve sterilization
- Cost
- Availability of equipment
- Processing area
- Trained personnel
- Compatibility of the sterilization method with the physical properties of the item

Methods of sterilization:

- Moist heat with steam under pressure (autoclave) -- High temperatures and pressure must be maintained over a period of time. Instrument must be cleaned, decontaminated, and packaged prior to autoclaving.

- Flash sterilization (270 - 275 degrees Fahrenheit for four minutes) – Short duration, high temperature steam under pressure autoclaving for items that are not placed in any type of packaging or container. This form of rapid sterilization is used for single metal instruments, not wrapped.

- Ethylene oxide gas (ETO) for heat sensitive devices (e.g., plastic, rubber, scopes, etc.) – Specific temperature and predetermined time are necessary.

- Glutaraldehyde – greater than 2% alkaline and acid for items that are heat sensitive or can't tolerate gas. Review labels and use correctly; must rinse only with sterile water.

Advantages: broad spectrum of antimicrobial activity, rapid inactivation of microorganisms, relative ease of use, lack of corrosive action against metals, rubbers, cements.

Disadvantages: irritating odor, health effects from glutaraldehyde vapor and ethylene oxide. OSHA's ethylene oxide standard, 29 CFR 1910.1047, and guidance documents related to safe use of glutaraldehyde, can be found at www.osha.gov.

Unsaturated chemicals, sterilization beads, other chemicals, and dry heat are additional sterilization methods that may be used depending on the item to be sterilized. The guidelines have changed and new sterilization processes include hydrogen peroxide, gas plasma, and liquid peracetic acid. Some examples of chemical sterilization of c*ritical* devices (Rutala et al., 2008) include:

- Glutaraldehyde (greater than 2.0%)
- Hydrogen peroxide-HP (7.5%)
- Peracetic acid-PA (0.2%)
- HP (1.0%) and PA (0.08%)
- HP (7.5%) and PA (0.23%)
- Glutaraldehyde (1.12%) and Phenol/phenate (1.93%)

A variety of methods exist to monitor the sterilization process.

In the **steam sterilization** process, monitoring includes:

- Mechanical indicators: recording charts for time and temperature, pressure gauges
- Chemical/physical indicators: package strips, heat sensitive tapes, pellets
- Biological indicators: biological monitors, spore strips

In the **ethylene oxide (ETO) sterilization** process, monitoring includes:

- Mechanical indicators: recording graph, humidity gauge, gas, conditioner steam, pressure gauge
- Chemical and physical indicators: heat sensitive tape, chemically treated paper strips
- Biological indicators: spore strips

In the **glutaraldehyde sterilization** process, monitoring includes:

- no specific biological monitoring
- a visible expiration date

For more detailed information on the advantages and disadvantages of high-level disinfectants and sterilization technologies, please refer to the *Guideline for Disinfection and Sterilization in Healthcare Facilities, 2008* (Rutala et al., 2008, p. 111) available from: https://www.cdc.gov/infectioncontrol/pdf/guidelines/disinfection-guidelines.pdf.

The process for post-sterilization handling and storage must consider the selection of proper packaging material, shelf life and storage. When selecting the *proper packaging* material, factors to consider include: size, shape, and weight of the item, allowance for penetration or evaporation of any chemicals. It is critical that the use of packing materials will maintain the sterility of the package contents. Appropriate packaging materials include: 180-240 thread count fabric, rigid sterilization containers, and non-woven disposable materials.

Shelf life must be addressed in specific policies and procedures. Stored items must contain a specific expiration date on the package, or a statement that the contents are sterile until opened. *Storage* of sterilized items should be in a clean, dry area. Sterile items should be handled as little as possible and not stored on the floor or within 18” of the ceiling. Rotate sterile items to move earlier expiring items to the front.

The following principles are applicable to most questions that the CDC receives about sterilization or disinfection of patient care equipment; however, these statements are not comprehensive (CDC, 2008):

1. In general, reusable medical devices or patient-care equipment that enters normally sterile tissue or the vascular system or through which blood flows should be sterilized before each use. Sterilization means the use of a physical or chemical procedure to destroy all microbial life, including highly resistant bacterial endospores.

   The major sterilizing agents used in hospitals are a) moist heat by steam autoclaving, b) ethylene oxide gas, and c) dry heat. However, there are a variety of chemical germicides (sterilants) that have been used for purposes of reprocessing reusable heat-sensitive medical devices and appear to be effective when used appropriately, i.e., according to manufacturer's instructions. These chemicals are rarely used for sterilization, but appear to be effective for high-level disinfection of medical devices that come into contact with mucous membranes during use (e.g., flexible fiber optic endoscopes).
2. Disinfection means the use of a chemical procedure that eliminates virtually all recognized pathogenic microorganisms but not necessarily all microbial forms (e.g., bacterial endospores) on inanimate objects. There are three levels of disinfection: high, intermediate, and low.

   - **High-level**

     High-level disinfection kills all organisms, except high levels of bacterial spores, and is effected with a chemical germicide cleared for marketing as a sterilant by the Food and Drug Administration (FDA).
   - **Intermediate-level**

     Intermediate-level disinfection kills mycobacteria, most viruses, and bacteria with a chemical germicide registered as a "tuberculocide" by the Environmental Protection Agency (EPA).
   - **Low-level**

     Low-level disinfection kills some viruses and bacteria with a chemical germicide registered as a hospital disinfectant by the EPA.
3. Heat stable reusable medical devices that enter the blood stream or enter normally sterile tissue should **always** be reprocessed using heat-based methods of sterilization (e.g., steam autoclave or dry heat oven).
4. Laparoscopic or arthroscopic telescopes (optic portions of the endoscopic set) should be subjected to a sterilization procedure before each use; if this is not feasible, they should receive high-level disinfection. Heat stable accessories to the endoscopic set (e.g., trocars, operative instruments) should be sterilized by heat-based methods (e.g., steam autoclave or dry heat oven).
5. Reusable devices or items that touch mucous membranes should, at a minimum, receive high-level disinfection between patients. These devices include reusable flexible endoscopes, endotracheal tubes, anesthesia breathing circuits, and respiratory therapy equipment.
6. Medical devices that require sterilization or disinfection must be thoroughly cleaned to reduce organic material, biofilms (microbial communities attached to surfaces that cannot be easily removed) or bioburden before being exposed to the germicide; the germicide and device manufacturer's instructions should be closely followed.
7. Except on rare and special instances (as mentioned later), items that do not ordinarily touch the patient or touch only intact skin are not involved in disease transmission, and generally do not necessitate disinfection between uses on different patients. These items include crutches, bed boards, blood pressure cuffs, and a variety of other medical accessories. Consequently, depending on the particular piece of equipment or item, washing with a detergent or using a low-level disinfectant may be sufficient when decontamination is needed. If noncritical items are grossly soiled with blood or other body fluids, follow instructions outlined in the Guidelines.

Exceptional circumstances that require noncritical items to be either dedicated to one patient or patient cohort, or subjected to low-level disinfection between patient uses are those involving:

1. Patients infected or colonized with vancomycin-resistant enterococci or other drug-resistant microorganisms judged by the infection control program, based on current state, regional, or national recommendations, to be of special clinical or epidemiologic significance, or

2. Patients infected with highly virulent microorganisms, e.g., viruses causing hemorrhagic fever (such as Ebola or Lassa).

If you have questions about a low- or intermediate-level disinfectant and certain sterilants, contact the manufacturer or the Antimicrobial Program Branch, Environmental Protection Agency (EPA). The EPA is the federal regulatory agency for low- or intermediate-level disinfectants and some sterilants.

If you have questions about high-level disinfectants (sterilants), or how to clean, disinfect, or sterilize a particular medical device, first contact the manufacturer of the product. If you are unable to obtain sufficient information in this manner, contact the Food and Drug Administration (FDA) regional office or the FDA Center for Devices and Radiological Health. The FDA is the federal regulatory agency for safe and effective use of medical devices and is now also responsible for regulation of chemical sterilants.

Sterilization and Disinfection of Emerging Pathogens

The disinfection and sterilization procedures that are standard for equipment for patient use are adequate to sterilize or disinfect devices and instruments that are contaminated with blood and body fluids from persons infected with emerging pathogens such as:

- Hepatitis C virus
- *Clostridium difficile*
- *Cryptosporidium*
- *Helicobacter pylori*
- *E.coli* 0157:H7
- Antibiotic-resistant microbes (MDR-TB, VRE, MRSA)
- SARS Coronavirus, avian influenza, norovirus
- Bioterrorism agents (e.g., anthrax, plague, smallpox)

(Rutala et al., 2008)

Environmental Cleaning

Routine cleaning and sanitizing of work surfaces is as important as care of medical devices and equipment. Bernard et al. (1999) studied contaminated stethoscopes and found that gram-positive bacteria survived on stethoscope membranes for up to 18 hours. Bures et al. (2000) studied sterile swab samples of computer keyboards and faucet handles. These authors concluded that the rate of colonization on these two surfaces is greater than that of other well-studied surfaces in intensive care units with patients positive for MRSA. Namias and Widrich (2000) studied personal pagers and found bacteria growing on 17 of 36 pagers, including *Staphylococcus aureus, Pseudomonas aeruginosa,* and *Acinetobacteria* species.

With routine cleaning, the manufacturer's instructions should be followed, that is both the manufacturer of the item to be cleaned, and the manufacturer of the cleaning product. For disinfection, detergent formulations are effective. Schedules should be set for cleaning: after each patient, daily, weekly, monthly, etc.

All surfaces that come in direct contact with blood/body fluid should be cleaned and sanitized between patient-use. All surfaces that come in direct contact with patients should be cleaned and sanitized daily.

Factors That Have Contributed to Contamination or Disease Transmission

The integrity of instruments, medical devices, or equipment can be compromised at any point during the reprocessing. Breaks in infection control practices must be avoided and prevented.

Specific factors that have been identified include:

- failure to reprocess or dispose of items between patients
- inadequate cleaning
- inadequate disinfection or sterilization
- contamination of disinfectant or rinse solutions
- improper packaging, storage and handling
- inadequate/inaccurate record-keeping of the reprocessing requirements

(Rutala et al., 2008)

Recognizing Potential Sources of Cross-Contamination in the Healthcare Environment

Cleaning schedules are often set in facility policies and procedures; however, despite cleaning schedules and existing policies/procedures there are practices that contribute to touch contamination and the potential for cross contamination such as:

- failure to wear gloves, wash hands, etc.
- reuse of equipment
- failure to adequately clean/sanitize between patients
- failure to follow label directions for proper cleaning
- failure to use proper technique

It is important to select the right product for cleaning/sanitizing. The choice is dependent on the surface, use, and presence of blood/body fluids. Products used for disinfecting critical and semi-critical devices are not routinely used for external cleaning.

The New York State Department of Health (NYSDOH) recently identified transmission of hepatitis B virus between two patients at a residential healthcare facility related to a shared lancet pen. **The FDA recommends that all fingerstick devices be labeled for use only on a single patient.**

To prevent transmission of bloodborne pathogens such as hepatitis B virus, hepatitis C virus, and human immunodeficiency virus during delivery of diabetes care, the Centers for Disease Control and Prevention (CDC) and the NYSDOH recommend the following:

- Fingerstick devices (including lancet pens and lancets) must never be used for more than one person.
- Whenever possible, blood glucose meters should not be shared. If they must be shared, the device should be cleaned and disinfected after every use, per manufacturer's instructions. If the manufacturer does not specify how the device should be cleaned and disinfected then it should not be shared.

- Insulin pens and other medication cartridges and syringes are for single-patient-use only and should never be used for more than one person.
- After use, all sharp fingerstick equipment must be disposed of at the point of use in an approved sharps container.

(NYSDOH, 2011)

Blood Spills

Blood spills must be cleaned immediately. The first step is to contain the spill so that exposure to other individuals, equipment, or instruments is prevented until cleaned up.

Wear appropriate PPE; gloves are mandatory; gowns/aprons are used depending on the extent of the spill. Wipe up the blood with a disposable cloth and pour a diluted bleach solution (1/4 cup household bleach to 1 gallon of water) or other EPA-approved agent directly onto the surface. Let this sit for 10 minutes and then wipe with a second disposable cloth.

Other OSHA-specific Environmental Issues

Medical waste is regulated by federal, state, and local agencies, including specific regulations concerning regulated medical waste, proper handling, and disposal of sharps.

General guidelines are as follows:

- Medical waste must be labeled as “Biohazard Waste” or red bagged
- Included in medical waste are:
    - blood and blood products
    - human pathological waste
    - discarded vaccines *(syringes must be disposed of in designated sharps disposal containers)*
    - microbiological cultures
    - items that are blood soaked
    - sharps (must be disposed using sharps containers)
- Use labeled containers, licensed haulers, and maintain tracking forms
- PPE is to be utilized as necessary

Soiled laundry is generally covered under facility policies, procedures and schedules. It is important to always utilize universal precautions in the handling of soiled laundry. Segregate soiled linens and PPE visibly soiled with blood or body fluids; utilize red bag or label “biohazard” or “contaminated” if universal precautions are not routinely used by outside laundry service.

<u>Disinfection in Ambulatory Care and Home Care Settings</u>

Increasing numbers of patients are now being cared for in the ambulatory and home care setting. Patients are vulnerable because they may be immunocompromised and may be exposed to communicable diseases. Many patients have invasive devices in the home setting, such as central lines, feeding tubes, and indwelling catheters. A safe patient environment can only be maintained when adequate disinfection is provided.

The ambulatory care setting (outpatient facility/clinic) provides the same risk for infection as the hospital. Guidelines for sterilization should follow those of the *Guideline for Disinfection and Sterilization in Healthcare Facilities, 2008* (Rutala et al., 2008, p. 104). The home environment should be much safer

than hospitals or ambulatory care. Cross-infections and epidemics in the home should be very rare. Family members need instructions about infection control techniques for the home environment. Proper hand hygiene, disinfection of any equipment they are using, and how to store the devices and equipment after they have been disinfected should be emphasized.

Bleach, alcohol, and hydrogen peroxide are recommended for disinfection in the home. APIC recommends that reusable objects (e.g., tracheostomy tubes) that touch mucous membranes be disinfected by immersion in 70% isopropyl alcohol for 5 minutes or in 3% hydrogen peroxide for 30 minutes. Additionally, a 1:50 dilution of 5.25% – 6.15% sodium hypochlorite (household bleach) for 5 minutes should be effective (Rutala et al., 2008, p. 27).

Blood pressure cuffs, crutches (non-critical items) can be cleaned with a detergent and blood spills should be handled according to OSHA regulations.

Sterilization of critical items is not practical in homes but theoretically could be accomplished by chemical sterilants or boiling. Single-use disposable items can be used or reusable items sterilized in a hospital (Rutala et al., 2008, p. 27).

