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# New York Infection Control, Including Sepsis (366)

Contact hours: 4
Author: Marian McDonald, RN, MSN, CIC (retired) and Lauren Robertson, BA, MPT (Administrator)
Expiration date: July 31, 2027
Provider approval #: TP02076

## Course Summary

Provides infection control training for all New York healthcare professionals, including responsibility for adhering to accepted principles and monitoring the performance of all for whom you are responsible. Reviews the mechanisms of transmission along with strategies of prevention and control, including sepsis. Coverage of controls, PPE, and practices to protect both patients and workers.

## Learning Objectives

When you finish this course, you will be able to:

1. Summarize the most prevalent risk factors for healthcare-associated infections (HAIs).

2. Define "zero tolerance" as it applies to infection prevention.

3. Recall and explain each of the six links in the Chain of Infection.

4. Outline the use of engineering and work practice controls to reduce the opportunity for exposure to potentially infectious material (POIM).

5. Explain both the importance and practice of hand hygiene in preventing HAIs.

6. Understand the importance of cleaning, disinfection, and sterilization.

7. State the signs and symptoms of sepsis and the importance of early recognition.

# Healthcare-Associated Infections (HAIs)

Healthcare-associated infections (HAIs) are infections that patients get while they are receiving healthcare or soon after receiving healthcare. These infections are largely considered preventable adverse events that can be reduced or eliminated with strict adherence to evidence-based infection prevention guidelines (Gidey et al., 2023).

On any given day, approximately 1 in 31 hospital patients and 1 in 43 nursing home residents have at least one HAI. In 2024, there were an estimated 687,000 HAIs in U.S. acute care hospitals, leading to approximately 72,000 deaths during hospitalization (CDC, 2026, January 29).

HAIs can be acquired anywhere healthcare is delivered, including:

- Inpatient acute care hospitals
- Outpatient settings such as ambulatory surgical centers
- End-stage renal disease (dialysis) centers
- Long-term care facilities, including nursing homes and rehabilitation centers

Most fall into the following four categories:

- Catheter-associated urinary tract infections (CAUTI)
- Surgical site infections (SSI)
- Central line-associated bloodstream infections (CLABSI)
- Ventilator-associated pneumonia (VAP)

HAIs can be caused by any infectious agent, including bacteria, fungi, and viruses. Infections are associated with the use of indwelling medical devices, surgical procedures, post-operative wound care, and contamination of the healthcare surfaces and equipment.

HAIs are also caused by transmission of communicable diseases between patients and healthcare workers and overuse or improper use of antibiotics, which contributes to antimicrobial resistance.

In accordance with NYS public health law §2819, acute care hospitals have been required to report HAIs since 2007. In 2023, NYS required hospitals to report SSIs, CLABSIs, CDIs (*Clostridioides difficile* infections), and CRE (*Carbapenem-resistant Enterobacter ales* infections). In addition, hospitals must report data to National Healthcare Safety Network (NHSN) (NYSDOH, 2025 July).

# Seven Elements of Infection Control

In 1992, New York State passed legislation establishing a requirement that certain healthcare professionals must receive training on infection control (IC) and barrier precautions every four years upon license renewal. Initially, six elements of IC were identified in the New York State IC Training Syllabus. In 2008, the legislature mandated updates to the curriculum, the training process, and the list of professionals requiring the training.

In 2018, Sepsis Awareness and Education was added to address the critical need for early identification and treatment of life-threatening systemic responses to infection. The seven elements are outlined below and detailed in the subsequent sections of this training.

| | |
|---|---|
| ELEMENT 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. |
| ELEMENT II | Modes and mechanisms of transmission of pathogenic organisms in the healthcare setting and strategies for prevention and control. |
| ELEMENT III | Use of engineering and work practice controls to reduce the opportunity for patient and healthcare worker exposure to potentially infectious material in all healthcare settings. |
| ELEMENT IV | Selection and use of barriers and/or personal protective equipment (PPE) for preventing patient and healthcare worker contact with potentially infectious material. |
| ELEMENT V | Creation and maintenance of a safe environment for patient care in all healthcare settings through application of infection control principles and practices for cleaning, disinfection, and sterilization. |
| ELEMENT VI | Prevention and management of infectious or communicable diseases in healthcare workers. |
| ELEMENT VII | Sepsis awareness and education, focusing on early recognition, clinical signs, and the urgency of treatment. |

Source: NYSDOH, 2018, latest available

# 1. Element I: Scientifically Accepted Principles

*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.*

Scientific evidence is the primary source of guidance for infection control and prevention. As the science evolves, practices are updated to reflect new findings. Several factors drive this changing landscape, most notably the emergence of novel pathogens and the mutation of existing germs.

The COVID-19 pandemic (SARS-CoV-2) was a striking example of a novel respiratory virus that forced a rapid, global shift in infection control protocols, emphasizing the importance of aerosol transmission and the critical role of high-filtration respiratory protection (CDC, 2026, March 19).

The expansion of healthcare services from acute care hospitals to home care, ambulatory surgery, free-standing specialty clinics, and long-term care facilities has highlighted the need for universal infection control practices to be adapted for each setting. The threat of antimicrobial resistance and the potential for large-scale outbreaks have moved infection prevention from a specialized hospital function to a fundamental component of all healthcare delivery.

## 1.1 The Cultural Shift Toward "Zero"

In the past, healthcare-associated infections were often viewed as an unfortunate but expected consequence of complex medical care. Hospitals traditionally compared their success to national averages called *benchmarks*. If a hospital's rates were near the average, performance was deemed acceptable.

Today, a  Zero Tolerance philosophy has emerged as a guiding concept in infection control management, with the goal of reducing preventable HAIs to zero. This shift is reinforced through financial penalties that incentivize hospitals to prioritize infection prevention as a core patient safety metric (CMS, 2026 March 19).

## 1.2 New York State Reporting and Public Health Law 2819

Under Public Health Law 2819, New York State mandates the reporting of certain healthcare-associated infections to provide transparency and drive quality improvement. Since the system's inception in 2007, the NYSDOH has refined the process to require healthcare organizations to:

- Maintain a standardized reporting system.
- Provide ongoing training for healthcare facilities.
- Audit and validate hospital infection data.
- Publish annual hospital-specific reports.

Annual reports provide hospital-specific data. Recently, reporting requirements have expanded to include a broader range of infections and pathogens to reflect modern clinical challenges.

## 1.3 Current Reporting Requirements

Hospitals in New York report HAI data using the CDC's National Healthcare Safety Network (NHSN), a secure web-based system used by nearly all U.S. hospitals. This allows state and federal agencies to monitor data using standardized definitions. All NYS acute care hospitals are required to report on the following (NYSDOH, 2026 February):

- CLABSI: central line-associated bloodstream Infections for adult, pediatric, and neonatal intensive care units and selected wards.
- SSI: surgical site infections.
- CAUTI: catheter-associated urinary tract infections.
- *Clostridium difficile*: laboratory-identified bloodstream infections occurring during a patient's stay.
- MRSA bacteremia: laboratory-identified methicillin-resistant staphylococcus aureus events.

Nationally, when comparing data to a 2015 baseline, among acute care hospitals, most HAIs have decreased (CDC, 2026 January 29):

- CLABSI: 9% decrease
- CAUTI: 10% decrease
- C. difficile: 11% decrease
- MRSA: 7% decrease
- SSI (colon): 4% decrease

## 1.4 Key Practices for Infection Control and Prevention

Infection control and prevention practices are evidence-based measures designed to prevent the transmission of healthcare-associated infections to protect patients, healthcare workers, and visitors. The consistent application of these practices is fundamental to modern healthcare.

### 1.4.1 Hand Hygiene

Han hygiene is recognized globally as the single most effective intervention to prevent the spread of infections. It should be performed before and after each patient contact, before aseptic tasks, and immediately after glove removal. It involves using either an alcohol-based hand rub or soap and water when hands are visibly soiled or when caring for patients with *Clostridium difficile* (Yilma et al., 2024).

### 1.4.2 Use of Personal Protective Equipment (PPE)

PPE serves as an adjunctive barrier to protect workers and patients. Protocols dictate using gloves, masks, respirators, face shields, and gowns based on the transmission route (Yilma et al., 2024).

### 1.4.3 Environmental Cleaning and Disinfection

The patient care environment is a key reservoir for pathogens. Regular cleaning and disinfection of frequently touched surfaces (such as bed rails, bedside tables, and mobile equipment) are essential to break the chain of transmission between the environment and the host.

### 1.4.4 Sharps Safety and Injection Safety

Safe needle and injection practices reduce the risk of occupational exposure and bloodborne pathogen transmission. This includes using safety-engineered devices and following strict no-recap protocols alongside safe disposal in designated sharps containers (Yilma et al., 2024).

### 1.4.5 Device Sterilization and Reprocessing

Reusable medical equipment and instruments must undergo standardized decontamination, cleaning, and sterilization or high-level disinfection before use on another patient.

### 1.4.6 Institutional Responsibilities

In addition to individual staff practices, institutional and systemic support forms an integral part of infection control. Healthcare facilities are responsible for establishing and maintaining written infection control policies and procedures. Written protocols must cover standard precautions, isolation measures, and specific guidelines for high-risk procedures.

Policies must be reviewed and updated regularly to reflect emerging threats and technological advancements. Facilities must provide continual staff education and use of quantitative assessment systems to track compliance rates in areas like personal protective equipment (PPE) use and hand hygiene.

## 1.5 Standards of Professional Conduct

In New York State, it is a violation of professional conduct to fail to use scientifically accepted infection prevention techniques appropriate to each profession. Contemporary standards emphasize standard precautions and transmission-based precautions, integrating high-level disinfection and sterilization protocols validated by recent clinical guidelines (Soni et al., 2025).

In New York, healthcare facilities must ensure that healthcare professionals maintain responsibility for adhering to and overseeing infection control practices among personnel under their supervision, reinforcing a culture of safety and accountability.

## 1.6 Mandatory Training Requirements

All licensed healthcare professionals in New York State are required to receive training on infection control and barrier precautions every four years through an NYS-approved provider. This ensures practitioners remain current on emerging pathogens and updated disinfection technologies.

Documentation of appropriate training must be maintained by both the course provider and the course participant to verify compliance during professional audits or renewals.

## 1.7 Reporting of Communicable Diseases and Outbreaks

The reporting of suspected or confirmed communicable diseases is an important part of public health surveillance.

### 1.7.1 Mandated Reporters and Timelines

While physicians hold primary responsibility, the duty to report extends to a broad range of professionals and entities, including (NYSDOH, 2025 September):

- School nurses and daycare center directors.
- Laboratory directors and infection control practitioners.
- Healthcare facilities, state institutions, and all healthcare service providers.

Reports must be submitted to the local health department in the county of the patient's residence within 24 hours of diagnosis. High-consequence or highly contagious diseases require "prompt action" and must be reported immediately by phone to local health authorities.

For a current, comprehensive list of reportable conditions, practitioners should refer to the *Communicable Disease Reporting Requirements* on the New York State Department of Health website, which is updated periodically to include emerging pathogens (NYSDOH, 2024, January).

### 1.7.2 Facility-Based Outbreak Reporting

Under *10NYCRR 702.4*, facilities licensed under Article 28 of the Public Health Law are required to report any single case of a reportable condition or any increase over the baseline incidence of any condition.