Ammonia, baking soda, vinegar, Borax, and liquid detergents are not registered with EPA. They should not be used for disinfecting because they are ineffective against *S. aureus*. Borax, baking soda, and detergents also are ineffective against *Salmonella* Typhi and *E. coli*; however, undiluted vinegar and ammonia are effective against *S.* Typhi and *E. coli*. According to Rutala, Barbee, Aguiar, Sobsey, and Weber (2000), “common commercial disinfectants designed for home use are also effective against select antibiotic-resistant bacteria” (as cited in Rutala et al., 2008, p. 27). Healthcare professionals must be aware of the recommendations in order to best educate patients, families, and caregivers about the infection control techniques required in the home where equipment and devices are being utilized.

The public has voiced an, as yet, unresolved issue regarding antibiotic-resistant bacteria. The public concern is that use of antimicrobials in the home can promote development of antibiotic-resistant bacteria. Further clinical studies and investigations need to be conducted.

Recognizing Differing Levels of Knowledge, Expectations, and Responsibility Based on Area of Professional Practice

Healthcare professionals who practice in organizations where the responsibility for handling, cleaning, and reprocessing of equipment and devices is designated to another department may not need to know the detailed information about cleaning, disinfection, and sterilization. However, the core concepts and principles described previously have relevance. Healthcare professionals are responsible for the appropriate application of safe practices for handling devices and equipment in the area of professional practice and for the overall practices regarding infection control. They are required to understand the core concepts and principles that include: standard and universal precautions; cleaning, disinfection, and sterilization; the application of safe practices for handling instruments, devices and equipment in the environment in which they work.

Additionally, the NYS DOH emphasizes that a designated area and a physical separation of the patient care environment from that of the cleaning and reprocessing area is highly recommended.

Knowledge Expectations of Individuals Who Have Primary/Supervisory Responsibilities for Equipment or Device Reprocessing

Healthcare professionals in the areas of sterile processing departments in facilities or in clinics and physician practices where the medical equipment and devices are reprocessed onsite have *additional*

responsibilities. Healthcare professionals who have primary or supervisory responsibilities for equipment or device reprocessing also must adhere to the core concepts and principles of cleaning, disinfection, and sterilization described. They also need to be knowledgeable about appropriate application of safe practices for handling devices and equipment specific to their particular clinical setting.

When selecting the appropriate method for reprocessing, those making the decisions should consider:

- The level of antimicrobial efficacy needed.
- The time constraints and requirements for various methods of reprocessing.
- The compatibility of the reprocessing method with the equipment or materials needing reprocessing. For example:
    - Corrosiveness
    - Penetrability
    - Heat tolerance
    - Moisture sensitivity
    - Leaching
    - Disintegration

The toxicity of the reprocessing method must be considered as well. Any occupational health risks, environmental hazards, abatement methods, monitoring exposures if necessary, and any potential for patient toxicity must all be considered. The residual effect of the reprocessing method must also be considered. Antibacterial residual effect and patient toxicity and allergy are important considerations. The ease of use of the reprocessing method must be taken into account, particularly any need for special equipment or special training requirements. Odor must be evaluated.

The stability of the method must be considered. This includes the concentration, potency, efficacy, and the effect of organic material. Additionally, the ability to monitor the process is important; methods for monitoring the reprocessing and recommendations for the frequency of monitoring must be considered. FDA regulations regarding the reuse of single use devices, the recommendations of the manufacturer for reprocessing, as well as the manufacturer of the reprocessing methods or materials must all be taken into consideration by the person doing or supervising the reprocessing.

Things to Remember

1. **Reprocessing Methods**: For an in-depth look at guidelines for the use of products by healthcare personnel in hospitals, ambulatory care as well as home care environments, the reader should review the *Guideline for Disinfection and Sterilization in Healthcare Facilities, 2008* https://www.cdc.gov/infectioncontrol/guidelines/disinfection/index.html

   - **Disinfection:** A process that results in the elimination of *many or all* pathogenic microorganisms on inanimate objects with the exception of bacterial spores. Comprised of:

     1. *High-level disinfection*
     2. *Intermediate-level disinfection*
     3. *Low-level disinfection*

   - **Sterilization:** A process that *completely* eliminates or destroys all forms of microbial life through physical or chemical methods.

   The steps in reprocessing include:

   1. Pre-cleaning
   2. Cleaning
   3. Disinfection
   4. Sterilization

   Remember that disposable cleaning devices should never be re-used!

   Spaulding Classifications

   - Sterilization is required for critical items – those directly introduced into the human body, blood stream, or normally sterile areas of the body.
   - High-level disinfection is required for semi-critical items – those that come in contact with mucous membranes or non-intact skin.
   - Low-level disinfection is required for non-critical items – those that come in direct contact with the patient, but usually unbroken skin.

2. **Ambulatory and Home Care Settings**

   - Bleach, alcohol, and hydrogen peroxide are recommended for disinfection in the home.
   - Some household cleaning products should not be used because they are inadequate in disinfection processes and healthcare personnel should have knowledge of the infection control techniques required in the home and ambulatory care settings.

3. **The Professional's Responsibility for Maintaining a Safe Patient Care Environment**

   Knowledge of the core concepts and principles that include:

   - Standard and universal precautions
   - Cleaning, disinfection, and sterilization
   - Application of safe practices for handling instruments, devices and equipment in the environment in which they work

Professionals who have primary or supervisory responsibilities for equipment or device reprocessing have additional responsibilities including:

- Selection of the appropriate reprocessing methods
- Toxicity to the user and patients
- Monitoring the processes in use

Element VI: Prevention and Control of Infectious and Communicable Diseases in Healthcare Workers

This element of the New York State mandatory infection control course discusses the prevention and control of infectious and communicable diseases in healthcare workers.

Element VI: Objective

At the end of this element you will be able to:

Identify strategies that healthcare professionals can follow to prevent and maintain control of communicable and infectious diseases to patients, staff and themselves.

Definitions

Communicable disease:	An illness due to a specific infectious agent which arises through transmission of that agent from an infected person, animal, or inanimate reservoir to a susceptible host.
Infectious disease:	A clinically manifest disease of human or animal resulting from an infection.
Occupational health strategies:	As applied to infection control, a set of activities intended to assess, prevent, and control infections and communicable diseases in healthcare workers**.**

Overview of Occupational Health Activities

The goals of occupational health strategies are two-fold:

- To prevent disease transmission by healthcare workers to patients.
- To protect susceptible healthcare workers from infectious or communicable diseases.

Strategies used to assess healthcare workers for disease risks include pre-employment and periodic physical examinations, health assessments, and the evaluation of acute or incubating illnesses. Immunizations are provided as required and as needed.

Hospitals as well as other healthcare organizations require pre-employment physical examinations and/or health assessments. Periodic physical examinations and health assessments occur after employment as well. Some of the information obtained in these assessments includes immunization history, childhood illnesses, TST-TB status, skin conditions, and chronic diseases.

Immunization/screening programs to maintain immunity are another strategy for maintaining the health of healthcare workers and reducing the risk of transmission of possible illness to patients. Some of the diseases targeted for screening/immunization include:

- rubella
- rubeola
- varicella
- mumps
- hepatitis B
- tuberculosis
- influenza

Proof of immunity is required for rubella and rubeola (from blood antibody titers), or a certificate of immunization is acceptable. A pre-employment TST or blood TB test is required and follow up is needed when there are positive results. Recommended immunizations are: hepatitis B, influenza, measles, mumps, and rubella. These regulatory requirements are covered under New York State Title 10 Regulations. The NYS Department of Labor PESH Bureau and OSHA also require that employers offer hepatitis B vaccinations to employees who are at risk for a work-related exposure to hepatitis B.

Visit http://www.cdc.gov/vaccines/schedules/index.html to view the 2018 recommendations for adult immunizations from the CDC. A copy of the immunization schedule is also provided in Appendix A.

In 2013, the NYS Department of Health began requiring all workers in Article 28 facilities to either be vaccinated against influenza annually or wear a surgical or procedure mask during flu season whenever they are in areas where patients are likely to be present.

The evaluation of acute or incubating illnesses in healthcare workers is dependent on the existence of signs and symptoms. Symptoms which should prompt evaluation for work fitness are:

- fever, chills
- cough, sputum production, other respiratory symptoms
- exanthema, vesicles
- skin lesions, weeping dermatitis
- draining wounds, sores
- diarrhea, nausea, vomiting

Post-exposure evaluation for incubating diseases in susceptible persons includes:

- Tuberculosis – skin or blood tests, chest x-rays if positive; prophylactic treatment
- Varicella – remove from work 8th - 21st day after exposure or if exposure unrecognized until all lesions dried and crusted
- Rubella – remove from work 5th - 21st day after exposure or for five days after onset of rash if exposure not known
- Rubeola – offer measles vaccine within three days, immune globulin if within six days of exposure; remove from workplace 5th - 21st day after exposure or seven days after rash appears
- Pertussis – surveillance and antibiotic for 14 days after exposure; remove healthcare worker with pertussis for three weeks, or five days after the start of effective therapy
- Mumps – remove from work 12th - 26th day after exposure or until nine days after onset of parotitis
- Ebola Virus Disease – daily monitoring for fever and/or other symptoms for a period of 21 days post exposure

Management strategies for dealing with healthcare staff with potentially communicable conditions include:

- evaluation/treatment as needed
- limiting contact with susceptible persons
- furlough until non-infectious

Rubella, rubeola, and pertussis are diseases that **must** be reported to the Office of Health Systems Management and Bureau of Disease Control.

Specific Prevention and Control Strategies for Bloodborne Pathogens

Healthcare workers are at risk for occupational exposure to bloodborne pathogens including HIV, HBV and HCV. In the United States between 1985 and 2013, 58 “documented” cases and 150 “possible” cases of occupational HIV transmission were reported to the Centers for Disease Control and Prevention (CDC, 2015). The risk of transmission of HIV after needlestick injury (when the needle has been contaminated with HIV-positive blood) is low: approximately 0.3% or three of every 1,000 healthcare workers.

The rate of hepatitis B virus (HBV) transmission is high after only one needlestick exposure to an HBV-infected patient and is reported as approximately 6-30%; however, the incidence has decreased 95% since 1983 due to widely available immunization against hepatitis B, the use of standard precautions, and the OSHA Bloodborne Pathogen Standard (CDC, 2003).

The vaccine against hepatitis B virus must be offered free to healthcare workers at their place of employment. It is a very effective and safe prevention strategy. Its makeup is now synthetic; the plasma-derived product is no longer used in the US. The vaccine is encouraged for all healthcare workers involved in direct patient care or those exposed to blood/body fluids. Ideally, the vaccine (currently given in three doses over a six-month period) should be completed during training **before** contact begins.

The risk of transmission of the hepatitis C virus (HCV) is approximately 3%. There is no currently available vaccine against hepatitis C; however, there are now a number of anti-viral regimens that have been successful in treating and eliminating the virus from infected individuals. Viral incubation for HCV ranges from five to seven weeks. Many people remain asymptomatic and diagnosis is often serendipitous. Chronic infection can develop in 75% to 85% of those with hepatitis C and many who have HCV develop an active liver disease.

Refer to Elements III and IV for the use of engineering, work practice and PPE controls to limit the risk of exposure to bloodborne pathogens.

Post Exposure Management for Bloodborne Pathogens

Two criteria are used in determining whether an occupational exposure has occurred:

1. the body substance involved
2. the type of injury or contact

Examples of exposures which require medical management are:

- exposure to blood
- semen
- vaginal secretions
- percutaneous exposure or permucosal exposure

Evaluation of the Source

The person who is the source of the exposure should be informed and interviewed for information relevant to the exposure. It is advisable to seek permission for HIV antibody testing, as well as testing for hepatitis B antibodies. HCV specific labs will include a HCV Polymerase chain reaction (PCR) to detect the presence or absence of virus, an HCV titer (HCV RNA) to determine the number of copies of virus present, and a genotype to identify the strain of virus with which the individual is infected. OSHA requires that the employer try to obtain the source patient’s consent to determine HIV and HBV infectivity.

HIV Post Exposure Guidance

1. Employer Responsibilities

   - As part of a comprehensive plan to prevent the transmission of blood borne pathogens, employers should implement the use of safety devices and educate workers about how to prevent needle stick injuries.
   - Antiretroviral medications for PEP should be readily available to exposed workers who sustain a potential occupational exposure to HIV.

2. HIV Post-Exposure Management and Evaluation

   - Occupational PEP should be initiated as soon as possible, ideally within two (2) hours of the exposure. A first dose of PEP should be offered to the exposed worker while the evaluation is underway.
   - Body sites exposed to potentially infectious fluid should be cleansed immediately. Wound and skin exposure sites should be washed with soap and water. Exposed mucous membranes should be flushed with water. The exposed worker should not attempt to “milk” the wound.
   - Prompt initiation of PEP is recommended for exposure to blood, visibly bloody fluids, or other potentially infectious material (semen; vaginal secretions; breast milk; and cerebrospinal, synovial, pleural, peritoneal, pericardial, and amniotic fluids) from HIV-infected or HIV-unknown sources in any of the significant exposure situations outlined in the text.
   - If the HIV serostatus of the source patient is unknown, consent for voluntary HIV testing of the source patient should be sought as soon as possible after the exposure.
   - In New York State, when the source patient has the capacity to consent to HIV testing, informed consent is required; if consent is not obtained, HIV testing cannot be performed. When the source person does not have the capacity to consent, consent may be obtained from a surrogate, or anonymous testing may be done if a surrogate is not immediately available.
   - Confidential baseline HIV testing of the exposed worker should be obtained at the time the occupational exposure is reported or within three (3) days of the exposure. Testing must be performed in full compliance with New York State Public Health Law.
   - PEP should be started without waiting for the results of the HIV test.

3. Timing of Initiation

   - When a potential occupational exposure to HIV occurs, every effort should be made to initiate PEP as soon as possible, **ideally within two (2) hours**. A first dose of PEP should be offered to the exposed worker while the evaluation is underway.
   - Decisions regarding initiation of PEP beyond 36 hours post exposure should be made on a case-by-case basis with the understanding of diminished efficacy when timing of initiation is prolonged.

4. Medical Regimens for Occupational PEP

   - For Medical Regimen see Appendix C.

5. Follow-Up and Monitoring

   - All exposed workers receiving PEP should be re-evaluated within three (3) days of the exposure.
   - The exposed worker should be evaluated weekly while receiving PEP to assess treatment adherence, side effects of treatment, interval physical complaints, and emotional status.