Facilities should prioritize reporting cases electronically using the Nosocomial Outbreak Reporting Application (NORA) using a secure NYSDOH web-based system. Reporting can also be conducted via fax to the Regional Epidemiology Program central office or by telephone to the regional epidemiologist.

Critical outbreaks or immediate threats to patient safety must be directed by phone to the regional epidemiologist to facilitate immediate epidemiological support and guidance.

## 1.8 Professional Misconduct and Legislative Enhancements

Legislation in New York has significantly strengthened the state's oversight regarding physician conduct and infection control accountability. These measures ensure that the NYSDOH can rapidly investigate potential breaches and that all levels of medical practitioners—from students to seasoned clinicians—are held to the same rigorous safety standards (Soni et al., 2025).

### 1.8.1 Oversight and Public Transparency

The current regulatory framework enhances the state's ability to address public health threats within clinical environments. The state is required to publicize charges served on a physician during any disciplinary proceeding.

Authorities are empowered to release information regarding any public health threat identified during an investigation, prioritizing patient safety over administrative confidentiality (NYS Education Law § 6530). There is a specific mandate for the reporting of suspected disease transmission occurring within office-based surgery practices, ensuring these settings are monitored with the same scrutiny as hospital environments.

### 1.8.2 Compliance and Educational Standards

The law strictly defines certain administrative failures as professional misconduct and standardizes training across the board:

- A physician's failure to respond to records requests from state or local health departments in a timely manner constitutes "professional medical misconduct."
- Medical students and residents are now required to complete the same NYS-approved infection control coursework as practicing physicians, physician assistants, and specialist assistants.

# 2. Element II: Mechanisms of Transmission

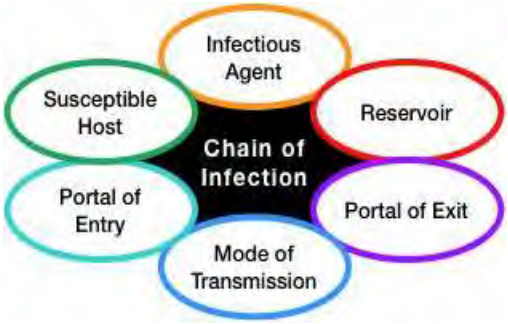
*Modes and mechanisms of transmission of pathogens organisms in the healthcare setting and strategies for prevention and control.*

The transmission of infections in healthcare settings is largely preventable. The concept of the *chain of infection* provides the basis for understanding the transmission of pathogens as well as identifying practices and procedures to prevent HAIs.

## 2.1 The Chain of Infection

We have all seen infections spread through a family, classroom, or office; this situation can be described using a concept called the chain of infection (see figure below). It is a process that begins when (1) an infectious agent or pathogen (2) leaves its reservoir, source, or host through (3) a portal of exit, (4) is conveyed by some mode of transmission, (5) enters the host through an appropriate portal of entry, and (6) infects a susceptible host. The now-infected susceptible host becomes a new reservoir and the whole process starts over.

The concept of a chain of infection is essential for understanding why we do what we do to prevent infection. Breaking any link of the chain of infection can prevent the spread of infection.




## 2.2 Infectious Agents (Pathogens)

*Infectious agents* are the microorganisms or "germs"—bacteria, viruses, fungi, and protozoa—that can cause disease or illness in their hosts. The word *pathogens* is derived from the Greek, meaning "that which produces suffering." Although microorganisms are common in the environment, most are not harmful to people.

Pathogens vary in infectivity and virulence. To cause disease an infectious dose —a sufficient number of organisms—is required. Creating an environment with no pathogens is not a realistic goal outside of highly specialized laboratories.

### 2.2.1 Bacteria

Bacteria are single-celled organisms, the vast majority of which are harmless or even beneficial. Our bodies contain bacteria, called *normal flora*, that protect us from infection by providing competition to pathogens.

Normal flora usually do not cause disease unless their balance is disturbed or the bacteria get into a part of the body that cannot tolerate them. Antibiotics are effective against many bacterial infections although the overuse or misuse of antibiotics has produced resistant strains of bacteria.

Pathogenic bacteria contribute to several globally prevalent diseases, including pneumonia, tuberculosis, and bacterial meningitis. Pathogenic bacteria include group A and group B streptococcus, *Haemophilus influenzae*, *Staphylococcus aureus*, methicillin-resistant staph aureus (MRSA), *Clostridium difficile*, *Neisseria meningitidis*, and *Streptococcus pneumoniae*.

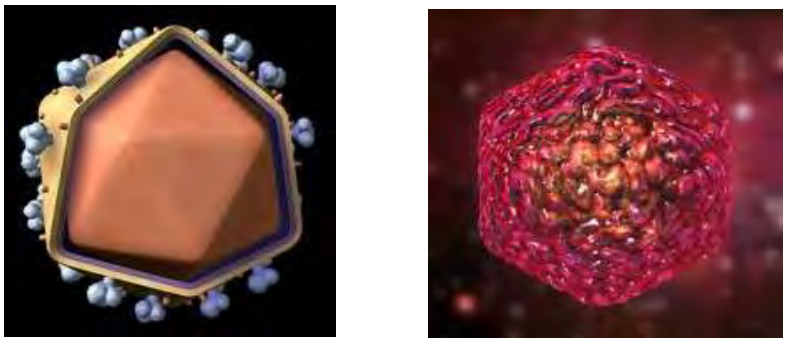
Left: A coccus is a bacterium with a spherical shape. Chains of cocci indicate streptococcus, while clusters indicate staphylococcus. Right: Bacillus can refer to any rod- shaped bacterium, or can be more specific to Bacillus, which is a gram-positive and rod-shaped genus. Source: Illustration by 3DScience.com, used with permission.

## 2.2.2 Viruses

Viruses are true parasites in that they can only reproduce inside the host cell. More than 5000 types of viruses have been described since the first was discovered in 1899. Viruses are about a hundred times smaller than bacteria, and like bacteria, not all viruses cause disease.

Viruses spread in many ways—by direct or indirect contact (soiled hands or articles), by droplets from coughing and sneezing, by contact with blood, by sexual contact, by fecal contamination, by contaminated food and water, or via certain insects. Examples of diseases caused by viruses include influenza, chickenpox, West Nile fever, and HIV.

Antibiotics are not effective against viruses. Vaccines, however, have been successful in eliminating or controlling some viral disease—including smallpox, polio, measles, mumps, and rubella—that have killed millions of people throughout the world. Anti-viral medications for some illnesses have varying degrees of effectiveness.

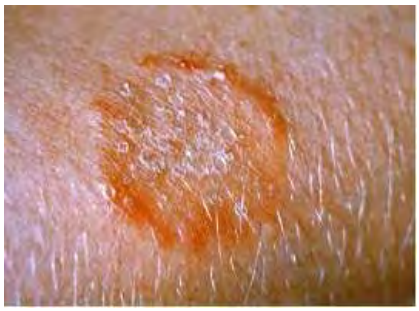


Left: HIV is a retrovirus, here showing protein arms, whose genetic content is stored in RNA, which is copied into the DNA of the host upon infection. Right: This image of the West Nile Virus shows its characteristic rough and furrowed surface with no protein arms projecting from it. Source: Illustration by 3DScience.com. Used with permission.

### 2.2.3 Fungi

Fungi are very common and only a few cause diseases in humans. Some fungal infections are life-threatening in certain susceptible patients. Fungal infections can be *superficial* (limited to the surface of the skin and hair), *cutaneous* (extending into the epidermis, nails, and hair), or *subcutaneous* (extending into the dermis, underlying tissues, muscle, and fascia). Fungal infections can also be *systemic*, often originating in the lungs and spreading to multiple organs.

There are several classes of antifungal medications, although fungal and human cells are similar on the molecular level, so antifungal drugs can have mild to serious side effects. Athlete's foot, yeast infections, and candidemia (yeast growing in the blood) are examples of diseases caused by fungi.



An example of a fungal infection called ringworm (no worm is involved). Source: CDC.

One fungus that survives exceptionally well in the air, dust, and moisture of healthcare facilities is *Aspergillus spp*., a common, aerobic fungus found in soil, water, and decaying vegetation (Corrêa-Junior et al., 2026). The incidence of invasive aspergillosis in hospitalized patients continues to rise, with a significant spike observed in 2020 and 2021 due to the emergence of COVID-19-associated pulmonary aspergillosis (CAPA) (Bustamante, 2026).

Site renovation and construction can disturb Aspergillus-contaminated dust, producing bursts of airborne fungal spores associated with clusters of healthcare-associated infections in immunocompromised patients. Absorbent building materials, such as wallboard and certain biodegradable polymers, provide ideal growth media if they remain wet (Samoilenko et al., 2025). Patient-care items and medical devices can also become contaminated with spores, acting as persistent sources of infection.

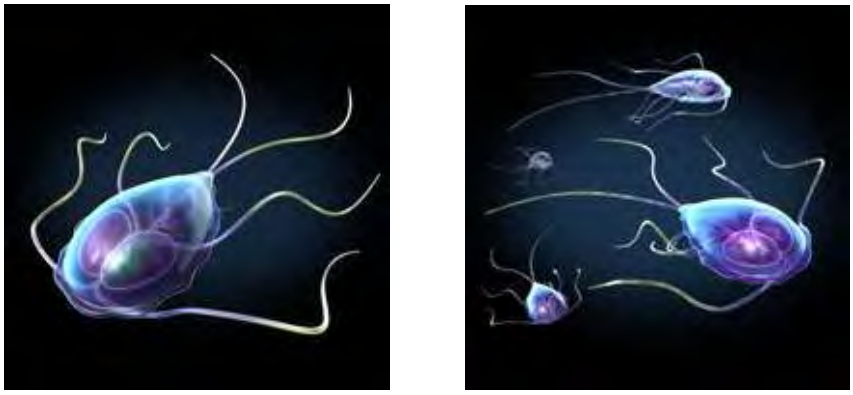
Other opportunistic fungi increasingly linked with HAIs include:

- Order Mucorales (pin molds): found in water-damaged wood and building materials, these fungi have seen increased prevalence in critically ill patients, particularly secondary to viral infections (Branda et al., 2025).
- Fusarium and penicillium: molds that can proliferate in moist environments and, in the case of fusarium, can become airborne or survive on inanimate surfaces (Branda et al., 2025).
- Pseudoallescheria: like Aspergillus, can be airborne and poses a threat during environmental disturbances.

As with aspergillosis, the primary risk factor for disease caused by any of these pathogens is the host's severe immunosuppression, whether from underlying disease, intensive care treatments, or immunosuppressive therapy (Jenks and Tobin, 2026, February).

### 2.3.4 Protozoa

Protozoa are single- or multi-celled microorganisms that are larger than bacteria. They have traditionally been classified by their means of propulsion: flagella, amoeboid, sporozoan, or ciliate. They may be transmitted in soil, via water, by direct contact, or by an insect such as a mosquito. Examples of diseases caused by protozoa include malaria and giardia. Malaria is a protozoan that lives in the blood of the host and is transmitted when an insect bites, ingests infected blood, and then transmits it by biting a new host. Protozoa are less common than the other types of organisms in the United States and can be treated with specific medication.



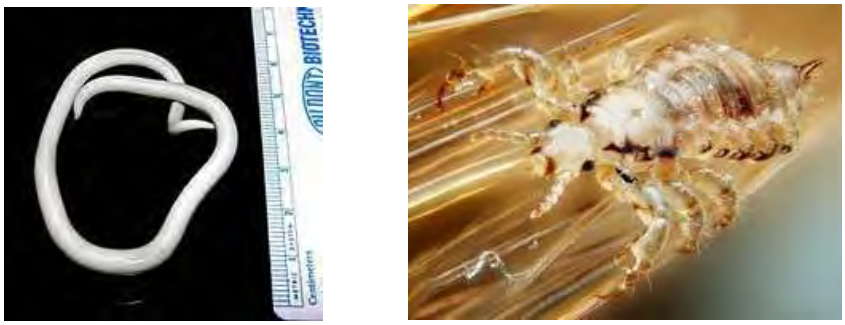
These images depict a type of protozoa called Giardia trophozoites in a variety of positions. Giardia stick closely to the lining of the small intestine in the hosts they infect and cause mild to severe diarrhea. Source: Illustration by 3DScience.com. Used with permission.

### 2.3.5 Parasites

Parasites are usually larger organisms that exploit a host by living on the skin, inside the gut, or in tissues. The life of a parasite is precarious because the host usually does everything it can to destroy the parasite.

Parasites are dependent upon the host for survival and employ several strategies to move from host to host. They can be transmitted by direct contact, as with lice or scabies, or wait in the external environment until there is contact with the host (ticks, leeches).

Helminthes are a class of parasites that live inside the body and include roundworms, tapeworms, and flukes. They infect humans principally through ingestion of fertilized eggs or when the larvae penetrate the skin or mucous membranes.




Left: The parasitic roundworm *Ascaris lumbricoides*. As many as one- quarter of the world's population is infected with Ascaris. Source: Wikipedia. Right: *Pediculus humanus* var. capitis, also known as head louse. Source: Wikipedia.

## 2.4 Reservoirs

A *reservoir* is defined as one or more epidemiologically connected populations or environments in which a pathogen can be permanently maintained and from which infection is transmitted to a defined target population (Wang et al., 2021). Reservoirs are the places where the germs live and grow. A general rule: If an area stays wet, it is probably a reservoir.

The most common reservoirs in healthcare facilities are people, who may be either sick or healthy. These human reservoirs include patients, healthcare personnel, visitors, and household members.

Individuals within these groups may act as sources while experiencing active infections, during asymptomatic or incubation periods, or while transiently or chronically colonized with pathogenic microorganisms—most notably within the respiratory and gastrointestinal tracts. The frequent presence of family members in hospital wards is a significant factor in maintaining these reservoirs (Alinasab, et al., 2025).

The complexity of identifying reservoirs is a significant challenge and specific sources often remain elusive. Public health actions are frequently taken when there is scientific consensus on a reservoir's location. Historical examples include the large-scale slaughter of livestock to control outbreaks like the Nipah virus or bovine spongiform encephalopathy.

For many deadly viruses, the identity of the natural reservoir is still being unraveled. For example, while fruit bats have long been suspected as reservoirs for Ebola and Marburg viruses, recent evidence points to insectivorous microbats, such as the Angolan free-tailed bat, as a highly probable natural reservoir (Bokelmann et al., 2021).

Human survivors can act as potential long-term reservoirs. For instance, the Ebola virus can persist in "immunologically privileged" sites such as the brain, eyes, and testes, occasionally reactivating years later to initiate new outbreaks. An incomplete understanding of these complex maintenance cycles continues to hamper the control of persistent diseases like Ebola and rabies in regions across Africa (Asare Fenteng et al., 2023).

In humans, the reservoir and the susceptible host can be the same person and can cause disease if the person's normal flora gets into the wrong part of the body. For example, oral flora getting into the lungs can cause aspiration pneumonia, skin flora contaminating an IV site can cause a site or bloodstream infection, and fecal flora contaminating the urinary tract can cause a urinary tract infection. This is why care must be taken to avoid carrying germs between different body sites of the same patient. The most effective prevention technique is to change gloves and do hand hygiene when going from a contaminated area to a cleaner area.

In healthcare facilities, activities aimed at eliminating reservoirs include:

- Treating people who are ill.
- Handling and disposing of body fluids carefully
- Using sterile water in respiratory equipment.
- Drying equipment before storing it.
- Handling food safely and cooking meat thoroughly.
- Monitoring soil and contaminated water in sensitive areas of the hospital and washing hands carefully after contact with either.
- Vaccinating people.
- Encouraging ill workers to stay home.

In acute care, a patient's risk for an HAI is related not only to the severity of illness and exposure to invasive interventions and devices but also to environmental risks, including exposure to other patients and inanimate reservoirs or pathogens. In home care, the rationale and strategy for use of precautions differ from those applied in hospitals. In most cases, the use of gowns, gloves, and masks in the care of homebound patients is recommended to protect the healthcare provider, not the client.

Caregivers in the home environment may require respiratory protection primarily when caring for clients with infectious respiratory pathogens, such as pulmonary tuberculosis. Although the home setting differs from acute care, it is recommended that healthcare personnel use an N95 mask during high-risk interactions with clients.

Home care clients known to be colonized or infected with multidrug-resistant organisms (MDROs) should be managed using appropriate barrier precautions. Although these organisms may not pose a significant health risk to healthy healthcare workers, they are easily transmitted to other vulnerable home care clients via contaminated hands or inanimate objects.

To minimize the risk of cross-contamination, the following protocols are recommended:

- Reusable items such as stethoscopes and blood pressure cuffs should remain in the client's home whenever possible.
- If practical, clients with MDROs should be seen as the last appointment of the day. When this is not feasible, visits must be scheduled to ensure that "at-risk" clients are seen before visiting a person with a known MDRO.
- Strict adherence to hand hygiene before and after client contact remains the single most effective measure in preventing the spread of MDROs in home health settings.

## 2.5 Portals of Exit: How Pathogens Leave the Body

A pathogen leaves its reservoir or host through a *portal of exit*, which typically corresponds to the anatomical site where the pathogen is localized (Edemekong and Huang, 2022). This exit point is a critical link in the chain of infection, as it dictates the subsequent mode of transmission to a new susceptible host.

For example, respiratory pathogens such as SARS-CoV-2, influenza viruses, and *M. tuberculosis* primarily exit through the respiratory tract via aerosolized droplets or fine particulate matter generated during coughing, sneezing, or even speaking. Enteric pathogens, including *Vibrio cholerae* and norovirus, exit the host via feces, often leading to fecal-oral transmission cycles in environments with poor sanitation. Ectoparasites like *Sarcoptes scabiei* (scabies) exit through direct shedding from infested skin lesions (CDC, 2024 January 12).

Specific exit routes for bloodborne and systemic pathogens include:

- Vertical transmission: certain pathogens cross the placental barrier from mother to fetus; these include Zika virus, syphilis, and toxoplasmosis (Edemekong and Huang, 2022).
- Percutaneous and skin breaks: bloodborne viruses like hepatitis B, hepatitis C, and HIV exit through cuts in the skin, shared needles, or contaminated medical equipment.
- Vector-borne exit: Pathogens such as the malaria or dengue virus exit the human reservoir when a blood-sucking insect ingests a blood meal from an infected individual.

The portal of exit is the link of the chain over which we have the least control. Any break in the skin—such as natural anatomic openings or draining lesions—may be a portal of exit from a host. Any body fluid may carry infectious agents out of the body. Some bacteria (such as MRSA) live on the patient's skin, so even dry skin contact may serve as the portal of exit.

Activities aimed at eliminating portals of exit in healthcare facilities include:

- covering coughs and sneezes with a tissue
- handling body fluids with gloves—followed by hand hygiene
- keeping draining wounds covered with a dressing
- staying home from work when you have wet lesions or weeping dermatitis

## 2.6 Means of Transmission

Did You Know. . .

Very few germs can fly—almost all must be carried from one place to another. The means of transmission is the weakest link in the chain of infection, and it is the only link we can hope to eliminate entirely. Most infection control efforts are aimed at preventing the transport of germs from the reservoir to the susceptible host.

Direct and indirect contact are the most common *means of transmission* in the healthcare setting, often from the hands of caregivers and items that move patient to patient. Standard, contact, droplet, and airborne precautions are designed to interrupt the means of transmission. Because it addresses the weakest link in the chain of transmission, hand hygiene is still the single most important procedure for preventing the spread of infection.

### 2.6.1 Direct Transmission

Person-to-person transmission of pathogens through touching, biting, kissing, or sexual intercourse.

### 2.6.2 Indirect Transmission

An agent or pathogen can be indirectly transmitted from a reservoir to a susceptible host by inanimate objects or a contaminated environment. Cleaning and disinfection are critical practices to ensure that medical equipment surfaces do not serve as means of transmission for multidrug-resistant microorganisms and other infectious pathogens (Santamaría-García et al., 2026).

Hands of healthcare personnel may transmit pathogens after touching an infected or colonized body site on a patient or a contaminated inanimate object if hand hygiene is not performed before touching another patient. Strict adherence to hand hygiene and the use of personal protective equipment are essential strategies for minimizing the transmission of highly infectious diseases (Imanipour and Kamali, 2026).

Patient-care devices—including electronic thermometers, glucose monitoring devices, stethoscopes, and blood-pressure cuffs—can transmit pathogens if they are contaminated with blood or bodily fluids or are shared between patients without cleaning and disinfecting.

Certain pathogens can remain infectious on nonporous surfaces for several weeks or longer. Recent advances have explored nanotechnology-enabled antimicrobial coatings for medical devices, such as catheters and surgical sutures, to inhibit the colonization of antibiotic-resistant bacteria like *Staphylococcus aureus* and *Pseudomonas aeruginosa* (Paladini, et al., 2025).

Shared toys can be a vehicle for transmitting respiratory viruses or pathogenic bacteria among pediatric patients. Toys used by young children should be washable and should be washed and dried routinely. Children should be encouraged to wash hands before and after using shared toys or equipment.

Instruments that are inadequately cleaned between patients before disinfection or sterilization, or that have manufacturing defects interfering with reprocessing, can transmit bacterial and viral pathogens. For instance, non-sterile medical or surgical equipment can lead to infections from resistant organisms such as *Mycobacterium abscessus* (To et al., 2020).

Clothing, uniforms, laboratory coats, or isolation gowns used as PPE can also become contaminated with potential pathogens after the care of a patient colonized or infected with an infectious agent (Imanipour and Kamali, 2026).

### 2.6.3 Airborne Transmission

Transmission of germs can occur through the air via droplet or airborne routes. Droplet transmission is common, easily spreading infections such as colds, influenza, whooping cough (pertussis), and some forms of meningitis.

Droplets are produced when the infected person coughs, sneezes, or speaks. They can travel about 3 to 6 feet before drying out or falling to the ground. Droplet precautions are designed to interrupt this means of transmission, and respiratory hygiene practices should be used when caring for any person with active respiratory symptoms.

This photograph captures a sneeze in progress, revealing the plume of salivary droplets as they are expelled in a large cone- shaped array from this man's open mouth, thereby dramatically illustrating the reason for covering your mouth when coughing or sneezing in order to protect others from germ exposure. Source: CDC.

Airborne transmission occurs with only a few infections—those caused by organisms that can survive the drying of respiratory droplets. When the droplets evaporate, they leave behind droplet nuclei, which are so tiny they remain suspended in the air. Diseases transmitted by the airborne route include tuberculosis, chickenpox, measles, severe acute respiratory syndrome (SARS), COVID, and smallpox. Airborne Precautions are designed to interrupt this means of transmission.