Full Guidelines and information can be found: https://www.hivguidelines.org/pep-for-hiv-prevention/

Hepatitis B and C Post Exposure Guidance

The New York State Department of Health AIDS Institute Clinical Guidelines Program (2018b) recommends the following guidelines:

- When an occupational exposure occurs, the source patient should be evaluated for both hepatitis B and hepatitis C.
- Consider concurrent exposure to HCV when exposed workers present with an HIV exposure.
- Neither immunoglobulin nor antiviral agents are recommended for HCV PEP.
- When HCV infection is identified, the exposed worker should be referred for medical management.
- Following an exposure to blood or body fluid, the clinician should assess the risk for exposure to HCV. Wounds should be washed with soap and water, and should not be squeezed. Mucous membranes should be flushed with water.
- Once exposure to blood or body fluid has occurred baseline tests should be obtained.
- Exposed workers should be educated about:
    - Avoidance of alcohol and, if possible, medications that may be toxic to the liver
    - Risk of transmission related to:
        - Blood-to-blood contact, including sharing personal care items that may have come in contact with another person's blood, such as razors or toothbrushes; occupational needlestick injuries; and sharing needles, syringes, or other equipment to inject drugs
        - Sexual activity
        - Donating blood, plasma, organs, tissue, or semen
        - Perinatal transmission
    - HCV is not spread via food or water and is not transmitted by:
        - Sharing eating utensils
        - Hugging, kissing, or holding hands
        - Coughing or sneezing
        - Breastfeeding: HCV is not transmitted by breastfeeding; however, clinicians should advise women who may have been exposed to HIV to avoid breastfeeding for three (3) months after the exposure

For HBV specific PEP view Appendix B.

Note: There is a professional obligation to inform patients exposed to a healthcare worker's blood or other potentially infectious material.

<u>Prevention Management of Airborne or Droplet Pathogens</u>

Tuberculosis

The CDC outlined new *Guidelines for Preventing the Transmission of Mycobacterium Tuberculosis (TB) in Healthcare Settings in 2005.* These guidelines replace all previous CDC guidelines for TB. The new focus is on preventing TB resurgence and eliminating healthcare worker (HCW) infection. The 2005 guidelines incorporate:

- A more inclusive risk assessment process for infection control.
- A "tuberculin skin test" (TST) replaced purified protein derivative (PPD).

- The interferon gamma release assay (IGRA), Quantified FEROn-TB Gold test (QFT-G) might be used instead of TST in TB screening programs. The advantage is specificity and decreasing visits for reading and interpreting tests. The disadvantages include higher costs and the need for specimens to be set up with a 12-hour time frame.
- A more defined criterion for serial screening of HCWs.
- The term "healthcare setting" is used over "healthcare facility." This includes inpatient, outpatient and long-term care.
- HCWs to be included in TB Screening/Surveillance:
    - All paid and unpaid persons working in the healthcare setting who have potential exposure to TB through air space shared with persons with infectious TB disease**. All** full time, part time, temporary and contract personnel should be included in the TB screening program.
- TB screening programs for HCWs are based on risk classification: low risk, medium risk, and potential ongoing transmission.
- Training and educating HCWs
    - HCW training and education on TB are essential to increase adherence to TB infection-control measures. Increased risks by an undiagnosed person and measures to reduce risks are essential in the education. Documentation by the healthcare employer that HCWs' training is relevant to their work setting must be adhered to (CDC, 2005).

For a complete version of the "Guidelines for Preventing the Transmission of Mycobacterium Tuberculosis in Health-care Settings, 2005," visit http://www.cdc.gov/mmwr/pdf/rr/rr5417.pdf (CDC, 2005).

Preventing TB by treating latent Mycobacterium tuberculosis infection is a strategy the United States has taken on to eliminate TB. Trials have been conducted that included a combination of drug therapy that the CDC has now recommended for the treatment of TB. Isoniazid and Rifapentine used in combination for 12 weeks has proven to be as effective as a 9-month regime of just one drug therapy (One and Only Campaign, 2011).

Post Exposure Management of Select Infectious Diseases

Varicella

The CDC Guideline for Infection Control in Healthcare Personnel recommendations includes (CDC 1998, Siegel et al., 2007):

- Administer varicella vaccine to susceptible personnel, especially those that will have contact with patients at high risk for serious complications.
- Do not perform serologic screening of persons with negative or uncertain history of varicella before administering varicella vaccine to personnel, unless the institution considers it cost-effective.
- Do not routinely perform post-vaccination testing of personnel for antibodies to varicella.
- No recommendation for administering post-exposure varicella vaccination for the protection of exposed, susceptive personnel. This is an unresolved issue at the CDC.
- Develop guidelines for managing healthcare personnel who receive varicella vaccine; for example, consider precautions for personnel who acquire a rash after receipt of varicella vaccine and for other healthcare personnel who receive varicella vaccine and will have contact with susceptible persons at high risk for serious complications from varicella.

- Develop written guidelines for post-exposure management of vaccinated or susceptible personnel who are exposed to wild-type varicella.
- Exclude personnel from work who have onset of varicella until all lesions have dried and crusted.
- Exclude from duty, after exposure to varicella, personnel who are not known to be immune to varicella (by history or serology), beginning on the eighth day after the first exposure until the 21st day after the last exposure (28th day if intravenous immunoglobulin (VZIG) was given).
- Restrict immunocompetent personnel with localized zoster from the care of high-risk patients until lesions are crusted; allow them to care for other patients with lesions covered.
- Restrict immunocompromised personnel with zoster from contact with patients until their lesions are crusted.
- Restrict susceptible personnel exposed to zoster from patient contact from the tenth day after the first exposure through the 21st day after the last exposure (28th day if VZIG was given).
- Perform serologic screening for immunity to varicella on exposed, vaccinated personnel whose antibody status is not known. If the initial test result is negative, retest five to six days after exposure to determine whether an immune response occurred.
- Consider excluding vaccinated personnel from work beginning on the tenth day after the first exposure through the 21st day after the last exposure if they do not have detectable antibodies to varicella, or screen daily for symptoms of varicella.
- Do not routinely give VZIG to exposed susceptible personnel, unless immunosuppressed, HIV infected, or pregnant. If VZIG is given, exclude personnel from duty from the tenth day after the first exposure through the 28th day after the last exposure.

Rubella

- Vaccinate all personnel without documented immunity to rubella with rubella vaccine (MMR is the vaccine of choice; if the recipient is known to be immune to one or more of the components, monovalent or bivalent vaccines may be used).
- Consult local and state health departments regarding regulations for rubella immunity in health care personnel.
- Do not perform serologic screening for rubella before vaccinating personnel with rubella vaccine, unless the healthcare employer considers it cost-effective or the potential vaccine recipient requests it.
- Do not administer rubella vaccine to susceptible personnel who are pregnant or might become pregnant within three months of vaccination.
- Administer rubella vaccine in the postpartum period to female personnel not known to be immune.
- Exclude susceptible personnel who are exposed to rubella from duty from the seventh day after the first exposure through the 21st day after the last exposure.
- Exclude personnel who acquire rubella from duty until seven days after the beginning of the rash.

Measles

- Ensure that all personnel have documented immunity to measles.
- Administer measles vaccine (MMR is the vaccine of choice; if the recipient is known to be immune to one or more of the components, monovalent or bivalent vaccines may be used) to persons born in 1957 or later, unless they have evidence of measles immunity.
- Administer measles vaccine to personnel born before 1957 if they do not have evidence of measles immunity and are at risk for occupational exposure to measles. Do not routinely perform

serologic screening for measles before administering measles vaccine to personnel, unless the healthcare employer considers screening cost-effective or at the request of the vaccine recipient.

- Administer post-exposure measles vaccine to measles-susceptible personnel who have contact with persons with measles within 72 hours after the exposure.
- Exclude exposed personnel who do not have documented immunity to measles from duty from the fifth day after the first exposure until the 21st day after the last exposure to measles, regardless of whether they receive post-exposure vaccine.
- Exclude personnel who acquire measles from duty for seven days after rash develops or for the duration of their acute illness, whichever is longer.

Pertussis

- Do not administer whole-cell pertussis vaccine to personnel.
- Immediately offer antimicrobial prophylaxis against pertussis to personnel who have had unprotected (i.e., without the use of proper precautions), intensive (i.e., close, face-to-face) contact with a patient who has a clinical syndrome highly suggestive of pertussis and whose cultures are pending; discontinue prophylaxis if results of cultures or other tests are negative for pertussis and the clinical course is suggestive of an alternate diagnosis. Pertussis is a communicable disease. The local health department will need to be notified of any confirmed cases. They will be available to assist a health care setting in the identification of HCW's who would need prophylactic antibiotics.
- Exclude personnel in whom symptoms develop (e.g., cough ≥seven days, particularly if accompanied by paroxysms of coughing, inspiratory whoop, or posttussive vomiting) after known exposure to pertussis from patient care areas until five days after the start of appropriate therapy.

On June 10, 2005, a tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis vaccine (Tdap), formulated for use in adults and adolescents, was licensed in the United States for persons aged 11–64 years (ADACEL®, manufactured by Sanofi Pasteur, Toronto, Ontario, Canada). Pre-licensure studies demonstrated safety and efficacy, inferred through immunogenicity, against tetanus, diphtheria, and pertussis when Tdap was administered as a single booster dose to adults (Kretsinger et al., 2006).

On July 8, 2011, the Food and Drug Administration (FDA) approved an expanded age indication for the tetanus toxoid, reduced diphtheria toxoid and acellular pertussis vaccine (Tdap) Boostrix (GlaxoSmithKline Biologicals, Rixensart, Belgium). Boostrix is licensed for use in persons aged 10 years and older as a single-dose booster vaccination (CDC, 2011a).

To reduce pertussis morbidity among adults and maintain the standard of care for tetanus and diphtheria prevention and to reduce the transmission of pertussis to infants and in healthcare settings, the Advisory Committee on Immunization Practices (ACIP) and the Healthcare Infection Control Practices Advisory Committee (HICPAC) recommends that:

- Any adult 19 years of age and older who has not received a dose of Tdap should get one as soon as feasible – to protect themselves and infants. This Tdap booster dose can replace one of the 10-year Td booster doses. Tdap can be administered regardless of interval since the previous Td dose. Shorter intervals between Tdap and last Td may increase the risk of mild local reactogenicity but may be appropriate if your patient is at high risk for contracting pertussis, such as during an outbreak, or has close contact with infants.

  When feasible, Boostrix (GSK) should be used for adults 65 years and older; however, either vaccine product administered to a person 65 years or older provides protection and may be considered valid. Providers should not miss an opportunity to vaccinate persons aged 65 years and older with Tdap. Therefore, providers may administer the Tdap vaccine they have available.

- Intervals shorter than ten years since the last Td may be used for booster protection against pertussis.
- Pregnant women should get a dose of Tdap during each pregnancy, preferably at 27 through 36 weeks gestation. By getting Tdap during pregnancy, maternal pertussis antibodies transfer to the newborn, likely providing protection against pertussis in early life, before the baby starts getting DTaP vaccines. Tdap will also help protect the mother at time of delivery, making her less likely to transmit pertussis to her infant. It is important that all family members and caregivers of the infant are up-to-date with their pertussis vaccines (DTaP or Tdap, depending on age) before coming into close contact with the infant. Tdap is recommended in the immediate postpartum period before discharge from the hospital or birthing center for new mothers who have never received Tdap before or whose vaccination status is unknown.
- A single dose of Tdap is recommended for health care personnel who have not previously received Tdap as an adult and who have direct patient contact. Tdap vaccination can protect health care personnel against pertussis and help prevent them from spreading it to their patients. Priority should be given to vaccinating those who have direct contact with babies younger than 12 months of age.

  Tdap can be administered regardless of interval since the previous Td dose. However, shorter intervals between Tdap and last Td may increase the risk of mild local reactogenicity.

(CDC, 2013b)

Mumps

- Administer mumps vaccine to all personnel without documented evidence of mumps immunity, unless otherwise contraindicated (MMR is the vaccine of choice. If the recipient is known to be immune to one or more of the components, monovalent or bivalent vaccines may be used).
- Before vaccinating personnel with mumps vaccine, do not routinely perform serologic screening for mumps, unless the healthcare employer considers screening cost-effective or it is requested by the vaccine recipient.
- Exclude susceptible personnel who are exposed to mumps from duty from the 12th day after the first exposure through the 26th day after the last exposure, or if symptoms develop, until nine days after the onset of parotitis.
- **NEW:** HICPAC has reduced the isolation recommendation from 9 to 5 days for infected individuals (Update: October 2017).

  (Siegel et al., 2007)

<u>Hemorrhagic Fevers</u>

Ebola Virus Disease

Because of a large outbreak of Ebola Virus Disease (EVD) in western Africa in 2014-15 and the subsequent treatment of EVD patients in the United States, the CDC has developed guidance materials for healthcare facilities to facilitate screening, isolation, testing and treatment of suspect and confirmed EVD cases. In addition the CDC and OSHA provide recommendations on protecting healthcare workers from exposure to EVD. The Ebola virus is highly lethal and can be spread through various modes of transmission. Healthcare workers treating patients with EVD are at a high risk for exposure.

The CDC recommends that healthcare workers:

- Use standard, contact and droplet precautions to care for a patient under investigation or patient with confirmed EVD and patient should be isolated in a single room with private bathroom.
- Take additional infection control steps if a patient under investigation or patient with confirmed EVD has other conditions or illnesses, such as tuberculosis, or requires care involving aerosol-generating procedures.
- Leave no skin exposed when treating the patient or handling potentially infected material or equipment.
- Minimize procedures that can increase environmental contamination with infectious material or create aerosols.

OSHA requires that employers follow the following standards to protect employees from Ebola virus infection:

- Bloodborne Pathogens Standard (OSHA 29 CFR 1910.1030)
- Personal Protective Equipment Standard (OSHA 29 CFR 1910.132)
- Eye and Face Protection Standard (OSHA 29 CFR 1910.133)
- Respiratory Protection Standard (OSHA 29 CFR 1910.134)
- Sanitation Standard (OSHA 29 CFR 1910.141)
- General Duty Clause (Section 5a1 of the Occupational Safety and Health Act of 1970)

Further information can be found at:
https://www.cdc.gov/vhf/ebola/clinicians/
https://www.osha.gov/SLTC/ebola/control_prevention.html

Evaluation of Healthcare Workers Infected With HIV, HBV or Other Bloodborne Pathogens

In 1991, the Centers for Disease Control and Prevention (CDC) published guidelines for the prevention of health care professional-to-patient transmission of HBV and HIV (http://www.cdc.gov/mmwr/preview/mmwrhtml/00014845.htm). At the same time the New York State Department of Health (NYSDOH) issued a policy statement and guidelines concerning HIV-infected medical personnel. In 1992, legislation formally codified New York's policies and guidelines to protect all citizens from exposure to HIV, HBV and other bloodborne pathogens during medical/dental procedures and to safeguard the rights of infected HCP (health care professionals). Since that time, much knowledge has been gained regarding health care associated transmission, management, and prevention of infection with these viruses. This current document was reviewed and revised in 2011 by NYSDOH. It includes an update of applicable laws and regulations and adds HCV to the list of bloodborne pathogens.