Means of transmission that are not common in hospitals include:

- Food, water, milk, or IV fluid. These products are obtained only from safe and approved sources to prevent contamination.
- Vector-borne transmission by an animal carrier such as a rat or mosquito that carries the pathogen from reservoir to host. Hospitals maintain their environment so that vector-borne transmission is not likely to occur.

Activities aimed at eliminating the means of transmission in healthcare facilities include:

- hand hygiene
- wearing gloves
- practicing standard, contact, droplet and airborne precautions
- cleaning, disinfection, or sterilization of equipment used by more than one patient
- cleaning of the environment, especially high-touch surfaces
- maintaining directional air flow

## 2.7 Portals of Entry: How Pathogens Are Introduced

The *portal of entry* refers to the location through which a pathogen enters a susceptible host. A portal of entry must provide access to tissues in which the pathogen can multiply, or a toxin can act. Often, the infectious agent uses the same portal to enter the new host that it used to exit the source host. For example, influenza virus exits the respiratory tract of the source host and enters the respiratory tract of the new host.

Some pathogens follow a so-called "fecal-oral route" because they exit the source host in feces, are carried on inadequately washed hands to a vehicle such as food, water, or utensils, and enter a new host through the mouth. Other portals of entry include skin, mucous membranes, and blood.

Pathogens cannot cause illness until they enter the body, and, in general cannot enter through intact skin. They may gain entry through an anatomic opening, a skin break caused by illness or accident, or an opening created during a medical procedure, such as a surgical wound or an IV site. Preventing or eliminating portals of entry, where possible, and protecting portals that cannot be eliminated is a must for both patients and healthcare personnel.

Examples of portals of entry include:

- mouth, nose, eyes, and other anatomic openings
- rash or dermatitis
- insect bites
- injuries, from microscopic to major
- surgical wounds
- intravenous sites
- any location, whether anatomic or created, with a tube in place
- needle-puncture injuries

Activities aimed at protecting or eliminating portals of entry in healthcare facilities include:

- use of aseptic surgical technique
- application of dressings on surgical wounds
- use of iv site dressings and proper care
- elimination of tubes as soon as possible
- use of masks, goggles, and face shields
- protecting your skin to prevent openings (such as dermatitis)
- keeping unwashed hands and objects away from the mouth
- use of actions and devices to prevent needle sticks

## 2.8 Susceptible Host

The final link in the chain of infection is the *susceptible host*. Most of the factors that influence infection, and the occurrence and severity of disease are related to the host, although agent and environmental factors also play a role (see table below). However, characteristics of the host-agent interaction—such as pathogenicity, virulence, and antigenicity—are important. The infectious dose, mechanism of disease production, and route of exposure are also factors.

| Factors That Influence the Outcome of an Exposure | |
|---|---|
| Host Factors | • Extremes of age<br>• Underlying disease such as HIV/AIDS<br>• Malignancy<br>• Transplants<br>• Medications that alter normal flora, such as antimicrobial agents, gastric acid suppressants, corticosteroids, anti-rejection drugs, antineoplastic agents, and immunosuppressive drugs<br>• Surgical procedures<br>• Radiation therapy<br>• Indwelling devices such as urinary catheters, endotracheal tubes, central venous and arterial catheters, and synthetic implants |
| Agent Factors | • Infectivity<br>• Pathogenicity<br>• Virulence<br>• Size of inoculum<br>• Route of exposure<br>• Duration of exposure<br>• The ability of a pathogen to maintain infectivity over a distance |
| Environmental Factors | • Contamination of environment and equipment<br>• Availability of means of transmission<br>• Temperature and humidity |

Some people exposed to pathogenic microorganisms never develop symptomatic disease while others become severely ill and even die. Those who are extremely old or young, are already ill, have holes in their skin, have invasive devices in place, or are immunocompromised are most susceptible. Still others progress from colonization to symptomatic disease either immediately following exposure or after a period of asymptomatic colonization.

For some diseases there are effective vaccines, and some diseases produce lasting immunity after illness. We have better resistance to disease when we are well rested, well fed, and relatively stress-free. People with healthy immune systems are often able to resist infection even when bacteria do invade.

The healthy body has numerous protective structures and systems that support resistance to infection. These include intact skin, blood circulation bringing white blood cells and nutrients to the tissues, antibodies to previously encountered infectious agents, the inflammatory response, stomach acid, and a robust community of normal flora, which provides competition to invading pathogens. A person with these defense mechanisms intact is said to be immunocompetent.

Immune compromise varies in severity and can be temporary or long term. A person who is sick in bed for a few days may be mildly compromised, while a person with a chronic illness such as diabetes is probably moderately and chronically compromised. Someone receiving chemotherapy or a transplant patient may be severely immunocompromised.

Extra care should be taken to protect a person who is immunocompromised. Nutritional status should be closely monitored to support immune competence. Both the very young and very old need extra protection from infection. Any indwelling device increases susceptibility. To reduce the risk of infections associated with these devices, the device should be discontinued as soon as the patient no longer needs it.

Some organisms are widely found but only cause disease in a susceptible host— such as the person recently treated with antibiotics who then develops a yeast infection. Examples of susceptible hosts include people who:

- are already ill
- have invasive devices or tubes in place
- are malnourished
- are very old or very young
- are tired or under high stress
- have skin breaks such as surgical wounds or IV sites
- are undergoing steroid therapy or treatment for cancer
- have HIV infection
- are well and healthy! (No one is immune to all disease.)

Activities aimed at protecting or eliminating susceptible hosts in healthcare facilities include:

- preventing exposure of both patients and staff to communicable disease
- removal of invasive devices as soon as they are no longer needed
- maintaining good nutrition
- maintaining good skin condition
- covering skin breaks
- vaccinating people against illnesses to which they may be exposed
- encouraging rest and balance in our lives

## 2.9 Prevention Strategies

Since 1991, when the Occupational Safety and Health Administration (OSHA) first issued its Bloodborne Pathogens (BBP) Standard (29 CFR 1910.1030), the focus of regulatory activity has centered on prevention and control measures. A central tenet of this approach is the adoption of Universal Precautions, which treats all human blood and certain body fluids as if they are known to be infectious for HIV, HBV, and other bloodborne pathogens.

## 2.9.1 The Exposure Control Plan

The OSHA Bloodborne Pathogens Standard requires that every employer with employees who have "occupational exposure" to blood or other potentially infectious materials (OPIM) establish a written Exposure Control Plan (ECP). This plan is designed to eliminate or minimize employee exposure and must be updated at least annually to reflect changes in technology that eliminate or reduce exposure to bloodborne pathogens.

The Exposure Control Plan must address the following key elements:

- Standard/Universal Precautions: Treating all patients as potentially infected and ensuring consistent hand hygiene.
- Engineering and work practice controls: Using sharps disposal containers, self-sheathing needles, and safer medical devices.
- Personal protective equipment (PPE): Providing and ensuring the use of gloves, gowns, laboratory coats, face shields or masks, and eye protection (Imanipour and Kamali, 2026).
- Housekeeping, laundry, and regulated waste: Implementing thorough cleaning and disinfection strategies for environmental surfaces and equipment (Santamaría-García et al., 2026).
- Contaminated sharps and equipment: Procedures for the safe handling and disposal of needles and other sharp objects.
- Hepatitis B vaccination and post-exposure follow-up: Offering the HBV vaccine series to all at-risk employees and providing confidential medical evaluations following an exposure incident.
- Employee communication and education: Training must be provided at the time of initial assignment and at least annually thereafter.
- Maintaining accurate medical and training records.

The Exposure Control Plan must be readily accessible to employees. While general education covers many of these requirements, it does not replace employer-specific protocols, such as the exact procedures for reporting an exposure or the location of the written plan within a specific facility.

## 2.9.2 Standard and Universal Precautions

Universal precautions were originally developed by OSHA for use with all patients to protect healthcare workers from bloodborne pathogens, such as HIV, Hepatitis B (HBV), and hepatitis C (HCV).

Universal precautions require avoidance of contact with blood or OPIM. OSHA defines OPIM, or "other potentially infectious materials," as (1) the following human body fluids: semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, pericardial fluid, peritoneal fluid, amniotic fluid, saliva in dental procedures, any body fluid that is visibly contaminated with blood, and all body fluids in situations where it is difficult or impossible to differentiate between body fluids; (2) any unfixed tissue or organ (other than intact skin) from a human (living or dead); and (3) HIV-containing cell or tissue cultures, organ cultures, and HIV- or HBV-containing culture medium or other solutions; and blood, organs, or other tissues from experimental animals infected with HIV or HBV.

Because the focus of universal precautions was narrow (protect healthcare workers from bloodborne pathogens), the CDC was led to develop Standard Precautions, which include all Universal Precautions and more.

Standard precautions protect patients and healthcare workers from many bacterial and viral infections, including bloodborne pathogens. When we use standard precautions, we are in full compliance with Universal Precautions.

Standard precautions tell us to avoid contact with:

- blood and all body fluids from all patients
- any bodily fluid, which can carry microorganisms
- mucous membranes
- non-intact skin (abrasions, dermatitis, rash)

Standard precautions represent the primary strategy for preventing HAIs and are designed to protect both patients and healthcare personnel (Sartelli et al., 2023). These precautions should be applied to all patients in all healthcare settings, regardless of their suspected or confirmed infection status.

Standard Precautions require consistent adherence to the following:

- Assumption of infection: Treat all human blood and certain body fluids, secretions, and excretions as potentially infectious.
- Routine hand hygiene: Perform hand hygiene correctly—using alcohol-based hand rub or soap and water—before and after patient contact, after touching the patient's environment, and immediately after removing gloves (Santamaría-García et al., 2026).
- Personal protective equipment (PPE): Select and use PPE based on the nature of the patient interaction and the potential for exposure to blood, body fluids, or infectious agents (Imanipour and Kamali, 2026).
- Safe injection practices: Adhere to "One Needle, One Syringe, Only One Time" protocols. This includes using sterile, single-use needles and syringes for each injection and preventing the contamination of multidose medication vials (Sartelli et al., 2023).
- Environmental and equipment cleaning: Clean and disinfect patient-care equipment (e.g., blood pressure cuffs, stethoscopes) between uses on different patients (Santamaría-García et al., 2026). High-touch surfaces in the patient environment must also be routinely sanitized.

Respiratory hygiene and cough etiquette: Implement "source control" measures in all areas where symptomatic individuals are seen. This includes masking symptomatic patients, providing tissues and no-touch waste bins, and ensuring hand hygiene supplies are readily available.

Respiratory hygiene remains a fundamental component of Standard Precautions, designed to contain infectious secretions at the source before they can be transmitted to others. Rigorous respiratory hygiene reduces the viral and bacterial load within the healthcare environment, providing essential protection for immunocompromised patients and frontline staff (Santamaría-García et al., 2026).