The updated NYSDOH policy statement and guidelines concerning bloodborne pathogen-infected HCP continue to emphasize voluntary testing of HCP and case-by-case evaluation of bloodborne pathogen-infected HCP who perform invasive procedures to determine if they pose a significant risk to patients. Bloodborne pathogen infection alone is not sufficient justification to limit the professional duties of HCP unless specific factors compromise an HCP's ability to meet infection prevention and control standards or to provide quality patient care (NYDOH, 2011).

Policy Statement

Based on currently-accepted medical and scientific evidence, the NYSDOH recommends the following policies to prevent infected health care personnel (HCP)-related bloodborne pathogen transmission (HIV, HBV, HCV):

1. The most effective means of preventing bloodborne pathogen transmission in health care settings is through strict adherence to Standard Precautions (Siegel, et al., 2007), and established infection prevention and control practices that decrease the opportunity for direct exposure to blood and body fluids for both health care workers and patients.
2. Voluntary testing without fear of disclosure or discrimination is the best means of encouraging people at risk for bloodborne pathogens to seek counseling and testing.
3. Mandatory screening of New York HCP for bloodborne pathogens is not recommended. Such a program would cost millions of dollars and would not produce any appreciable gain in public safety. Negative antibody tests for HIV, HBV, and HCV do not rule out the presence of infection since it can take some time for measurable antibodies to appear.
4. All patients and health care workers who have been potentially exposed to bloodborne pathogens should be strongly counseled to seek testing so they may benefit from medical management. Health care workers should also seek screening for bloodborne diseases per CDC recommendations as part of their own health care. CDC recommends that all persons aged 13–64 have routine screening for HIV (CDC, 2006). Persons of all ages with ongoing risk factors for HIV should have periodic repeat screening and seek medical care if they are found to be HIV-infected. HBV and HCV screening recommendations are based on an assessment of individual risks (CDC, 2001).
5. Bloodborne pathogen infection alone does not justify limiting a health care worker's professional duties. Limitations, if any, should be determined on a case-by-case basis after consideration of the factors that influence transmission risk, including inability or unwillingness to comply with infection prevention and control standards or functional impairment that interferes with job performance.
6. Health care workers are not required to inform patients or employers that they have a bloodborne pathogen infection. Such disclosure might serve as a deterrent to workers seeking voluntary testing and medical evaluation. Strict adherence to Standard Precautions is an effective means of preventing transmission of bloodborne pathogens.

Protecting Healthcare Workers with a BBP Infection

The NYSDOH has identified measures that enhance public safety and guard against discrimination for bloodborne pathogen-infected health care personnel (HCP).

1. Mandatory Infection Prevention and Control Training for HCP

New York State regulation (10 N.Y.C.R.R. § 405.11) requires all licensed health care facilities to train their staff in infection prevention and control techniques, to provide appropriate equipment, and to enforce use of Standard Precautions in situations involving potential exposure to blood or other body fluids. The NYSDOH also provides detailed infection prevention and control guidelines to all physicians and dentists practicing in New York State and makes such guidelines publicly available on the NYSDOH website: http://www.health.ny.gov/professionals/diseases/reporting/communicable/infection/prevention_and_control_guidelines.htm.

In addition, NYS Public Health Law (PHL) § 239 and Education Law (EdL) § 6505-b require licensed health care professionals (including physicians, physician assistants, specialist assistants, registered nurses, licensed practical nurses, dentists, dental hygienists, podiatrists, and optometrists) to complete a course in infection control and barrier precautions on or before July 1, 1994, and every four years

thereafter. As of 2008, PHL § 239 also requires medical students, medical residents, and physician assistant students to complete coursework or training in infection control practices. Required courses, tailored to the infection prevention and control training needs of specific health care specialties, include work practices and engineering controls, safe injection practices, and disinfection and sterilization procedures. The NYSDOH or NYSED must approve the course syllabus and course providers.

Health care professionals must submit proof of completion of required infection prevention and control training to either the NYSDOH or NYSED. Physicians with hospital privileges will present the necessary training documentation to the facility (in lieu of the NYSDOH) during the process of renewing facility privileges. The NYSDOH or NYSED will grant an exemption from this training requirement to health care professionals who demonstrate that such training is not needed because of the nature of their clinical practice, or that they have completed equivalent training or coursework. A health care professional who receives an exemption must apply to the NYSDOH or NYSED to continue such exemption every four years.

2. Enforcement of Infection Prevention and Control Standards

All licensed health care facilities are responsible under existing regulations (see 10 N.Y.C.R.R. § 405.11 by visiting https://regs.health.ny.gov/content/section-40511-infection-control) for monitoring and enforcing proper use of infection prevention and control practices and Standard Precautions by health care workers functioning under their jurisdiction. Failure to comply with this requirement will result in NYSDOH citation, potential fines, and other disciplinary action against the facility.

Any licensed health care worker who fails to use appropriate infection prevention and control techniques to protect patients or fails to ensure that health care workers under his or her supervision do so may be subject to charges of professional misconduct and disciplinary action (e.g., Education Law § 6530(47); 8 N.Y.C.R.R. § 29.2(a)(13)).

Any patient or employee report regarding lax infection prevention and control practices in a private medical or dental office may prompt an investigation by the appropriate authorities. Substantiated lapses in infection prevention and control in a private practice setting may result in charges of professional misconduct against any licensed professional in the practice who was involved or who has responsibility for ensuring that office staff are adequately trained and follow patient protection measures.

The NYSDOH and NYSED have promulgated regulations and/or statutory amendments to implement these enforcement provisions.

3. Protecting HCP from Infection

All health care facilities should take the following steps to protect HCP from occupational exposure to bloodborne pathogens (for more details, refer to the Occupational Safety and Health Administration's website at http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10051):

- All HCP should receive appropriate training for their job titles in infection prevention and control techniques, including engineering and work practice controls, Standard Precautions, and work practices that help prevent sharps or other injuries and splashes of blood and body fluids.
- All HCP should be provided a safe work environment, including protective equipment, clothing, and devices to reduce the risk of occupational exposure to blood and body fluids.
- All HCP whose job responsibilities involve contact with blood or sharp objects likely to be contaminated with blood should be offered and encouraged to receive the hepatitis B vaccine.
- All HCP should receive information about the risks associated with bloodborne pathogen transmission and the merits of knowing their status if they have personal or occupational risks so they may benefit from medical management.
- All HCP should be informed that, if they have an impaired immune system, they are at risk of acquiring potentially life-threatening infections, including tuberculosis, from patients.

- Information on the availability of voluntary and confidential or anonymous (in the case of HIV) counseling and testing for bloodborne pathogens should be made available to health care workers.

4. Evaluating Infected HCP

Evaluation Criteria:

A health care facility should base its evaluation of HCP on the premise that bloodborne pathogen infection alone is not sufficient justification to limit the professional duties of HCP. The determination of whether an individual HCP poses a significant risk to patients that warrants job modification, limitation, or restriction requires a case-by-case evaluation that considers the multiple factors that can influence risk. Periodic re-evaluation of HCP with bloodborne pathogen infection may be appropriate if physical or mental functioning changes.

Factors that may bear on the ability of HCP, including those with bloodborne infections, to provide quality health care include:

- Physical or mental condition that may interfere with the worker's ability to perform assigned tasks or regular duties;
- Lack of compliance with established guidelines to prevent transmission of disease and/or documentation or evidence of previous transmission of bloodborne pathogens;
- Lack of appropriate infection prevention and control techniques as related to performance of procedures (e.g., poor hand hygiene practices or lack of attention to Standard Precautions);
- Any health condition that would pose a significant risk to others including, but not limited to, weeping dermatitis, draining or open skin wounds.

Institutional Review Process:

Under NYSDOH regulations (10 N.Y.C.R.R. § 405.3(b)), all licensed health care facilities are responsible for ensuring that their employees, medical staff, and volunteers do not have physical or mental impairments related to bloodborne pathogen infection or any other condition that would interfere with the performance of their duties or pose a risk to patients.

Consistent with this regulation, health care facilities are responsible for establishing a mechanism for evaluating HCP with bloodborne pathogen infection to ensure that they do not pose a risk. This requirement should not be misconstrued to condone involuntary or mandatory screening of employees for bloodborne pathogens by health care facilities.

Except as otherwise authorized in state or federal law, PHL § 2781 prohibits HIV testing of any person without written, informed consent. All HCP should be counseled about the importance of learning their bloodborne pathogen status.

Institutional evaluations of individual workers known to be infected with bloodborne pathogens should involve consultation with experts who can provide a balanced perspective. Such experts may include an infectious disease physician and/or hospital epidemiologist with an understanding of bloodborne pathogens, a representative from the infected health care worker's specialty area, and the infected worker's primary care provider. All matters related to such evaluations must be handled confidentially.

Any modifications of work practice must seek to impose the least restrictive alternative in accordance with disability laws. Any worker who believes that his/her employment has been restricted or terminated without just cause may ask for a second opinion from a NYSDOH review panel and/or file a complaint with the State Human Rights Commission.

State-Appointed Review Panels:

Pursuant to PHL § 2760, the NYSDOH may convene a state advisory panel that provides guidance to bloodborne pathogen-infected health care workers who seek consultation. Access to state-appointed panel review is available on request to infected health care workers who perform procedures that might increase the risk of worker-to-patient blood exposure. State panels function as an evaluation resource for practitioners who are not affiliated with institutions, or as a second opinion for workers affiliated with health care facilities that have been evaluated by their facilities.

Each panel would include a state or local public health officer, an infectious disease expert, and an expert in infection control/epidemiology. In addition, an individual from the infected health care worker's specialty area and the individual's primary care provider may be asked to serve as members of the panel. The purpose of such panels is to provide timely advice and consultation on an individual's risk of bloodborne disease transmission through his/her professional practice and to recommend practice limitations, modifications, or restrictions where the evidence suggests there is a significant risk to patients.

The evaluation process will be confidential except for the following circumstances:

- To adequately evaluate health care workers who are institutionally based, the panel – directly or through its designees – may request information about the health care worker's practice from the facility.
- If practice restrictions are recommended, the individual involved shall verify to the panel that all health care facilities in which the health care worker practices are informed. If verification is not forthcoming, the panel will inform such facilities. Within all facilities, the usual rules of confidentiality apply.

NYSDOH Consultation:

The NYSDOH is available to any individual, institution, or organization to discuss concerns about the management of employees with bloodborne pathogens. In addition, the NYSDOH will provide information, confidentiality or anonymously, on the process for accessing the state review panels described above. For information, contact the NYSDOH Bureau of Healthcare-Associated Infections Healthcare Epidemiology and Infection Control program at 518-474-1142 or visit the Bureau's website at http://www.health.ny.gov/professionals/diseases/reporting/communicable/infection/hcp_training.htm .

Enforcement of Practice Restrictions:

Health care facilities must ensure that health care workers who are in their employ or who provide patient care from their facilities follow any practice limitations recommended by institutional panels. If practice limitations are recommended for a community-based health care worker, the NYSDOH or NYSED (depending upon the license held by infected HCP) will perform periodic monitoring with the professional's consent to ensure compliance. If a health care worker does not follow the practice restrictions or if compliance is uncertain, the appropriate state licensing/certification/permit board will be notified.

Confidentiality of a Health Care Worker's HIV Status:

PHL § 2782 protects the confidentiality of HIV-related information by limiting who may obtain the information and for what purpose. The Human Rights Law §296 (https://dhr.ny.gov/law) prohibits discriminatory employment practices based on a person's disability. In accordance with the law, HIV-infected health care workers may not be required as a condition of employment to disclose their HIV status to patients. Similarly, health care facilities are under no general obligation under New York State law to disclose to patients the status of an infected health care worker in their employ. Issues related to possible employment discrimination should be directed to the NYS Division on Human Rights (718-741-8400) (website: https://dhr.ny.gov/) or to the
NYC Commission on Human Rights (718-722-3131) (website: http://www.nyc.gov/html/cchr/home.html).

Notification of patients that they were exposed to the blood of a health care worker should be based on documentation of an injury to a health care worker or negligent practice that could have resulted in the health care worker's blood coming into direct contact with a patient's bloodstream or mucous membranes. In such circumstances, the patient should be advised to receive testing for potential bloodborne pathogen exposure. The NYSDOH will be available to assist health care facilities in determining if a significant risk of exposure to bloodborne pathogens warrants notification to patients.

5. Quality Assurance Protections

Health care facility quality assurance programs and, under their umbrella, infection prevention and control policies and procedures, are key mechanisms for preventing disease transmission within health care settings. To further reduce the low risk of bloodborne pathogen transmission from infected HCP through medical procedures, health care facilities should take the following actions:

- Ensure policies and procedures for the prevention of bloodborne pathogen infections are in place and being monitored for compliance.
- Review existing policies and procedures to ensure that mechanisms are in place for reporting and managing circumstances where an HCP is exposed to a patient's blood and/or body fluids or there has been blood exposure between a patient and an HCP (e.g., during a procedure where injury to a health care worker resulted in both parties having contact with the other person's blood).

Form cooperative work groups to review surgical techniques (in the case of an infected HCP) to identify changes in practice or other alternatives to reduce any risk of potential injury to a health care worker that could result in blood exposure to patients.

Considerations while applying and implementing the policies and guidelines above include:

- nature and scope of professional practice
- techniques used in performance of invasive procedures that may pose a risk to patients
- compliance with infection control standards
- presence of weeping dermatitis or skin lesions
- overall health status
- physical health
- cognitive function

(NYDOH, 2011)

✓ Things to Remember

1. Goals of Occupational Health Strategies

   - Prevent disease transmission by healthcare workers to patients
   - Protect susceptible healthcare workers from infectious or communicable diseases

2. Targeted diseases for screening and/or immunization include: rubella, rubeola, varicella, mumps, hepatitis B, tuberculosis, and influenza.

3. The 2018 CDC recommendations for adult immunizations can be found at: https://www.cdc.gov/vaccines/schedules/downloads/adult/adult-combined-schedule.pdf

4. Post-exposure management for bloodborne pathogens depends on:

   - Body substance involved
   - Type of contact

5. CDC recommendations for prevention of transmission of TB include:

   - Baseline TST or blood testing
   - Follow-up evaluation and risk assessment
   - Post-exposure management

6. The NYSDOH *Policy Statement and Guidelines to Prevent Transmission of Bloodborne Pathogens from Infected Health Care Personnel through Medical/Dental Procedures* (2012) provides information relating to:

   - HIV and HBV-related policies to best safeguard New York's citizens
   - Protecting the viability of our healthcare system

7. Confidentiality of a Healthcare Worker's HIV Status

   HIV-infected healthcare workers are entitled to protections under the New York State HIV Confidentiality Law as are all citizens. Such workers are **not** required to:

   - Disclose their HIV status to patients or employers.
   - Healthcare facilities are under **no** obligation to disclose to patients the status of an infected healthcare worker in their employ; such disclosure, without the consent of the worker, would likely violate New York's HIV Confidentiality Law.

Element VII: Sepsis Awareness and Education

Sepsis is the body's extreme response to an infection. It is life-threatening, and without immediate action, often rapidly leads to tissue damage, organ failure, and death (CDC, 2018a). The 2016 Surviving Sepsis Campaign Guidelines was published, the 4th revision, done by a consensus committee of 55 international experts representing 25 international organizations. The following year in October 2017, Governor Cuomo signed into law amendments to Public Health Law § 239 and Education Law § 6505 requiring the addition of sepsis awareness and education training to the NYS-mandated Infection Control and Barrier Precautions coursework. The law requires that this new Element be included in the educational offering beginning July 1, 2018.

Element VII Objectives:

At the end of this element you will be able to:

- Describe the scope of the sepsis problem and the NYS Sepsis Improvement Initiative.
- Recognize signs and symptoms of sepsis to identify and treat at-risk patients, both adult and pediatric, as early as possible.
- Understand the need for rapid evaluation and management in adults and children if sepsis is suspected.
- Identify common sources of sepsis.
- Educate patients and families on methods for preventing infections and illnesses that can lead to sepsis and on identifying the signs and symptoms of severe infections and when to seek care.

<u>Sepsis: Scope of the Problem</u>

Sepsis is a life threatening medical emergency which is the body's extreme reaction to infection that requires early recognition and intervention. It is a life threatening medical emergency because, in this state, the body attacks its own organs and tissues which can lead to tissue damage, organ failure and death.

More than 1.5 million people get sepsis each year in the United States, and about 250,000 Americans die from sepsis each year – about one (1) in three (3) patients who die in a hospital, have sepsis (CDC, 2018a). Sepsis is the leading cause of death in hospitals in the United States with an increasing rate of sepsis each year.

<u>New York State Sepsis Improvement Initiative and Rory Staunton's Law</u>

Sepsis begins outside of the hospital for almost 80% of sepsis patients and is the most expensive condition treated in U.S. hospitals (Rory Staunton Foundation, 2018). Seven (7) of ten (10) patients with sepsis had recently used healthcare services or had chronic conditions requiring frequent medical care.

Early recognition of sepsis is the responsibility of all healthcare providers. New York State Public Health Law § 239-a and New York Education Law § 6505-b requires health care providers to take an infection control educational program, beginning July of 2018 the program must also include education about sepsis. New York State Sepsis Improvement Initiative and Rory Staunton's Law requires that each acute care hospital in New York under Title 10 of the New York State Codes, Rules and Regulations (§ 405.2 and § 405.4) are to develop and implement evidence informed sepsis protocols that describe their approach to both early recognition and treatment of sepsis patients (NYSDOH, 2016).

Causes of Sepsis

Sepsis is triggered by a bacterial, viral or fungal infection that starts in any part of the body, although bacterial infections are the most common cause. The most frequently identified germs that cause infections that develop into sepsis are Staphylococcus aureus (staph), Escherichia coli (E. coli) and sometimes Streptococcus. The four types of body parts and infections that are often linked with sepsis are: lungs (pneumonia), kidney (urinary tract infection), skin and gut (CDC, 2018a).

Certain populations are at more risk for becoming septic such as:

- People with chronic medical conditions, such as diabetes, lung disease, cancer, kidney disease
- People with weakened immune systems
- People 65 or older
- Babies and very young children
- People suffering from a burn or wound

(Rory Staunton Foundation, 2018a and CDC, 2018a)

Early Recognition of Sepsis

There is no single symptom of sepsis, and sepsis typically presents as a combination of symptoms. If presenting with two or more of any of the following symptoms, sepsis should be considered:

- A fever above 101º F or a temperature below 96.8º F, shivering or feeling very cold
- Confusion or disorientation
- Shortness of breath, breathing more than 20 breaths per minute
- Probable or confirmed infection
- Extreme pain or discomfort
- High heart rate, more than 90 beats per minute
- Clammy or sweaty skin

(Rory Staunton Foundation, 2018a)

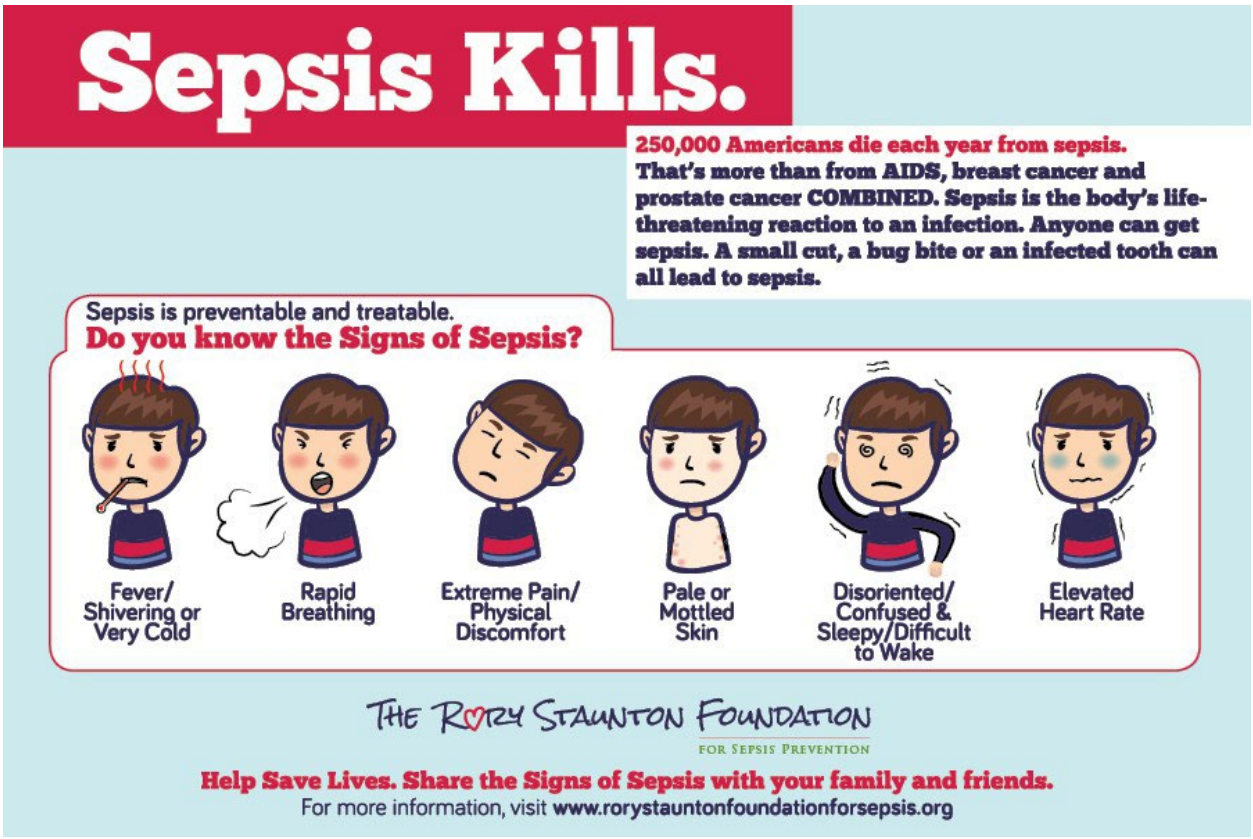


Image courtesy of The Rory Staunton Foundation, 2018.

Sepsis and the Elderly

Aging immune systems and frailer bodies make older people more vulnerable to sepsis. Older people have higher chances of chronic diseases which also increase their susceptibility to sepsis along with the addition of potential for more frequent hospital stays. Research shows that elderly patients are much more likely to suffer lasting consequences from sepsis including a threefold increase in life-altering cognitive decline, physical limitations and organ failure or amputations.

Getting recommended vaccinations against the flu and pneumonia is one of the best ways to protect the elderly against sepsis. For the elderly especially, confusion and tiredness is the major sign that medical attention is needed. Other signs are similar to those found in adult sepsis indicated above.

(Rory Staunton Foundation, 2018b)

Sepsis in Pediatrics

In newborns and young infants, bacterial infections such as E-coli, meningitis, pneumonia, Group B Streptococcus, and salmonella poisoning are the most common cause of sepsis. Infections can be passed from mother to child during pregnancy, or during labor and delivery.

Those at particular risk are:

- Unvaccinated babies and children, particularly between the age of two (2) months and 36 months when the immune system is not fully developed.

- Infants in the pediatric ICU and premature babies in the Neonatal ICU, because of their immune system and increased exposure to entry points of bacteria in to their body, such as IV lines and catheters.
- Babies during the labor and delivery process where complications may have occurred that result in bacteria entering the baby's body from the mother, such as; maternal fever during labor, infection in the uterus or placenta, premature rupture of the amniotic fluid sac before 37 weeks of gestation, early rupture of the amniotic sac (during labor) 18 hours or more before delivery, or the mother has Group B Streptococcus bacteria which can be passed on to the baby during labor.

(Rory Staunton Foundation, 2018c)

Signs and Symptoms in newborns:

- disinterest in feeding or vomiting
- fever above 100.4º F or higher rectally or sometimes low temperatures
- irritability or increased crankiness or the baby doesn't look right
- lethargy
- changes in heart rate: faster than normal (early sepsis) or significantly slower (late sepsis)
- breathing very quickly or difficulty breathing
- periods where babies seem to stop breathing for more than 10 seconds (apnea)
- change in skin color
- jaundice
- rash
- decreased urine output
- bulging or fullness of the fontanelle

Signs and Symptoms in older infants and children:

- fever
- vomiting
- rash
- change in skin color
- trouble breathing
- racing heart
- lethargy, irritability or confusion

(Rory Staunton Foundation, 2018c)

A child with sepsis may have started with an infection such as cellulitis or pneumonia that seems to be spreading or getting worse. If an infant, baby or child have any symptoms of sepsis, medical treatment should be sought immediately.

<u>Severe Sepsis</u>

If sepsis progresses to a severe state, symptoms may include:

- significantly decreased urine output
- abrupt change in mental status
- decrease in platelet count
- difficulty breathing
- abnormal heart pumping function
- abdominal pain

If, in addition to the symptoms above, the patient has extremely low blood pressure that doesn't adequately respond to simple fluid replacement, the patient may be diagnosed with septic shock.

Principles of Sepsis Treatment

It is critical that medical treatment begin as soon as possible. Early treatment is critical for optimal outcomes. There is increased morbidity/mortality with delayed recognition and treatment (The Rory Staunton Foundation, 2016). Medical providers should ascertain as quickly as possible if the patient has or has recently had an infection.

Medical providers check for symptoms of sepsis by including but not limited to hemodynamic assessment, drawing blood to determine if there is an abnormal white blood cell count, lactate level, and checking for organ dysfunction. Blood cultures should be conducted and urine, sputum, or other bodily fluids may be cultured as well as a chest x-ray or other scans to determine the source of infection.

Medical providers should treat septic patients based on current standards of practice which are reflected in facility policies. Treatment such as resuscitation with crystalloid fluid (IV fluid), IV medication, antimicrobial therapy, control of the infected source, oxygen or mechanical ventilation (Rhodes, et al., 2017). It is vital to keep abreast of current standards of practice pertaining to early recognition and treatment of sepsis, as research is continuously driving change in practice.

In March 2017, the journal, *Critical Care Medicine*, Vol. 45, Issue 3 (p 486 – 552) published, "Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock 2016" the latest guidelines developed by a consensus committee of 55 international experts that can be reviewed for specifics on current guidelines.

Additionally, "The Surviving Sepsis Campaign Bundle: 2018 update" reflects the new hour-1 bundle, replacing both the 3-h and 6-h bundles, by beginning resuscitation and management *immediately* (Levy, Evans & Rhodes, 2018).

To review hour-1 bundle guidelines, review Appendix F.

Patient Education and Prevention

Because sepsis is a life-threatening medical emergency that requires early intervention, it is important that healthcare providers educate patients and families on recognition and prevention of sepsis.

Prevention

Sepsis is not completely preventable, but the likelihood of developing sepsis can be decreased by:

- washing hands regularly
- preventing infections that can lead to sepsis by cleaning wounds and keeping them covered, even minor ones such as scrapes and blisters

- being vigilant if you have an infection, taking prescribed antibiotics when ordered by a medical professional, notifying your doctor right away if signs of infection persist or get worse
- being aware of the symptoms of sepsis and seeking medical treatment immediately if they appear
- taking good care of chronic conditions and getting recommended vaccinations
- providing relevant history and information to the medical provider

(Sepsis Alliance, 2017)

General Information and Knowledge

Knowing about the signs of infection of a wound which require medical treatment can help to prevent sepsis such as:

- cuts that have pus or liquid that is cloudy, green or foul smelling
- red skin around the wound or cut
- swelling around the cut or wound that gets worse after a few days
- pimple or yellowish crust on top of wound
- sores that look like blisters
- pain that gets worse after a few days
- the wound has not healed, keeps looking the same and has not closed after 10 days

When seeking medical care for suspected sepsis it is important to let the medical provider know any and all relevant information such as:

- recent surgeries
- recent infections and what, if any, treatment was provided for the infection
- chronic conditions or recent medical issues
- location of any cuts, burns, wounds
- symptoms of sepsis and possible infection such as productive cough or pain you are currently having and for how long

✓ Things to Remember

1. **Sepsis is the leading cause of death in hospitals in the United States. One (1) of every three (3) patients that die in a hospital, have sepsis.**

2. The most common germs that cause infections that develop into sepsis are Staphylococcus aureus (staph), Escherichia coli (E. coli) and Streptococcus (strep).

3. Populations that are more at risk for becoming septic are:

   - people with chronic medical conditions such as diabetes, lung disease, cancer, kidney disease
   - people with weakened immune systems
   - people who are 65 and older
   - babies and very young children
   - people suffering from a burn or wound

4. **Symptoms of sepsis** include:

   - confusion or disorientation
   - low blood pressure (SBP < or = 100 mmHg)
   - shortness of breath (Respiratory Rate = or > 22/minute)
   - infection
   - extreme pain or discomfort
   - high heart rate
   - clammy or sweaty skin
   - fever

5. **Early diagnosis is key to successful treatment of sepsis. There is increased morbidity/mortality with delayed recognition and treatment.**

   Treatment includes:

   - resuscitation with crystalloid fluid (IV fluid) of at least 30 mL/kg within first 3 hours
   - IV antibiotics and other medications as needed
   - antimicrobial therapy
   - control of the infected source
   - oxygen or mechanical ventilation
   - drawing blood for lactate level and other labs to determine if there is an infection

Conclusion

Healthcare professionals have long known the benefits of practicing good infection control principles. However, in addition to their professional and ethical responsibilities to follow good infection control practices, New York State mandates this course so that healthcare professionals will also understand their legal responsibilities. An incident utilizing poor infection control principles can render one open to charges of professional misconduct. This applies not only to the individual healthcare professional, but also to those for whom the professional is responsible.