Additional respiratory hygiene practices include:

- Implementing these measures immediately at the point of initial encounter—such as triage, reception, or waiting areas—to minimize the window of potential exposure (Santamaría-García et al., 2026).
- Apply hygiene protocols universally to both patients and any accompanying individuals, recognizing that visitors and caregivers can be significant vectors for respiratory viruses (Imanipour and Kamali, 2026).
- Post clear instructions at entrances and in high-traffic areas. Direct individuals with respiratory symptoms to cover their mouths and noses, dispose of tissues properly, and perform hand hygiene (Sartelli et al., 2023).
- Ensure that tissues, no-touch waste receptacles, and hand hygiene materials (alcohol-based hand rub or soap) are readily available and positioned in highly visible locations.
- Offer a surgical mask to coughing patients immediately upon entry to the facility to contain droplets at the source and prevent environmental contamination (Imanipour and Kamali, 2026).
- Encourage symptomatic patients to maintain 6 feet of physical distance from others in waiting areas (Sartelli et al., 2023).

| Correct Use of Standard Precautions | |
|---|---|
| Always | • Use good hand hygiene.<br>• Use gloves for contact with blood, body fluids, non-intact skin (including rash), mucous membranes, used equipment, linen, and trash.<br>• Use a gown any time your clothing may become soiled and if a patient has uncontained body substances.<br>• Use a mask and eye protection if you may be splashed. OSHA-compliant eye protection must have solid side shields.<br>• Change gloves if they become heavily soiled or if you must go from a dirtier area to a cleaner one. |
| Never | • Wear artificial fingernails—check your facility's policy for details.<br>• Touch a second patient with the same pair of gloves.<br>• Re-use gowns, even for repeated contacts with the same patient.<br>• Contaminate the environment with dirty gloves.<br>• Wear gloves in the hall unless you can say why you are wearing them. |

## 2.10 Transmission Based Precautions

For patients with certain infections, use of transmission-based precautions, in addition to Standard Precautions is recommended. Standard Precautions are used with all patients and do not require a sign on the door. Patients being cared for using contact, droplet, or airborne precautions will have a sign on the door in most facilities. Note that the sign on the door may not specify the patient's diagnosis for reasons of privacy.

Facilities should have policies for transport of a patient outside the room, addressing each type of transmission-based precautions.

### 2.10.1 Contact Precautions

The following recommendations are for acute care facilities. Other types of facilities should develop policies based on these guidelines:

- Hand hygiene is critical in the care of patients.
- Visitors must perform hand hygiene on leaving the room.
- Use a single-patient room if possible; consult with infection prevention staff if not possible.
- Wear gloves to enter the room. Change gloves as specified by Standard Precautions.
- Wear a gown to enter the room.
- Use single-patient equipment, left in the room.
- Disinfect any equipment that leaves the room.
- Clean and disinfect these rooms at least daily.

Supplies needed include:

- gloves and gowns
- disinfectant for removed equipment
- trash container for discarded PPE
- single-patient use equipment

Contact precautions are often used to care for patients with Methicillin-resistant *Staphylococcus aureus*, *C. difficile*, wounds with uncontained drainage, and several other infections.

### 2.10.2 Droplet Precautions

Droplet Precautions are used to provide care to patients with influenza, pertussis, some types of meningitis, undiagnosed respiratory infections, and several other diseases. The following are CDC recommendations for acute care facilities. Other types of facilities should develop policies based on these guidelines:

- Use a single-patient room if possible; consult with infection prevention staff if not possible.
- Maintain at least 3 feet separation between the patient and others.
- If two patients must share a room, draw the privacy curtain between them.
- Hand hygiene must be done as specified for Standard Precautions.
- Staff should wear a simple mask to enter the room.
- Supplies needed (beyond Standard Precautions) are limited to simple masks.

### 2.10.3 Airborne Precautions

Airborne Precautions are the only type that require:

- Airborne infection isolation room—AIIR—a negative pressure isolation room.
- N-95 respirator or PAPR.
- Supplies needed (beyond Standard Precautions) are limited to the appropriate respiratory protection.

AIIRs have very specific requirements and are often available only in acute care facilities. If a disease requiring Airborne Precautions is suspected and an AIIR is not available, place a simple mask on the patient and place him or her in a separate room with its door closed while transfer to a facility with an available AIIR is arranged. Non-acute care settings should have well known policies for identifying and managing such patients.

If patients must come out of the AIIR, put a simple mask on them; *a tight-fitting respirator may not be tolerated and is not indicated.*

Airborne Precautions are used for patients known or suspected of having:

- Tuberculosis, active pulmonary or rule-out
- Chickenpox
- Measles
- Disseminated herpes zoster (shingles of more than one dermatome)
- SARS
- Smallpox

## 2.11 Tuberculosis

Tuberculosis (TB) is a bacterial infection caused by *Mycobacterium tuberculosis* and is spread in airborne droplets when people with the disease cough or sneeze. Most people with healthy immune systems infected with *M. tuberculosis* never become ill. However, the bacteria remain dormant within the body and can cause tuberculosis years later if host immunity declines (Williams et al., 2024).

Every year, an estimated 10.7 million people worldwide develop tuberculosis and nearly 1.25 million people die from the disease (WHO, 2026 March 24).

The person who is most likely to transmit tuberculosis is the person who has not been diagnosed—the unknown carrier. Identification without delay of the person with active tuberculosis is critical so that isolation and treatment can prevent transmission to others.

Active TB does have symptoms, which depend on where in the body the TB bacteria are growing. Tubercular disease in the lungs may cause symptoms such as a bad cough that lasts 3 weeks or longer, pain in the chest, or coughing up blood or sputum (phlegm from deep inside the lungs). Other symptoms of active TB disease are weakness or fatigue, weight loss, no appetite, chills, fever, or sweating at night.

Diagnostic tests for the disease include chest x-rays, the tuberculin skin test (and interferon-gamma release assays), and sputum cultures. Tuberculosis can usually be cured by taking several powerful antibiotics daily for several months.

Because tuberculosis is a disease transmitted by a true airborne route, and because it is an undiagnosed person who is most likely to transmit disease, the CDC recommends a three-level hierarchy of controls (Ali et al., 2021):

1. Administrative controls: specify who oversees the facility's TB control program, including critical infrastructure such as laboratories as well as other services needed to maintain an effective program.
2. Environmental controls: to contain the source of exposure, primarily using Airborne Infection Isolation (AII) rooms that provide negative-pressure ventilation.
3. Respiratory controls: address the protection of people who must be protected from contaminated air when they enter the AII room.

Tuberculosis infectiousness usually declines within weeks of beginning treatment. The patient must show clear clinical improvement before isolation is discontinued because the patient with resistant organisms remains infectious if initial treatment is not effective.

Airborne Precautions for tuberculosis may be discontinued when both of the following criteria have been met: (1) clinical improvement, and (2) three consecutive sputum smears negative for acid-fast bacilli (TB germs).

Multidrug-resistant TB (MDR-TB) and extensively-drug-resistant tuberculosis (XDR-TB) have become more common and are highly infectious (Bu et al., 2023). Treatment of drug-resistant TB is much more difficult than normal tuberculosis, requiring more antibiotics, and for long periods, up to 2 years and beyond—although recent advancements in shorter all-oral regimens are being used (Dookie et al., 2022).

A person who is HIV-positive people is much more likely to develop active tuberculosis (which speeds the development of AIDS) than people with a healthy immune system (Tian et al., 2024).

The following table illustrates the recent evolution in treatment approaches for drug-resistant tuberculosis.

| Comparison of Treatment Regimens (Dookie et al., 2022) | | |
|---|---|---|
| Regimen Type | Duration | Key Agents |
| Traditional Regimens | 18 to 24 month | Second-line injectables and fluoroquinolones |
| Novel Short-Course Regimens | 6 to 9 months | Bedaquiline, Pretomanid, Linezolid, and Moxifloxacin (BPaL/BPaLM) |

## 2.12 Hand Hygiene

The chain of infection makes it clear why hand hygiene is critical. For generations, handwashing with soap and water has been the standard measure of personal hygiene. The concept of cleansing hands with an antiseptic agent probably emerged in the early nineteenth century. The term *hand hygiene* now includes both the use of an alcohol-based hand rub and washing with soap and water.

Current guidelines have brought a major change in hand hygiene practices. While washing with soap and water is still required in some situations, the use of an alcohol-based hand rub is now preferred for routine use (von Auer et al., 2024).

Despite the simplicity and effectiveness of hand hygiene in preventing the spread of infectious disease, adherence to hand hygiene practice remains unacceptably low throughout the world (Silva et al., 2025). Although measuring hand hygiene adherence is not a simple task, recent studies note that adherence varies among professional categories of healthcare workers and between hospital departments but is usually estimated as less than 60% (Silva et al., 2025).

Observed and self-reported factors that influence adherence to hand hygiene practices include heavy workloads, lack of time, infrastructural deficits, and discrepancies between a worker's knowledge and actual practice (von Auer et al., 2024; Silva et al., 2025).

My 5 Moments for Hand Hygiene

It takes just 5 moments to change the world. Clean your hands, stop the spread of drug-resistant germs!

1. Before touching a patient.
2. Before a clean/aseptic procedure.
3. After body fluid risk exposure.
4. After touching a patient.
5. After touching patient surroundings.

## 2.12.1 Choosing Alcohol Sanitizer or Soap and Water

If you can see dirt on your hands—whether from blood, body fluid, or other visible soiling— wash your hands with soap and water, which physically removes the dirt from your hands. Washing with soap and water does not kill germs.

Alcohol hand rubs do kill most germs including viruses, but they do not remove dirt and debris from your hands. If you use alcohol, choose a hand hygiene product that contains alcohol; plain alcohol should not be used because it evaporates too quickly to provide enough contact time to kill germs.

## 2.12.2 How To Do Hand Hygiene Correctly

- If using soap, wet your hands first to minimize skin irritation.
- Use friction on all surfaces to loosen dirt and germs.
- Scrub for at least 15 seconds (Row, Row, Row Your Boat, twice).
- Use a comfortable water temperature; water hot enough to kill germs would injure your skin.
- Use alcohol hand rubs on dry skin only.
- Use one measured amount of alcohol sanitizer and rub until hands are completely dry; do not wipe off with a paper towel.

CDC recommends cleaning hands in a specific way to avoid getting sick and spreading germs to others. The recommendations for effective handwashing and use of hand sanitizer were developed based on data from a number of studies. Source: CDC

For routine hand hygiene, alcohol products are preferred. They are better than soap and water because:

- they kill germs
- they leave skin in better condition
- they are quicker and easier, so are used more frequently

When dealing with diarrhea that may be infectious, use soap and water. Both *Clostridium difficile* and norovirus cause diarrhea and neither is effectively killed by alcohol-based hand rubs.

Because alcohol products are effective antimicrobial agents, antimicrobial soap is not recommended for routine hand hygiene. Antimicrobial soaps are often more irritating to the skin, are more expensive, and tend to build up in the environment. *"Plain" soap removes germs from the hands as well as an antimicrobial product.*

## 2.13 Safe Injection Practices: Protecting Patients

Needles, cannulas, and syringes are sterile, single-use items—any use will result in these items being contaminated. They are contaminated once they are used to enter or connect to any component of a patient's intravenous infusion set, and under no circumstances should they be reused across different patients or injection steps (CDC, 2024 March 26).

After use, immediately dispose of all needles and syringes as a single unit into a leak-proof, puncture-resistant, closable container located as close as feasible to the point of care (OSHA, 2021).

## 2.14 Key Safety and Disposal Protocols

The following safety and compliance measures are essential to protect staff and maintain a secure workplace:

- Engineering controls: implement and utilize safer medical devices (such as retractable needles or needleless IV connectors) whenever possible to eliminate or minimize the risk of sharps injuries (OSHA, 2021).
- Immediate disposal: discard contaminated sharps immediately after use. Do not recap, bend, or break needles unless absolutely necessary, and if unavoidable, use a safe one-handed scoop technique).
- Policy review: develop, implement, and routinely review exposure control policies and procedures in accordance with regulatory standards to ensure staff compliance and up-to-date training (OSHA, 2021).

## 2.15 Medications and Solutions

A pathogen can be indirectly transmitted through contaminated medications and injection equipment. For this reason, medications and solutions must be properly handled whether they are single or multidose. To prevent cross contamination, preparation and disposal of medications should be handled in designated areas away from patient care spaces and soiled equipment (CDC, 2024 March 26).

The reuse of needles or syringes and the misuse of medication vials are serious threats to public health. Healthcare providers should never reuse a needle or syringe, either from one patient to another or to withdraw medicine from a vial. Both the needle and the syringe must be discarded once they have been used. It is not safe to change the needle and reuse the syringe—reuse of needles or syringes to access medication can result in contamination of the medicine with infectious material that can be spread to others when the medicine is used again (Park et al., 2024).

### 2.15.1 Medication Safety: Single-Use Vials

A single-use vial is a bottle of liquid medication that is given to a patient through a needle and syringe. Single-use vials contain only one dose of medication and should only be used once for one patient, using a clean needle and clean syringe. Use single-dose vials for parenteral medications whenever possible. Do not administer medications from single-use vials or ampoules to multiple patients or combine leftover contents for later use. Because these vials typically lack antimicrobial preservatives, reusing or combining their contents poses a significant risk of microbial contamination and severe infection (CDC, 2024 March 26).

### 2.15.2 Multi-Dose Vials

A multi-dose vial is a small, sealed container holding more than one dose of medication, vaccine, or fluid. The advantages of multi-dose vials include being able to adjust dosage of medication easily, less waste of left-over medication, cost savings in packaging, and ease of use. For the medication to remain sterile and safe for use between patients, a new sterile needle and syringe must be used every time the vial is entered.

Improper handling or storage of multi-dose vials, or the reuse of syringes and needles, is strongly associated with bacterial contamination and the spread of multidrug-resistant pathogens in clinical environments.

To prevent these sorts of breaches, minimize the use of multi-dose vials whenever possible. If multi-dose vials must be used, always use aseptic technique. Use a new needle or cannula and a new syringe to access the multi-dose vial. Do not keep the vials in the immediate patient treatment area. Do not use bags or bottles of IV solution as a common source of medication or fluid for multiple patients. Use infusion sets (i.e., intravenous bags, tubing, and connectors) for one patient only and dispose appropriately after use.

### 2.15.3 Aseptic Technique

Aseptic technique involves the handling, preparation, and storage of medications in a manner that prevents microbial contamination. It also applies to the handling of all supplies used for injections and infusions, including syringes, needles, and IV tubing. To avoid contamination, medications should be drawn in a clean medication preparation area.

Any item that may have encountered blood or bodily fluids should be kept separate from medications. Incorrect practices that have resulted in transmission of hepatitis C or hepatitis B virus include using:

- the same syringe to administer medication to more than one patient, even if the needle was changed
- the same medication vial for more than one patient and accessing the vial with a syringe that has already been used to administer medication to a patient
- a common bag of saline or other IV fluid for more than one patient, and accessing the bag with a syringe that has already been used to flush a patient's catheter

In addition to strictly adhering to aseptic technique, ensure that all staff perform proper hand hygiene before and after gloving, between patients, and whenever hands are soiled. Avoid cross contamination with soiled gloves. Provide adequate soap and water, disposable paper towels, and waterless alcohol-based hand rubs throughout all medical facilities.

## 2.16 Preventing Disease Transmission

Safe injection practices are designed to prevent disease transmission from patient to patient and healthcare worker to patient. The absence of visible blood or signs of contamination in a used syringe, IV tubing, multi-dose medication vial, or blood glucose monitoring device does not mean the item is free from potentially infectious agents.

Bacteria and other microbes can be present without clouding or other visible evidence of contamination. All used injection supplies and materials are potentially contaminated and should be discarded.

Many cases reported to the CDC in which a bloodborne pathogen was transmitted because of improper injection practices have common themes and findings. Often aseptic technique and Standard Precautions were not carefully followed. In many cases infection control programs were lacking or responsibilities were unclear.

Lack of recognition of an IC breach led to prolonged transmission and a growing number of infected patients. In all cases, investigations were time-consuming and costly and required the notification, testing, and counseling or hundreds and sometimes thousands of patients.

To ensure safe injection practices, providers should use aseptic technique throughout all aspects of injection preparation and administration. Medications should be drawn up in a designated "clean" medication area that is not adjacent to areas where potentially contaminated items are placed. In addition:

- Use a new sterile syringe and needle to draw up medications for each patient. Prevent contact between the injection materials and the non-sterile environment.
- Practice proper hand hygiene before handling medications.
- Disinfect the rubber septum of a medication vial with alcohol prior to piercing.
- Discard medication vials upon expiration or any time there are concerns regarding the sterility of the medication.

Never leave a needle or other device inserted into a medication vial septum, IV bag, or bottle for multiple uses. This provides a direct route for microorganisms to enter the vial and contaminate the fluid. Medications should never be administered from the same syringe to more than one patient, even if the needle is changed. Never use the same syringe or needle to administer IV medications to more than one patient, even if the medication is administered into the IV tubing, regardless of the distance from the IV insertion site.

Keep in mind that all the infusion components from the infusate to the patient's catheter are a single interconnected unit. All the components are directly or indirectly exposed to the patient's blood and 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 nonpatient-specific multi-dose vial. Separation from the patient's IV by distance, gravity, or positive infusion pressure does not ensure that small amounts of blood are not present in these items.

Dedicate vials of medication to a single patient. Never enter a vial with a syringe or needle that has been used for a patient if the same medication vial might be used for another patient. Medications packaged as single use must never be used for more than one patient. Never combine leftover contents for later use. Medications packaged as multi-use should be assigned to a single patient whenever possible. Never use bags or bottles of IV solution as a common source of supply for more than one patient.

CDC strictly mandates that capillary blood sampling devices be restricted to individual patients to prevent the spread of infectious agents, such as hepatitis B and hepatitis C.

Peripheral capillary blood monitoring devices packaged for single-patient use should never be used on more than one person, even if the lancet is changed. In facilities where assisted monitoring of blood glucose is performed, use single-use, auto-disabling fingerstick devices.

If reusable lancing devices are used, they must be assigned to an individual patient, clearly labeled, and stored in a manner that prevents cross contamination and inadvertent use for the wrong patient. Treat them as personal care items (e.g., toothbrushes or razors).

Never reuse lancets. Dispose of them at the point of use in an approved sharps container. Evaluate and select safer devices to prevent sharps injuries. Choose single-use lancets that permanently retract upon puncture to protect both the patient and the healthcare provider.

Whenever possible, assign blood glucose meters to a specific individual and do not share them. If blood glucose meters must be shared among patients, the device must be thoroughly cleaned and disinfected after every use per the manufacturer's instructions. If the manufacturer does not specify cleaning instructions, the device must not be shared.

To protect healthcare personnel from percutaneous (needlestick) injuries, safer medical devices should be evaluated and integrated whenever possible. The CDC, FDA, and OSHA strongly encourage healthcare professionals to use blunt-tip suture needles as an alternative to standard suture needles when suturing fascia and muscle to decrease the risk of needlestick injury and exposure to bloodborne pathogens.

Suture needle injuries account for over half of all percutaneous injuries in surgical settings. Using blunt-tip needles significantly decreases this risk while maintaining clinical integrity and safety. Under OSHA's Bloodborne Pathogens Standard, employers must evaluate the use of blunt-tip suture needles as an engineering control to protect staff.

# 3. Element III: Engineering and Work Practice Controls

*The use of engineering and work practice controls to reduce the opportunity for patient and healthcare worker exposure to potentially infectious material should be standard practice in all healthcare settings, not only in hospitals. Facilities are required to address and manage high-risk practices and procedures capable of causing healthcare-acquired infections (HAIs) from bloodborne pathogens.*

[The information in this section is taken from the OSHA Bloodborne Pathogens Standard, 1910.1030.]

Engineering and work practice controls are intended to eliminate or minimize employee exposure. They must be examined and maintained or replaced on a regular schedule to ensure their effectiveness.

Engineering controls usually involve an object, such as sharps disposal containers, splash guards, self-sheathing needles, and safer medical devices that can isolate or remove the hazard from the workplace.

Work practice controls reduce the likelihood of exposure by altering the way a task is performed (e.g., prohibiting recapping of needles by a two-handed technique). Work practice controls tell how to do the job safely and should be described in written procedures.

Engineering and work practice controls are designed to reduce risk of percutaneous, mucous membrane/non-intact skin or parenteral exposures. Percutaneous (through the skin) exposures can occur during handling, disassembly, disposal, and reprocessing of contaminated needles and other sharp objects, or via human bites, cuts, and abrasions.

Activities that risk percutaneous exposures include manipulating contaminated needles and other sharp objects by hand, removing scalpel blades from holders, and removing needles from syringes.

Percutaneous exposures can also occur when performing procedures where there is poor visualization—such as blind suturing, non-dominant hand positioned opposed or next to a sharp and performing procedures where bone spicules or metal fragments are produced.

Mucous membrane/non-intact skin exposures occur when there is direct blood or body fluids contact with the eyes, nose, mouth, or other mucous membranes. This can occur via contact with contaminated hands, contact with open skin lesions/dermatitis, and from splashes or sprays of blood or body fluids (e.g., during irrigation or suctioning).

Parenteral refers to a route of transmission or administration that involves piercing mucous membranes or the skin barrier through such events as needlesticks, human bites, cuts, and abrasions. A parenteral exposure occurs because of injection with infectious material, which can occur during administration of parenteral medication, sharing of blood monitoring devices such as glucometers, hemoglobinometers, lancets, and lancet platforms/pens, and infusion of contaminated blood products or fluids.

# 3.1 Sharps Safety: Protecting Healthcare Workers

Approximately 385,000 sharps and needlestick injuries occur among the U.S. healthcare workforce each year, with nurses and physicians bearing the greatest burden of injury. Despite decades of regulation, these incidents are often underreported, creating potentially dangerous working environments (Krainev et al., 2025).


Neither portion of the injectable device may be reused under any circumstances. Source: CDC.

Nurses are particularly at risk, as they sustain the greatest number of needlestick injuries. Studies have shown that as many as one-third of all sharps injuries in the hospital setting occur during sharps disposal. Common needle types involved include hypodermic needles (32%), suture needles (19%), winged steel needles (12%), IV catheter stylets (6%), and phlebotomy needles (3%) (OSHA, 2024).

Delaying or improperly disposing of sharps, leaving contaminated needles or sharp objects on counters or workspaces, or disposing of sharps in non-puncture-resistant receptacles can lead to sharps injuries. Recapping contaminated needles and other sharp objects using a two- handed technique is a common cause of injury.