The seven elements of this mandated course for select healthcare professionals addressed:

- The responsibility to adhere to accepted principles and practices of infection control for the healthcare professional and the performance of those for whom the professional is responsible.
- The modes and mechanisms of transmission of pathogenic organisms in the healthcare setting and strategies for prevention and control.
- The use of engineering and work practices to reduce the opportunity for patient and healthcare worker exposure to potentially infectious material.
- The selection and use of personal protective equipment for preventing patient and healthcare worker contact with potentially infectious material.
- The creation and maintenance of a safe environment for patient care through the application of infection control principles and practices for cleaning, disinfection and sterilization.
- The prevention and control of infectious and communicable diseases in the healthcare worker.
- The prevention and control of sepsis.

Appendix A - Immunization Schedule, 2018

Figure 1. Recommended immunization schedule for adults aged 19 years or older by age group, United States, 2018

This figure should be reviewed with the accompanying footnotes. This figure and the footnotes describe indications for which vaccines, if not previously administered, should be administered unless noted otherwise.

Vaccine	19–21 years	22–26 years	27–49 years	50–64 years	≥65 years
Influenza[1]	1 dose annually				
Tdap[2] or Td[2]	1 dose Tdap, then Td booster every 10 yrs				
MMR[3]	1 or 2 doses depending on indication (if born in 1957 or later)				
VAR[4]	2 doses				
RZV[5] (preferred)				2 doses RZV (preferred)	
or				or	
ZVL[5]				1 dose ZVL	
HPV–Female[6]	2 or 3 doses depending on age at series initiation				
HPV–Male[6]	2 or 3 doses depending on age at series initiation				
PCV13[7]	1 dose				
PPSV23[7]	1 or 2 doses depending on indication				1 dose
HepA[8]	2 or 3 doses depending on vaccine				
HepB[9]	3 doses				
MenACWY[10]	1 or 2 doses depending on indication, then booster every 5 yrs if risk remains				
MenB[10]	2 or 3 doses depending on vaccine				
Hib[11]	1 or 3 doses depending on indication				

Recommended for adults who meet the age requirement, lack documentation of vaccination, or lack evidence of past infection

Recommended for adults with other indications

No recommendation

Figure 2. Recommended immunization schedule for adults aged 19 years or older by medical condition and other indications, United States, 2018

This figure should be reviewed with the accompanying footnotes. This figure and the footnotes describe indications for which vaccines, if not previously administered, should be administered unless noted otherwise.

Vaccine	Pregnancy[1-6]	Immuno-compromised (excluding HIV infection)[3-7,11]	HIV infection CD4+ count (cells/μL)[3-7,9-10] <200	HIV infection CD4+ count (cells/μL)[3-7,9-10] ≥200	Asplenia, complement deficiencies[7,10,11]	End-stage renal disease, on hemodialysis[7,9]	Heart or lung disease, alcoholism[7]	Chronic liver disease[7-9]	Diabetes[7,9]	Health care personnel[3,4,9]	Men who have sex with men[6,8,9]
Influenza[1]	1 dose annually										
Tdap[2] or Td[2]	1 dose Tdap each pregnancy	1 dose Tdap, then Td booster every 10 yrs									
MMR[3]	contraindicated	1 or 2 doses depending on indication									
VAR[4]	contraindicated	2 doses									
RZV[5] (preferred)					2 doses RZV at age ≥50 yrs (preferred)						
or					or						
ZVL[5]	contraindicated				1 dose ZVL at age ≥60 yrs						
HPV–Female[6]		3 doses through age 26 yrs			2 or 3 doses through age 26 yrs						
HPV–Male[6]		3 doses through age 26 yrs			2 or 3 doses through age 21 yrs						2 or 3 doses through age 26 yrs
PCV13[7]		1 dose									
PPSV23[7]		1, 2, or 3 doses depending on indication									
HepA[8]	2 or 3 doses depending on vaccine										
HepB[9]	3 doses										
MenACWY[10]	1 or 2 doses depending on indication , then booster every 5 yrs if risk remains										
MenB[10]	2 or 3 doses depending on vaccine										
Hib[11]	3 doses HSCT recipients only				1 dose						

Recommended for adults who meet the age requirement, lack documentation of vaccination, or lack evidence of past infection

Recommended for adults with other indications

Contraindicated

No recommendation

Footnotes. Recommended immunization schedule for adults aged 19 years or older, United States, 2018

1. Influenza vaccination
www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/flu.html

General information

- Administer 1 dose of age-appropriate inactivated influenza vaccine (IIV) or recombinant influenza vaccine (RIV) annually
- Live attenuated influenza vaccine (LAIV) is not recommended for the 2017–2018 influenza season
- A list of currently available influenza vaccines is available at www.cdc.gov/flu/protect/vaccine/vaccines.htm

Special populations

- Administer age-appropriate IIV or RIV to:
  - **Pregnant women**
  - Adults with **hives-only egg allergy**
  - Adults with **egg allergy other than hives** (e.g., angioedema or respiratory distress): Administer IIV or RIV in a medical setting under supervision of a health care provider who can recognize and manage severe allergic conditions

2. Tetanus, diphtheria, and pertussis vaccination
www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/tdap-td.html

General information

- Administer to adults who previously did not receive a dose of tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis vaccine (Tdap) as an adult or child (routinely recommended at age 11–12 years) 1 dose of Tdap, followed by a dose of tetanus and diphtheria toxoids (Td) booster every 10 years
- Information on the use of Tdap or Td as tetanus prophylaxis in wound management is available at www.cdc.gov/mmwr/preview/mmwrhtml/rr5517a1.htm

Special populations

- **Pregnant women**: Administer 1 dose of Tdap during each pregnancy, preferably in the early part of gestational weeks 27–36

3. Measles, mumps, and rubella vaccination
www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/mmr.html

General information

- Administer 1 dose of measles, mumps, and rubella vaccine (MMR) to adults with no evidence of immunity to measles, mumps, or rubella
- Evidence of immunity is:
  - Born before 1957 (except for health care personnel, see below)
  - Documentation of receipt of MMR
  - Laboratory evidence of immunity or disease
- Documentation of a health care provider-diagnosed disease without laboratory confirmation is not considered evidence of immunity

Special populations

- **Pregnant women and nonpregnant women of childbearing age** with no evidence of immunity to rubella: Administer 1 dose of MMR (if pregnant, administer MMR after pregnancy and before discharge from health care facility)
- **HIV infection and CD4 cell count ≥200 cells/μL for at least 6 months** and no evidence of immunity to measles, mumps, or rubella: Administer 2 doses of MMR at least 28 days apart
- **Students in postsecondary educational institutions, international travelers**, and **household contacts of immunocompromised persons**: Administer 2 doses of MMR at least 28 days apart (or 1 dose of MMR if previously administered 1 dose of MMR)
- **Health care personnel born in 1957 or later** with no evidence of immunity: Administer 2 doses of MMR at least 28 days apart for measles or mumps, or 1 dose of MMR for rubella (if born before 1957, consider MMR vaccination)
- Adults who **previously received ≤2 doses of mumps-containing vaccine and are identified by public health authority to be at increased risk for mumps in an outbreak**: Administer 1 dose of MMR
- MMR is contraindicated for pregnant women and adults with severe immunodeficiency

4. Varicella vaccination
www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/varicella.html

General information

- Administer to adults without evidence of immunity to varicella 2 doses of varicella vaccine (VAR) 4–8 weeks apart if previously received no varicella-containing vaccine (if previously received 1 dose of varicella-containing vaccine, administer 1 dose of VAR at least 4 weeks after the first dose)
- Evidence of immunity to varicella is:
  - U.S.-born before 1980 (except for pregnant women and health care personnel, see below)
  - Documentation of receipt of 2 doses of varicella or varicella-containing vaccine at least 4 weeks apart
  - Diagnosis or verification of history of varicella or herpes zoster by a health care provider
  - Laboratory evidence of immunity or disease

Special populations

- Administer 2 doses of VAR 4–8 weeks apart if previously received no varicella-containing vaccine (if previously received 1 dose of varicella-containing vaccine, administer 1 dose of VAR at least 4 weeks after the first dose) to:
  - **Pregnant women without evidence of immunity**: Administer the first of the 2 doses or the second dose after pregnancy and before discharge from health care facility
  - **Health care personnel without evidence of immunity**
- Adults with **HIV infection and CD4 cell count ≥200 cells/μL**: May administer, based on individual clinical decision, 2 doses of VAR 3 months apart
- VAR is contraindicated for pregnant women and adults with severe immunodeficiency

5. Zoster vaccination
www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/shingles.html

General information

- Administer 2 doses of recombinant zoster vaccine (RZV) 2–6 months apart to adults aged 50 years or older regardless of past episode of herpes zoster or receipt of zoster vaccine live (ZVL)
- Administer 2 doses of RZV 2–6 months apart to adults who previously received ZVL at least 2 months after ZVL
- For adults aged 60 years or older, administer either RZV or ZVL (RZV is preferred)

Special populations

- ZVL is contraindicated for pregnant women and adults with severe immunodeficiency

6. Human papillomavirus vaccination
www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/hpv.html

General information

- Administer human papillomavirus (HPV) vaccine to **females through age 26 years** and **males through age 21 years** (males aged 22 through 26 years may be vaccinated based on individual clinical decision)
- The number of doses of HPV vaccine to be administered depends on age at initial HPV vaccination
  - **No previous dose of HPV vaccine**: Administer 3-dose series at 0, 1–2, and 6 months (minimum intervals: 4 weeks between doses 1 and 2, 12 weeks between doses 2 and 3, and 5 months between doses 1 and 3; repeat doses if given too soon)
  - **Aged 9–14 years at HPV vaccine series initiation and received 1 dose or 2 doses less than 5 months apart**: Administer 1 dose
  - **Aged 9–14 years at HPV vaccine series initiation and received 2 doses at least 5 months apart**: No additional dose is needed

Special populations

- Adults with **immunocompromising conditions (including HIV infection)** through age 26 years: Administer 3-dose series at 0, 1–2, and 6 months
- **Men who have sex with men** through age 26 years: Administer 2- or 3-dose series depending on age at initial vaccination (see above); if no history of HPV vaccine, administer 3-dose series at 0, 1–2, and 6 months
- **Pregnant women** through age 26 years: HPV vaccination is not recommended during pregnancy, but there is no evidence that the vaccine is harmful and no intervention needed for women who inadvertently receive HPV vaccine while pregnant; delay remaining doses until after pregnancy; pregnancy testing is not needed before vaccination

7. Pneumococcal vaccination
www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/pneumo.html

General information

- Administer to immunocompetent adults aged 65 years or older 1 dose of 13-valent pneumococcal conjugate vaccine (PCV13), if not previously administered, followed by 1 dose of 23-valent pneumococcal polysaccharide vaccine (PPSV23) at least 1 year after PCV13; if PPSV23 was previously administered but not PCV13, administer PCV13 at least 1 year after PPSV23
- When both PCV13 and PPSV23 are indicated, administer PCV13 first (PCV13 and PPSV23 should not be administered during the same visit); additional information on vaccine timing is available at www.cdc.gov/vaccines/vpd/pneumo/downloads/pneumo-vaccine-timing.pdf

Special populations

- Administer to adults aged 19 through 64 years with the following chronic conditions 1 dose of PPSV23 (at age 65 years or older, administer 1 dose of PCV13, if not previously received, and another dose of PPSV23 at least 1 year after PCV13 and at least 5 years after PPSV23):
  - **Chronic heart disease** (excluding hypertension)
  - **Chronic lung disease**
  - **Chronic liver disease**
  - **Alcoholism**
  - **Diabetes mellitus**
  - **Cigarette smoking**
- Administer to adults aged 19 years or older with the following indications 1 dose of PCV13 followed by 1 dose of PPSV23 at least 8 weeks after PCV13, and a second dose of PPSV23 at least 5 years after the first dose of PPSV23 (if the most recent dose of PPSV23 was administered before age 65 years, at age 65 years or older, administer another dose of PPSV23 at least 5 years after the last dose of PPSV23):
  - **Immunodeficiency disorders** (including B- and T-lymphocyte deficiency, complement deficiencies, and phagocytic disorders)
  - **HIV infection**
  - **Anatomical or functional asplenia** (including sickle cell disease and other hemoglobinopathies)
  - **Chronic renal failure and nephrotic syndrome**
- Administer to adults aged 19 years or older with the following indications 1 dose of PCV13 followed by 1 dose of PPSV23 at least 8 weeks after PCV13 (if the dose of PPSV23 was administered before age 65 years, at age 65 years or older, administer another dose of PPSV23 at least 5 years after the last dose of PPSV23):
  - **Cerebrospinal fluid leak**
  - **Cochlear implant**

Hepatitis A vaccination

www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/hepa.html

General information

- Administer to adults who have a specific risk (see below), or lack a risk factor but want protection, 2-dose series of single antigen hepatitis A vaccine (HepA; Havrix at 0 and 6–12 months or Vaqta at 0 and 6–18 months; minimum interval: 6 months) or a 3-dose series of combined hepatitis A and hepatitis B vaccine (HepA-HepB) at 0, 1, and 6 months; minimum intervals: 4 weeks between first and second doses, 5 months between second and third doses

Special populations

- Administer HepA or HepA-HepB to adults with the following indications:
  - **Travel** to or work in countries with high or intermediate hepatitis A endemicity
  - **Men who have sex with men**
  - **Injection or noninjection drug use**
  - **Work with hepatitis A virus in a research laboratory or with nonhuman primates infected with hepatitis A virus**
  - **Clotting factor disorders**
  - **Chronic liver disease**
  - Close, personal **contact with an international adoptee** (e.g., household or regular babysitting) during the first 60 days after arrival in the United States from a country with high or intermediate endemicity (administer the first dose as soon as the adoption is planned)
  - Healthy adults **through age 40 years who have recently been exposed to hepatitis A virus**; adults older than age 40 years may receive HepA if hepatitis A immunoglobulin cannot be obtained

9. Hepatitis B vaccination

www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/hepb.html

General information

- Administer to adults who have a specific risk (see below), or lack a risk factor but want protection, 3-dose series of single antigen hepatitis B vaccine (HepB) or combined hepatitis A and hepatitis B vaccine (HepA-HepB) at 0, 1, and 6 months (minimum intervals: 4 weeks between doses 1 and 2 for HepB and HepA-HepB; between doses 2 and 3, 8 weeks for HepB and 5 months for HepA-HepB)

Special populations

- Administer HepB or HepA-HepB to adults with the following indications:
  - **Chronic liver disease** (e.g., hepatitis C infection, cirrhosis, fatty liver disease, alcoholic liver disease, autoimmune hepatitis, alanine aminotransferase [ALT] or aspartate aminotransferase [AST] level greater than twice the upper limit of normal)
  - **HIV infection**
  - **Percutaneous or mucosal risk of exposure to blood** (e.g., **household contacts** of hepatitis B surface antigen [HBsAg]-positive persons; adults younger than age 60 years with **diabetes mellitus** or aged 60 years or older with diabetes mellitus based on individual clinical decision; adults in predialysis care or receiving **hemodialysis or peritoneal dialysis**; recent or current **injection drug users**; **health care and public safety workers** at risk for exposure to blood or blood-contaminated body fluids)
  - **Sexual exposure risk** (e.g., sex partners of HBsAg-positive persons; sexually active persons not in a mutually monogamous relationship; persons seeking evaluation or treatment for a sexually transmitted infection; and **men who have sex with men** [MSM])
  - Receive care in **settings where a high proportion of adults have risks for hepatitis B infection** (e.g., facilities providing sexually transmitted disease treatment, drug-abuse treatment and prevention services, hemodialysis and end-stage renal disease programs, institutions for developmentally disabled persons, health care settings targeting services to injection drug users or MSM, HIV testing and treatment facilities, and correctional facilities)
  - **Travel** to countries with high or intermediate hepatitis B endemicity

10. Meningococcal vaccination

www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/mening.html

Special populations: Serogroups A, C, W, and Y meningococcal vaccine (MenACWY)

- Administer 2 doses of MenACWY at least 8 weeks apart and revaccinate with 1 dose of MenACWY every 5 years, if the risk remains, to adults with the following indications:
  - **Anatomical or functional asplenia** (including sickle cell disease and other hemoglobinopathies)
  - **HIV infection**
  - **Persistent complement component deficiency**
  - **Eculizumab use**
- Administer 1 dose of MenACWY and revaccinate with 1 dose of MenACWY every 5 years, if the risk remains, to adults with the following indications:
  - **Travel to or live in countries where meningococcal disease is hyperendemic or epidemic**, including countries in the African meningitis belt or during the Hajj
  - At risk from a **meningococcal disease outbreak attributed to serogroup A, C, W, or Y**
  - **Microbiologists** routinely exposed to *Neisseria meningitidis*
  - **Military recruits**
  - **First-year college students who live in residential housing** (if they did not receive MenACWY at age 16 years or older)

General Information: Serogroup B meningococcal vaccine (MenB)

- May administer, based on individual clinical decision, to young adults and adolescents aged 16–23 years (preferred age is 16–18 years) who are not at increased risk 2-dose series of MenB-4C (Bexsero) at least 1 month apart or 2-dose series of MenB-FHbp (Trumenba) at least 6 months apart
- MenB-4C and MenB-FHbp are not interchangeable

Special populations: MenB

- Administer 2-dose series of MenB-4C at least 1 month apart or 3-dose series of MenB-FHbp at 0, 1–2, and 6 months to adults with the following indications:
  - **Anatomical or functional asplenia** (including sickle cell disease)
  - **Persistent complement component deficiency**
  - **Eculizumab use**
  - At risk from a **meningococcal disease outbreak attributed to serogroup B**
  - **Microbiologists** routinely exposed to *Neisseria meningitidis*

11. *Haemophilus influenzae* type b vaccination

www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/hib.html

Special populations

- Administer *Haemophilus influenzae* type b vaccine (Hib) to adults with the following indications:
  - **Anatomical or functional asplenia** (including sickle cell disease) or undergoing elective splenectomy: Administer 1 dose if not previously vaccinated (preferably at least 14 days before elective splenectomy)
  - **Hematopoietic stem cell transplant** (HSCT): Administer 3-dose series with doses 4 weeks apart starting 6 to 12 months after successful transplant regardless of Hib vaccination history

Appendix B - Post-exposure Prophylaxis to Prevent HBV Infection

Note. The following information was extracted from CDC (2006) with permission. Retrieved from http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5516a3.htm

This appendix provides guidelines for management of persons with nonoccupational exposure to hepatitis B virus (HBV) through a discrete, identifiable exposure to blood or body fluids (Table 1). Guidelines for post-exposure prophylaxis of occupational exposures have been published separately and are intended for use in settings in which post-vaccination testing is recommended for certain employees and in which programs are available to implement testing and follow-up algorithms. HBV occupational exposure guidelines can be found at www.cdc.gov/mmwr/preview/mmwrhtml/rr6210a1.htm (1), Recommendations for management of infants born to hepatitis B surface antigen (HBsAg)--positive mothers also have been published separately (2).

HBsAg-Positive Exposure Source

- Persons who have written documentation of a complete hepatitis B vaccine series and who did not receive post-vaccination testing should receive a single vaccine booster dose.
- Persons who are in the process of being vaccinated but who have not completed the vaccine series should receive the appropriate dose of hepatitis B immune globulin (HBIG) and should complete the vaccine series.
- Unvaccinated persons should receive both HBIG and hepatitis B vaccine as soon as possible after exposure (preferably within 24 hours). Hepatitis B vaccine may be administered simultaneously with HBIG in a separate injection site. The hepatitis B vaccine series should be completed in accordance with the age-appropriate vaccine dose and schedule.

Exposure Source with Unknown HBsAg Status

- Persons with written documentation of a complete hepatitis B vaccine series require no further treatment.
- Persons who are not fully vaccinated should complete the vaccine series.
- Unvaccinated persons should receive the hepatitis B vaccine series with the first dose administered as soon as possible after exposure, preferably within 24 hours. The vaccine series should be completed in accordance with the age-appropriate dose and schedule.

References

1. CDC. Updated U.S. Public Health Service guidelines for the management of occupational exposures to HBV, HCV, and HIV and recommendations for post-exposure prophylaxis. MMWR 2013; 62(No. RR-10; 1-19).
2. CDC. A comprehensive immunization strategy to eliminate transmission of hepatitis B virus infection in the United States: recommendations of the Advisory Committee on Immunization Practices (ACIP). Part 1: immunization of infants, children, and adolescents. MMWR 2005; 54(No. RR-16).

TABLE 1. Guidelines for post-exposure prophylaxis* of persons with non-occupational exposures† to blood or body fluids that contain blood, by exposure type and vaccination status

	Treatment	
Exposure	**Unvaccinated person§**	**Previously vaccinated person¶**
HBsAg-positive source**		
Percutaneous (e.g., bite or needlestick) or mucosal exposure to HBsAg-positive blood or body fluids	Administer hepatitis B vaccine series and hepatitis B immune globulin (HBIG)	Administer hepatitis B vaccine booster dose
Sex or needle-sharing contact of an HBsAg-positive person	Administer hepatitis B vaccine series and HBIG	Administer hepatitis B vaccine booster dose
Victim of sexual assault/abuse by a perpetrator who is HBsAg-positive	Administer hepatitis B vaccine series and HBIG	Administer hepatitis B vaccine booster dose
Source with unknown HBsAg status		
Victim of sexual assault/abuse by a perpetrator who unknown HBsAg status	Administer hepatitis B vaccine series	No treatment
Percutaneous (e.g., bite or needlestick) or mucosal exposure to potentially infectious blood or body fluids from a source with unknown HBsAg status	Administer hepatitis B vaccine series	No treatment
Sex or needle-sharing contact of person with unknown HBsAg status	Administer hepatitis B vaccine series	No treatment

*When indicated, immunoprophylaxis should be initiated as soon as possible, preferably within 24 hours. Studies are limited on the maximum interval after exposure during which post-exposure prophylaxis is effective, but the interval is unlikely to exceed 7 days for percutaneous exposures or 14 days for sexual exposures. The hepatitis B vaccine series should be completed.
†These guidelines apply to non-occupational exposures. Guidelines for management of occupational exposures have been published separately (1) and also can be used for management of non-occupational exposures, if feasible.
§A person who is in the process of being vaccinated but who has not completed the vaccine series should complete the series and receive treatment as indicated.
¶A person who has written documentation of a complete hepatitis B vaccine series and who did not receive post-vaccination testing.
**Hepatitis B surface antigen.

Appendix C – NYS Department of Health Updated Clinical Guidelines for HIV Post-Exposure Prophylaxis

In May 2018, the New York State Department of Health (2018b) updated its recommendations on HIV post-exposure prophylaxis following an occupational exposure.

What's New – May 2018 Update

Language regarding potential increased risk of neural tube defects with dolutegravir (DTG)-based ART regimens was added throughout the guideline (for clarity, some changes in blue):

ART Regimens for oPEP

Change 1. Recommendation: The preferred PEP regimen is tenofovir disoproxil fumarate + emtricitabine (lamivudine may be substituted for emtricitabine) plus either raltegravir or dolutegravir* (see text for dosing and Antiretroviral Agents Recommended for PEP for additional information). Zidovudine is no longer recommended in the preferred PEP regimen. The first dose should be given as soon as possible after exposure, ideally within 2 hours. The recommended duration of PEP is 28 days.

*On May 18, 2018, the U.S. Food and Drug Administration and the DHHS Antiretroviral Guidelines Panels issued statements in response to preliminary results from a study that reported increased risk of neural tube defects in babies born to mothers were taking dolutegravir (DTG)-based antiretroviral (ARV) drug regimens at the time of conception. For exposed women who are pregnant, considering pregnancy, or not using effective contraception, dolutegravir-containing regimens should be avoided until more data are available. If there are no alternatives for dolutegravir in women of childbearing potential, clinicians should strongly advise the use of effective contraception and should obtain a pregnancy test before initiating treatment (see PEP for Exposed Workers Who Are Pregnant or Breastfeeding for drugs to avoid in exposed workers who are pregnant or breastfeeding) (cited AIDSinfo as reference 13 and U.S. Food and Drug Administration as reference 14).

Change 2. Added the following note for recommended PEP regimen following occupational exposure: Preliminary results from an ongoing observational study reported increased risk of neural tube defects in babies born to mothers were taking dolutegravir (DTG)-based antiretroviral (ARV) drug regimens at the time of conception. For exposed women who are pregnant, considering pregnancy, or not using effective contraception, dolutegravir-containing regimens should be avoided until more data are available. If there are no alternatives for dolutegravir in women of childbearing potential, clinicians should strongly advise the use of effective contraception and should obtain a pregnancy test before initiating treatment.

Change 3. Under Antiretroviral Drugs to Avoid as PEP Components, revised text to state that Efavirenz is not recommended as part of an initial PEP regimen for several reasons (reasons enumerated in text).

PEP for Exposed Workers Who are Pregnant or Breastfeeding

Change 4. Added the following note at the beginning of the section:

⇨ Note: Potential Increased Risk of Neural Tube Defects with Dolutegravir (DTG)-based ART Regimens

On May 18, 2018, the U.S. Food and Drug Administration and the DHHS Antiretroviral Guidelines Panels issued statements in response to preliminary results from a study that reported increased risk of neural tube defects in babies born to mothers were taking dolutegravir (DTG)-based antiretroviral (ARV) drug regimens at the time of conception [1,2]. For exposed workers who are pregnant, considering pregnancy, or not using effective contraception, dolutegravir-containing

regimens should be avoided until more data are available. If there are no alternatives for dolutegravir in individuals of childbearing potential, clinicians should strongly advise the use of effective contraception and should obtain a pregnancy test before initiating treatment (cited AIDSinfo as reference 1 and U.S. Food and Drug Administration as reference 2).

Change 5. Recommendation: The preferred PEP regimen for pregnant individuals is tenofovir disoproxil fumarate + emtricitabine (lamivudine may be substituted for emtricitabine) plus raltegravir (see text for dosing and Antiretroviral Agents Recommended for PEP for additional information). The recommended duration of PEP is 28 days. (AII)

Change 6. With the exception of dolutegravir, the agents listed below are non-preferred agents for use in PEP regimens and are not likely to be used; however, clinicians should be aware that these agents should not be prescribed in exposed workers who are pregnant.

Change 7. Added dolutegravir to the list of drugs to avoid during pregnancy:
Dolutegravir: Teratogenicity; preliminary reports of increased risk of neural tube defects

Source: HIV Clinical Resource, *PEP for Occupational Exposure to HIV Guideline.* Updates to this Guideline. May 2018.

The full NYS Department of Health (2018a) clinical guidelines for HIV post-exposure prophylaxis for healthcare workers can be found at: https://www.hivguidelines.org/pep-for-hiv-prevention/occupational/#

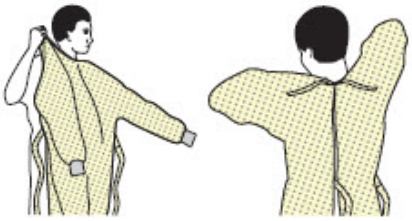
Appendix D – CDC *Sequence for Putting On Personal Protective Equipment (PPE)*

SEQUENCE FOR PUTTING ON PERSONAL PROTECTIVE EQUIPMENT (PPE)

The type of PPE used will vary based on the level of precautions required, such as standard and contact, droplet or airborne infection isolation precautions. The procedure for putting on and removing PPE should be tailored to the specific type of PPE.

1. GOWN

- Fully cover torso from neck to knees, arms to end of wrists, and wrap around the back
- Fasten in back of neck and waist



2. MASK OR RESPIRATOR

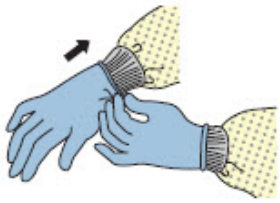
- Secure ties or elastic bands at middle of head and neck
- Fit flexible band to nose bridge
- Fit snug to face and below chin
- Fit-check respirator

3. GOGGLES OR FACE SHIELD

- Place over face and eyes and adjust to fit

4. GLOVES

- Extend to cover wrist of isolation gown



USE SAFE WORK PRACTICES TO PROTECT YOURSELF AND LIMIT THE SPREAD OF CONTAMINATION

- Keep hands away from face
- Limit surfaces touched
- Change gloves when torn or heavily contaminated
- Perform hand hygiene

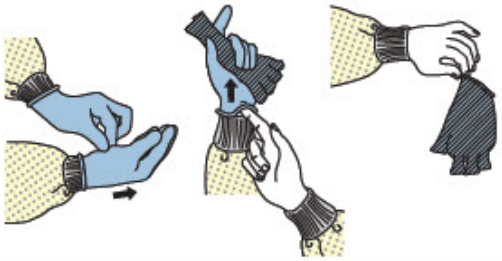
Appendix E – CDC *How to Safely Remove Personal Protective Equipment (PPE)*

HOW TO SAFELY REMOVE PERSONAL PROTECTIVE EQUIPMENT (PPE) EXAMPLE 1

There are a variety of ways to safely remove PPE without contaminating your clothing, skin, or mucous membranes with potentially infectious materials. Here is one example. **Remove all PPE before exiting the patient room** except a respirator, if worn. Remove the respirator **after** leaving the patient room and closing the door. Remove PPE in the following sequence:

1. GLOVES

- Outside of gloves are contaminated!
- If your hands get contaminated during glove removal, immediately wash your hands or use an alcohol-based hand sanitizer
- Using a gloved hand, grasp the palm area of the other gloved hand and peel off first glove
- Hold removed glove in gloved hand
- Slide fingers of ungloved hand under remaining glove at wrist and peel off second glove over first glove
- Discard gloves in a waste container