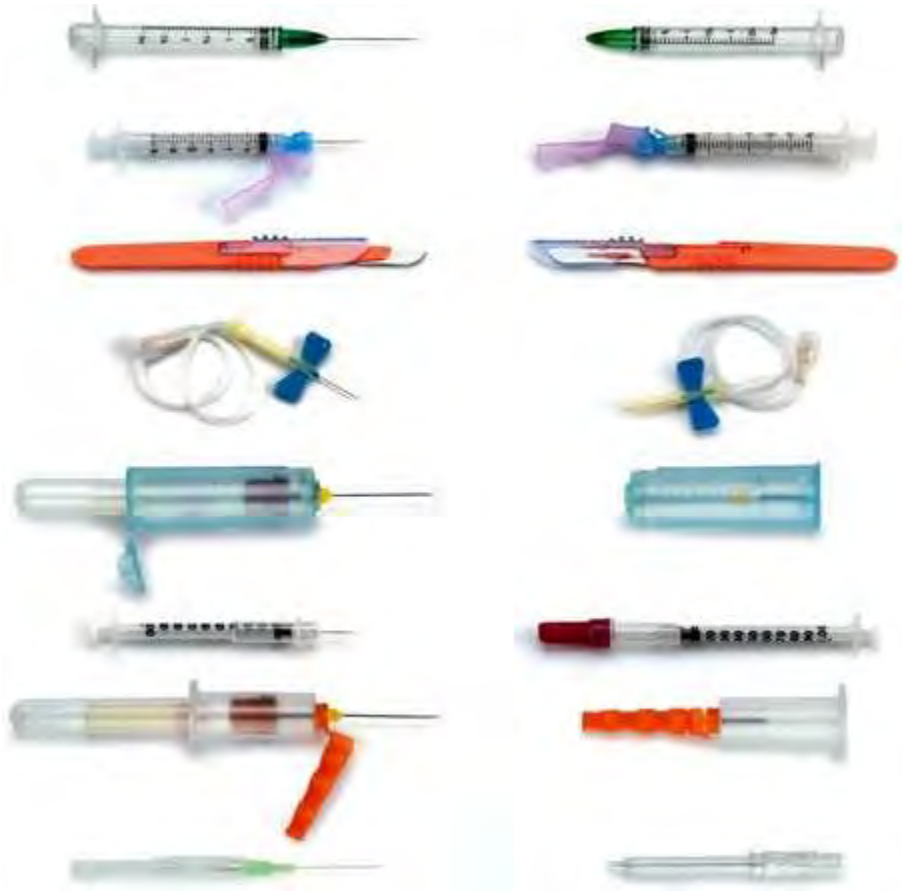
Although hospitals account for the largest number of reported sharps injuries, they occur in other healthcare settings:

- clinical labs
- dental settings
- prehospital / EMS
- home health
- housekeeping, laundry, and waste management
- long-term care / nursing homes
- medical and nursing students

Data from the International Safety Center (ISC) reveals that needlestick injuries have not decreased over the past five years. Through the ISC's EPINet system, which collects data from 40 U.S. healthcare facilities, the number of needlestick injuries has remained alarmingly consistent through and beyond the COVID-19 pandemic (Umandap et al., 2024).

There has been an increased focus on removing or minimizing sharps hazards in healthcare settings through the development and use of engineering controls and safe work practices (Garus-Pakowska et al., 2022). Safety-engineered devices are designed with features such as shields, mechanisms that automatically retract, or blunt-tip features to isolate the hazard from the workplace (Serafin et al., 2023).

Sharps with Safety Features Exposed (left) and Covered (right)



Source: CDC.

A comprehensive sharps injury prevention program includes measures to handle needles and other sharp devices in a manner that will prevent injury to the user and to others who may encounter the device during or after a procedure. Key elements include:

- safe disposal of used sharp instruments in an approved, puncture-resistant sharps container
- safer medical devices that feature safety protections to prevent percutaneous injuries
- involvement of frontline, non-managerial healthcare personnel in the selection and evaluation of safer devices (Garus-Pakowska et al., 2022)

## 3.2 Work Practice Controls

The following safety protocols reflect current, evidence-based practices regarding the handling of contaminated sharps and Other Potentially Infectious Materials (OPIM).

### 3.2.1 Sharps Handling and Disposal

Prohibition of manual manipulation: Contaminated needles and other contaminated sharps must not be bent, recapped, or removed unless the employer demonstrates that there is no alternative or that the action is required by a specific medical procedure.

Safety techniques: Manipulation must be accomplished using a mechanical device or a one-handed "scoop" technique to prevent needlestick injuries.

Shearing and breaking: Shearing or breaking of contaminated needles is strictly prohibited.

As soon as possible after use, contaminated reusable sharps must be placed in appropriate containers until properly reprocessed. These containers must be:

- puncture-resistant
- labeled or color-coded in accordance with OSHA standards
- leakproof on the sides and bottom
- maintained in accordance with OSHA requirements for reusable sharps


Examples of FDA-cleared sharps disposal containers made from rigid plastic and marked with a line that indicates when the container should be considered full, which means it's time to dispose of the container. Source: FDA, 2021, April 28

## 3.2.2 Work Area Restrictions and Hygiene

Eating, drinking, smoking, applying cosmetics or lip balm, and handling contact lenses are strictly prohibited in work areas where there is a reasonable likelihood of occupational exposure to blood or OPIM. Food and drink must not be stored in refrigerators, freezers, shelves, cabinets, or on countertops/bench tops where blood or OPIM are present.

Facilities may designate specific, hazard-free zones (kept clear of body fluids, specimens, and gloves) where beverages are permitted.

## 3.2.3 Procedure and Specimen Protocols

All procedures involving blood or OPIM must be performed in such a manner as to minimize splashing, spraying, spattering, and the generation of droplets. Mouth pipetting or suctioning of blood or OPIM is prohibited.

Specimens of blood or OPIM must be placed in a container that prevents leakage during collection, handling, processing, storage, transport, or shipping. The container must be labeled or color-coded according to OSHA guidelines.

When a facility utilizes Standard Precautions in the handling of all specimens, the labeling or color-coding of specimens is not necessary, provided the containers are recognizable as containing specimens. Labeling or color-coding is required when such specimens or containers leave the facility.

General Practices for the Workplace

- Use proper hand hygiene.
- Use proper procedures for cleaning of blood and bodily fluid spills.
- Practice proper handling and disposal of blood and bodily fluids.
- Select, don, doff, and dispose of PPE as trained.
- Protect work surfaces in direct proximity to patient procedure treatment areas.
- Prevent percutaneous exposures by avoiding unnecessary use of needles and other sharp objects.
- Use care in the handling and disposing of needles and other sharp objects.

## 3.3 Evaluation/Surveillance of Exposure Incidents

Employers must identify those at risk for exposure and what devices cause exposure. All sharp devices can cause injury and disease transmission if not used and disposed of properly. For example, hollow-bore needles have a higher disease transmission risk, while butterfly-type IV catheters, devices with recoil action, and blood glucose monitoring devices (lancet platforms/pens) have a higher injury rate.

# 4. Element IV: Personal Protective Equipment

*Selection and use of barriers and/or personal protective equipment (PPE) for preventing patient and healthcare worker contact with potentially infectious material.*

Personal protective equipment (PPE) includes barriers such as gloves, gowns, masks, goggles, and face shields. They protect patients and workers from exposure to bloodborne pathogens on the job. Use of PPE is part of Standard Precautions, used with all patients, and is required by OSHA.

Under OSHA's General Duty Clause, PPE is also required for any potential infectious disease exposure. Employers must provide their employees with appropriate PPE and ensure their proper disposal. If reusable, it must be properly cleaned or laundered, repaired, and stored after use.

## 4.1 Selecting PPE

Selection of PPE—particularly the combination of more than one type of protective equipment—is determined by the category of the patient's isolation precautions and the type of anticipated exposure. Touch, splashes or sprays, or large volumes of blood or bodily fluids can penetrate protective clothing. Anticipated exposure affects whether PPE needs to be fluid resistant, fluid proof, or neither. When selecting protective equipment, consider its durability and appropriateness for the task.

Procedures that generate splashes or sprays of blood, body fluids, secretions, or excretions—such as open endotracheal suctioning, bronchoscopy, invasive vascular procedures— require either a face shield (disposable or reusable) or mask and goggles. The wearing of masks, eye protection, and face shields in specified circumstances when blood or bodily fluid exposures are likely to occur is mandated by the OSHA Bloodborne Pathogens Standard.

## 4.2 Types of PPE/Barriers

In addition to the familiar gloves and gowns, PPE includes a variety of barriers and respirators used alone or in combination to protect skin, mucous membranes, and airways from contact with infectious agents. The selection of PPE is based on the nature of the patient interaction and the likely mode of transmission.

### 4.2.1 Gloves

Wear gloves when contact with blood, body fluid, mucous membranes or non-intact skin is anticipated, when performing vascular access procedures, and for contact with contaminated items or surfaces. Gloves used in the healthcare setting are subject to FDA evaluation and clearance. Nonsterile disposable medical gloves made of latex or nitrile should be available for routine patient care.

Always change gloves between patients!

Always do hand hygiene following removal of gloves, in case of unsuspected holes in the gloves or contamination of the hands during glove removal.

In the non-surgical setting, the selection of glove type is based on the task to be performed, anticipated contact with chemicals and chemotherapeutic agents, latex sensitivity, sizing, and facility policies for creating a latex-free environment. For contact with blood and body fluids, a single pair of gloves generally provides adequate barrier protection.

There is considerable variability among gloves. Both the quality of the manufacturing process and type of material influence their effectiveness. While there is little difference in the barrier properties of unused intact gloves, studies have repeatedly shown that vinyl gloves have higher failure rates than latex or nitrile gloves when tested under simulated and actual clinical conditions.

For this reason, either latex or nitrile gloves are preferable for clinical procedures that require manual dexterity or will involve more than brief patient contact. Reusable utility gloves are indicated for non-patient-care activities, such as handling or cleaning contaminated equipment or surfaces.

During patient care, transmission of infectious organisms can be reduced by adhering to the principles of working from "clean" to "dirty," and confining or limiting contamination to surfaces that are directly needed for patient care. It may be necessary to change gloves during the care of a single patient to prevent cross contamination of body sites. It also may be necessary to change gloves if the patient interaction involves touching portable computer keyboards or other mobile equipment that is transported from room to room.

Gloves must be changed between patients to prevent transmission of infectious material. They should never be washed and reused because microorganisms cannot be removed reliably from glove surfaces and continued glove integrity cannot be ensured. Glove reuse has been associated with transmission of MRSA and gram-negative bacilli.

When gloves are worn in combination with other PPE, put them on last. Gloves that fit snugly around the wrist are preferred for use with an isolation gown because they can cover the gown cuff and provide a more reliable continuous barrier for the arms, wrists, and hands. Gloves that are removed properly will prevent hand contamination. Hand hygiene following glove removal further ensures that the hands will not carry potentially infectious material that might have penetrated through unrecognized tears or that could contaminate the hands during glove removal.

### 4.2.2 Cover Garb: Gowns and Lab Coats

Wear a gown or fluid-resistant lab coat whenever soiling of skin or clothing is anticipated. Gowns are intended to protect your arms and exposed body areas and prevent contamination of clothing with blood, body fluids, and OPIM. The type of gown is chosen based on the nature of the patient interaction, including the anticipated degree of contact with infectious material and potential for blood and bodily fluid penetration of the barrier. Clinical and laboratory coats or jackets worn over personal clothing for comfort or purposes of identity are not considered PPE.

Gowns are always worn in combination with gloves, and with other PPE when indicated. Gowns are usually the first piece of PPE to be donned. Full coverage of the arms and body front, from neck to the mid-thigh or below, will ensure that clothing and exposed upper body areas are protected. Several gown sizes should be available in a healthcare facility to ensure appropriate coverage for staff members.