2. GOGGLES OR FACE SHIELD

- Outside of goggles or face shield are contaminated!
- If your hands get contaminated during goggle or face shield removal, immediately wash your hands or use an alcohol-based hand sanitizer
- Remove goggles or face shield from the back by lifting head band or ear pieces
- If the item is reusable, place in designated receptacle for reprocessing. Otherwise, discard in a waste container

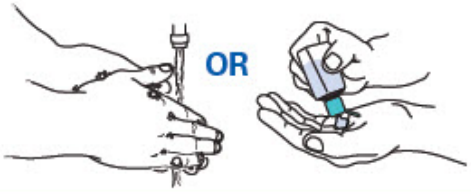
3. GOWN

- Gown front and sleeves are contaminated!
- If your hands get contaminated during gown removal, immediately wash your hands or use an alcohol-based hand sanitizer
- Unfasten gown ties, taking care that sleeves don't contact your body when reaching for ties
- Pull gown away from neck and shoulders, touching inside of gown only
- Turn gown inside out
- Fold or roll into a bundle and discard in a waste container

4. MASK OR RESPIRATOR

- Front of mask/respirator is contaminated — DO NOT TOUCH!
- If your hands get contaminated during mask/respirator removal, immediately wash your hands or use an alcohol-based hand sanitizer
- Grasp bottom ties or elastics of the mask/respirator, then the ones at the top, and remove without touching the front
- Discard in a waste container

5. WASH HANDS OR USE AN ALCOHOL-BASED HAND SANITIZER IMMEDIATELY AFTER REMOVING ALL PPE



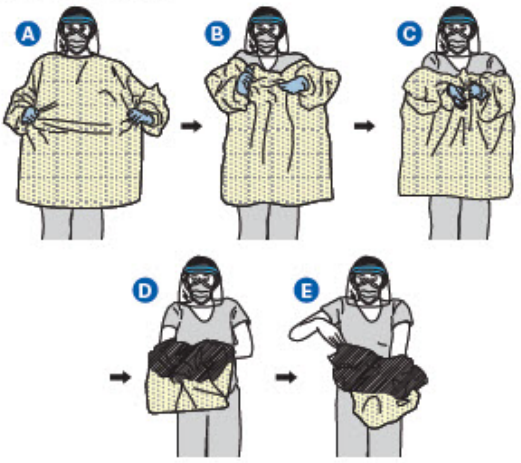
PERFORM HAND HYGIENE BETWEEN STEPS IF HANDS BECOME CONTAMINATED AND IMMEDIATELY AFTER REMOVING ALL PPE

HOW TO SAFELY REMOVE PERSONAL PROTECTIVE EQUIPMENT (PPE) EXAMPLE 2

Here is another way to safely remove PPE without contaminating your clothing, skin, or mucous membranes with potentially infectious materials. **Remove all PPE before exiting the patient room** except a respirator, if worn. Remove the respirator **after** leaving the patient room and closing the door. Remove PPE in the following sequence:

1. GOWN AND GLOVES

- Gown front and sleeves and the outside of gloves are contaminated!
- If your hands get contaminated during gown or glove removal, immediately wash your hands or use an alcohol-based hand sanitizer
- Grasp the gown in the front and pull away from your body so that the ties break, touching outside of gown only with gloved hands
- While removing the gown, fold or roll the gown inside-out into a bundle
- As you are removing the gown, peel off your gloves at the same time, only touching the inside of the gloves and gown with your bare hands. Place the gown and gloves into a waste container



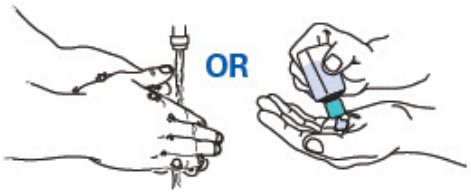
2. GOGGLES OR FACE SHIELD

- Outside of goggles or face shield are contaminated!
- If your hands get contaminated during goggle or face shield removal, immediately wash your hands or use an alcohol-based hand sanitizer
- Remove goggles or face shield from the back by lifting head band and without touching the front of the goggles or face shield
- If the item is reusable, place in designated receptacle for reprocessing. Otherwise, discard in a waste container

3. MASK OR RESPIRATOR

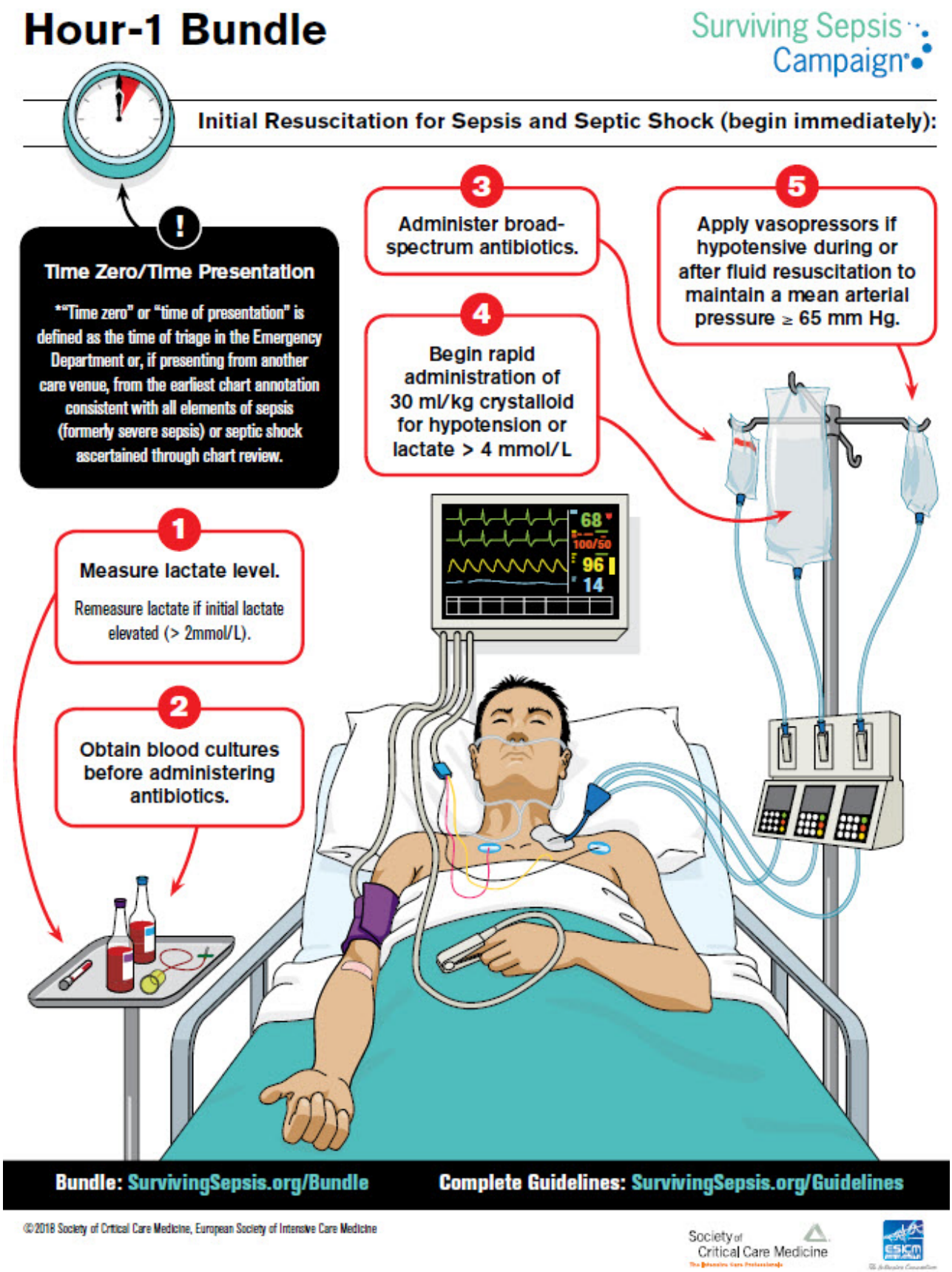
- Front of mask/respirator is contaminated — DO NOT TOUCH!
- If your hands get contaminated during mask/respirator removal, immediately wash your hands or use an alcohol-based hand sanitizer
- Grasp bottom ties or elastics of the mask/respirator, then the ones at the top, and remove without touching the front
- Discard in a waste container

4. WASH HANDS OR USE AN ALCOHOL-BASED HAND SANITIZER IMMEDIATELY AFTER REMOVING ALL PPE



PERFORM HAND HYGIENE BETWEEN STEPS IF HANDS BECOME CONTAMINATED AND IMMEDIATELY AFTER REMOVING ALL PPE

Appendix F – Surviving Sepsis Campaign (SCC) *Hour-1 Bundle*



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Mandated NYS Infection Control Training for Healthcare Professionals

Course Exam

After studying the downloaded course and completing the course exam, you need to enter your answers online. **Answers cannot be graded from this downloadable version of the course.** To enter your answers online, go to the e-leaRN web site, www.elearnonline.net and click on the Login/My Account button. As a returning student, login using the username and password you created, click on the "Go to Course" link, and proceed to the course exam.

Note: Contact hours/CEUs will be awarded for this online course until **July 26, 2023**.

1. In addition to mandating that certain health professionals receive training on infection control and barrier precautions, New York State has established that:

    a. Failure to report a case of human immunodeficiency virus (HIV) infection is considered unprofessional conduct.
    b. Failure to utilize infection control procedures is considered unprofessional conduct.
    c. Sterilization is required for all patient care materials.
    d. High-level disinfection is required for all patient care materials.

2. According to the Needlestick Safety and Prevention Act of 2000, employers are required to do all of the following *except*:

    a. Solicit input from direct patient care employees in the identification, evaluation and selection of safer needle devices and work practices.
    b. Maintain a log of sharps injuries.
    c. Provide care to family members of employees who have sustained a sharps injury.
    d. Consider and implement new technologies when updating their exposure control plan.

3. According to New York State law, the professional conduct standards require that certain healthcare professionals may be subject to charges of unprofessional conduct for failure to:

    a. Insure that others carry out infection control standards
    b. Undergo testing for the human immunodeficiency virus (HIV) if a needlestick occurs
    c. Serve on a professional review panel regarding infection control standards, if asked
    d. Wear gown, gloves, and mask when caring for patients who are infected with HIV

4. Which government agency provides scientifically sound infection control recommendations?

    a. National Institute for Occupational Safety and Health (NIOSH)
    b. National Council of State Boards of Nursing (NCSBN)
    c. American Nurses Association (ANA)
    d. The Joint Commission

5. The most significant factors which can impact a person's chance of becoming septic are:

   a. Having a compromised immune system and being exposed to a bacterial infection
   b. Diet and personal hygiene
   c. Getting recommended immunizations
   d. Birth order and exposure to allergens

6. An organism described as "highly virulent" has which of these characteristics?

   a. The organism is easily destroyed by high-level disinfectants.
   b. Exposure to a small amount of organism can cause infection.
   c. The organism is resistant to many antibiotics.
   d. Culture and sensitivity must be performed to identify the organism.

7. The ***most*** common effective way to prevent healthcare associated infections (HAIs) is to use:

   a. Sterile technique
   b. Complete isolation
   c. Disinfection
   d. Hand hygiene

8. Which of the following isolation systems is used in all healthcare facilities?

   a. Category specific isolation
   b. Body substance isolation
   c. Standard precautions
   d. Disease specific precautions

9. Which of the following is a **work practice control** that should be implemented to protect patients and healthcare workers?

   a. Implementing a negative pressure ventilation system
   b. Selecting puncture resistant needle containers
   c. Not recapping needles
   d. Using centrifuge lids that lock

10. Which of the following is an **engineering control** that would assist in preventing the transmission of tuberculosis?

    a. TST or blood testing and follow-up
    b. Triage and separation of infected patients
    c. Early identification of patients with tuberculosis
    d. A negative pressure isolation room

11. Non-sterile gloves may be used for which of these procedures?

    a. Gastric tube feedings
    b. Minor surgery
    c. Bladder catheterization
    d. Suturing wounds

12. Which of the personal protective equipment (PPE) listed below should be used when changing a dressing for a patient who has a three-day-old clean surgical incision?

    a. Gloves, only
    b. Gloves and gown, only
    c. Gloves, gown, and mask, only
    d. Gloves, gown, mask, and goggles

13. A healthcare worker is planning to provide care to a patient who has active tuberculosis. The worker should plan to wear:

    a. A surgical mask
    b. An N95 respirator
    c. Sterile gloves
    d. A gown

14. Which of the following practices would result in contamination?

    a. Sterilizing instruments for a length of time that exceeds the time recommended
    b. Using a disinfectant that is clear and colorless
    c. Rinsing disinfected items with sterile water
    d. Reusing single-use equipment without reprocessing

15. To insure proper processing of items and equipment for patient care, it is ***essential*** to:

    a. Use a central sterilization department
    b. Follow the manufacturer's recommendations
    c. Use single-use items for all sterile procedures
    d. Comply with Federal Drug Administration (FDA) guidelines

16. Which of the following pathogens that the healthcare worker may encounter in their work environment is the least susceptible to sterilization processes and disinfecting agents?

    a. Hepatitis C virus (HCV)
    b. Mycobacteria TB
    c. Prion agents
    d. Human immunodeficiency virus (HIV)

17. A healthcare worker is observed cleaning instruments prior to sterilization. Which of these actions of the worker represents an error that requires correction?

    a. The worker cleans the instruments in a hand washing sink.
    b. The instruments are cleaned under running warm water.
    c. Brushes are used to clean instruments with lumens.
    d. The worker rinses the instruments with distilled water.

18. Which of the following would be considered an **occupational health goal** for preventing infection in a healthcare setting?

    a. Providing healthcare workers with paid sick leave
    b. Preventing healthcare workers from caring for patients who have undiagnosed illnesses
    c. Protecting healthcare workers from communicable diseases
    d. Insuring that the meals provided to patients are well-balanced

19. A healthcare employee in a community hospital is found to be infected with the human immunodeficiency virus (HIV). According to New York State law, the hospital's evaluation of the employee's ability to continue working should include consultation with experts including an infectious disease specialist, a representative from the employee's practice area, and:

    a. The state-appointed review panel
    b. The employee's personal physician
    c. A physician approved by the Occupational Safety and Health Administration (OSHA)
    d. A physician provided through the Centers for Disease Control and Prevention (CDC)

20. A healthcare worker who is HIV-positive expresses concern about confidentiality related to the condition. Which of the following statements provide accurate information about the healthcare worker's right to confidentiality?

    a. With the exception of physicians and dentists, the confidentiality of healthcare workers is protected by the New York State law.
    b. The confidentiality of a healthcare worker is protected under New York State law provided that the worker's activities do not include direct patient care.
    c. The worker is protected by the New York State HIV confidentiality law and is not required to disclose HIV status to patients or employers.
    d. The worker's employer is required under New York State law to disclose to patients the status of the infected healthcare worker if the worker performs invasive procedures.