Gowns should be removed before leaving the patient care area to prevent possible contamination of the environment outside the patient's room. Gowns should be removed in a manner that prevents contamination of clothing or skin. The outer, "contaminated" side of the gown is turned inward and rolled into a bundle and then discarded into a designated container to contain contamination. Do not reuse gowns.

### 4.2.3 Masks

Masks by themselves are used for three primary purposes in healthcare settings: (1) to protect workers from contact with infectious material from patients, (2) to protect patients from exposure to infectious agents carried in the workers' mouths or noses when they are engaged in procedures requiring sterile technique, and (3) to put on coughing patients, to limit potential dissemination of infectious respiratory secretions from the patient to others.

A mask can be worn without eye protection, but eye protection must be worn with a mask. Masks should not be confused with respirators that are used to prevent inhalation of small particles that may contain infectious agents transmitted via the airborne route.

When airborne precautions are used, a respirator is required. It can be an N-95 respirator, which requires fit testing, or a positive air-purifying respirator (PAPR), which does not require fit testing. (These are discussed in Element II, in the section on tuberculosis.)

There are many types of disposable particulate respirators, also known as air-purifying respirators, because they protect by filtering particles out of the air as you breathe. These respirators protect only against particles—not gases or vapors. Since airborne biologic agents such as bacteria or viruses are particles, they can be filtered by particulate respirators.

An N-95 respirator is an example of a particulate respirator; it must be fit-tested as required by OSHA to verify a good seal. Facial hair may interfere with a good seal, requiring use of a positive-pressure respirator that does not require a seal.

An N95 Mask
Note the N-95 identifier in horizontal box at the bottom of the text. Source: 3M

### 4.2.4 Face Shields and Goggles

Masks in combination with eye protection devices, such as goggles or glasses with solid side shields, or chin-length face shields, shall be worn whenever splashes, spatter, or droplets of blood or OPIM may be generated and eye, nose, or mouth contamination can be reasonably anticipated (OSHA).

The eye protection chosen for specific work situations—for example, goggles or face shield—depends upon the circumstances of exposure, other PPE used, and personal vision needs. Personal eyeglasses and contact lenses are not considered adequate eye protection. Eye protection must be comfortable, allow for sufficient peripheral vision, and be adjustable to ensure a secure fit.

Indirectly vented goggles with a manufacturer's anti-fog coating may provide the most reliable practical eye protection from splashes, sprays, and respiratory droplets from multiple angles. Newer styles of goggles may provide better indirect airflow properties to reduce fogging, as well as better peripheral vision and more size options for fitting goggles to various workers (see below). Many styles of goggles fit adequately over prescription glasses with minimal gaps. While effective as eye protection, goggles do not provide splash or spray protection to other parts of the face.

As compared with goggles, a face shield can provide protection to other facial areas in addition to the eyes. Face shields extending from chin to forehead provide better face and eye protection from splashes and sprays; face shields that wrap around the sides may reduce splashes around the edge of the shield.

Removal of a face shield, goggles and mask can be performed safely after gloves have been removed and hand hygiene performed. The ties, earpieces, and/or headband used to secure the equipment to the head are considered "clean" and therefore safe to touch with bare hands. The front of a mask, goggles, or face shield is considered contaminated.

### 4.2.5 Application of PPE

Personal protective equipment must fit the individual user, and it is up to the employer to ensure that all PPE are available in sizes appropriate for the workforce to be protected.

Gloves should fit the user's hands comfortably; they should not be too loose or too tight. They also should not tear or be easily damaged. If contamination of the arms can be anticipated, a gown should be selected. Gowns should fully cover the torso, fit comfortably over the body, and have long sleeves that fit snuggly at the wrist.

Masks should fit snuggly and fully cover the nose and mouth to prevent fluid penetration. For this reason, masks that have a flexible nose piece and can be secured to the head with string ties or elastic are preferable. Goggles provide barrier protection for the eyes and should fit snuggly over and around the eyes or personal prescription lenses. Personal prescription lenses do not provide optimal eye protection and should not be used as a substitute for goggles. Goggles with prescription lenses are available.

Before you use a respirator, your employer is required to have you medically evaluated to determine that it is safe for you to wear a respirator, to fit test you for the appropriate respirator size and type, and to train you on how and when to use a respirator. You are responsible for fit checking your respirator before every use to make sure it has a proper seal.

In addition to providing employees with appropriate PPE, employers are responsible for its proper disposal. If protective equipment is reusable, it must be properly cleaned or laundered, repaired, and stored after use. Many types of PPE, such as latex gloves and disposable gowns, are used once and then discarded in an appropriate receptacle.

Other types of PPE, such as cloth gowns or reusable heavy-duty latex or nitrile gloves, can be cleaned and reused. If goggles or face shields are reusable, they must be placed in a designated receptacle for subsequent reprocessing. If they are not reusable, they may be discarded in a waste receptacle.

PPE is a potential source of cross-contamination if not changed between patients. To avoid cross contamination:

- Don PPE before contact with the patient, generally before entering the room.
- Use carefully—don't spread contamination. Avoid touching the environment with soiled gloves.
- Remove and discard carefully, either at the doorway or immediately outside the patient room.
- Remove respirator outside the room.

Immediately perform hand hygiene.

The use of personal protective equipment is not a substitute for safe work practices. Avoid contaminating yourself by keeping your hands away from your face and not touching or adjusting PPE. Also, remove your gloves if they become torn and perform hand hygiene before putting on a new pair of gloves. Avoid spreading contamination by limiting surfaces and items touched with contaminated gloves.

## Factors Influencing Compliance

Despite the emphasis given to the proper use of PPE, inconsistent use among healthcare workers continues to be a challenge. Many studies have reported low compliance with the use of PPE use among healthcare workers, with compliance varying from individual to individual (George et al., 2023).

Studies carried out to identify factors affecting use of PPE during respiratory outbreaks suggested that compliance is influenced by an understanding of the guidelines, support received from managers, communication about guidelines, sufficient resources, the perceived value of following guidance, the comfort of personal protective equipment, and availability of resources. Poor compliance, improper use of PPE, and reuse of PPE were associated with an increased risk of infection among frontline healthcare workers during the COVID-19 pandemic (George et al., 2023).

# 5. Element V: Cleaning, Disinfection, and Sterilization

*Creation and maintenance of a safe environment for patient care in all healthcare settings through application of infection control principles and practices for cleaning, disinfection, and sterilization. (updated guideline)*

Application of accepted infection control principles helps maintain a safe environment for both patients and healthcare workers. This includes proper use of Standard Precautions and an understanding and ability to apply proper techniques for cleaning, disinfection, sterilization, and reprocessing of medical equipment.

Microorganisms are abundant in moist, organic environments; however, many significant pathogens can persist and remain viable on dry, inanimate surfaces (fomites) for extended periods. Contaminated environmental surfaces serve as reservoirs and are associated with the transmission of healthcare-associated infections—especially multi-drug -resistant and highly transmissible organisms such as *C. diff*, norovirus, and MRSA.

The transfer of microorganisms from an environmental surface to a patient or healthcare worker occurs predominantly via direct or indirect hand contact. Because of this dynamic, addressing both human vectors and environmental reservoirs is essential to breaking the chain of infection.

While strict adherence to hand hygiene is critical, it is most effective when paired with comprehensive environmental control practices. Cleaning and disinfecting environmental surfaces, particularly high-touch surfaces in patient-care areas, is fundamental in reducing the facility's microbial burden and lowering the incidence of HAIs.

## 5.1 Environmental Cleaning

All work areas must be maintained in a clean and sanitary condition. The employer is required to determine and implement a written schedule for cleaning and disinfection based on the location within the facility, type of surface to be cleaned, type of soil present, and tasks or procedures being performed.

All equipment, environmental, and working surfaces must be properly cleaned and disinfected after contact with blood or OPIM. Contaminated broken glassware must be removed using mechanical means, like a brush and dustpan or vacuum cleaner.

Chemical germicides and disinfectants must be used to decontaminate environmental surfaces. Consult the Environmental Protection Agency (EPA) lists of registered sterilants, tuberculocidal disinfectants, and antimicrobials with HIV/HBV efficacy claims to ensure that the disinfectant is appropriate.

## 5.2 Laundry

Contaminated laundry is laundry that has been soiled with blood or other potentially infectious materials or may contain sharps. Contaminated textiles and fabrics often contain high numbers of microorganisms from body substances, including blood, skin, stool, urine, vomitus, and other body tissues and fluids.

Disease transmission attributed to healthcare laundry involves contaminated fabrics that are handled inappropriately (e.g., the shaking of soiled linens). Bacteria, viruses, fungi, and ectoparasites such as scabies can be transmitted from contaminated textiles and fabrics to workers either via direct contact or via aerosols of contaminated lint generated from sorting and handling contaminated textiles.

Fabrics, textiles, and clothing used in healthcare settings are disinfected during laundering and generally rendered free of vegetative pathogens (hygienically clean), *but they are not sterile.* The antimicrobial action of the laundering process results from a combination of mechanical, thermal, and chemical factors.

Dilution and agitation in water remove substantial quantities of microorganisms. Soaps and detergents function to suspend soils and exhibit some microbicidal properties. Hot water provides an effective means of destroying microorganisms. Chlorine bleach is an economical, broad-spectrum chemical germicide that enhances the effectiveness of the laundering process.

Laundry that is or may be soiled with blood or OPIM, or may contain contaminated sharps, must be treated as though contaminated. Contaminated laundry must be bagged at the location where it was used and should not be sorted or rinsed in patient-care areas. It must be placed and transported in bags that are labeled or color-coded.

Laundry workers must wear protective gloves and other appropriate personal protective clothing when handling potentially contaminated laundry. All contaminated laundry must be cleaned or laundered so that any infectious agents are destroyed.

## 5.3 Appropriate Ventilation

Engineering controls to contain or prevent the spread of airborne contaminants center on local exhaust ventilation, general ventilation, and air cleaning. General ventilation encompasses: (a) dilution and removal of contaminants via well-mixed air distribution of filtered air; (b) directing contaminants toward exhaust registers and grilles via uniform, non-mixed airflow patterns; (c) pressurization of individual spaces relative to other spaces; and (d) pressurization of buildings relative to the outdoors and other attached buildings.

## 5.4 Waste Management

The most practical approach to medical waste management is to identify wastes that represent a sufficient potential risk of causing infection during handling and disposal and for which some precautions are likely prudent.

Although any item that has had contact with blood, exudates, or secretions may carry pathogens, treating all such waste as infective is neither practical nor necessary. Federal, state, and local guidelines and regulations specify the categories of medical waste that are subject to regulation and outline the requirements associated with treatment and disposal. The categorization of these wastes has generated the term *regulated medical waste*, which is defined as any of the following:

- liquid or semi-liquid blood or other potentially infectious materials (OPIM)
- contaminated items that would release blood or OPIM in a liquid or semi-liquid state, if compressed
- items that are caked with dried blood or OPIM and can release these materials during handling
- contaminated sharps
- pathologic and microbiologic wastes that contain blood or OPIM

Medical wastes require careful disposal and containment before collection and consolidation for treatment. Measures for discarding regulated medical-waste items are designed to protect the workers who generate medical wastes and who manage the wastes from point of generation to disposal. A single, red, leak-resistant biohazard bag is usually adequate for containment of regulated medical wastes, provided the bag is sturdy and the waste can be discarded without contaminating the bag's exterior. If the outside of the primary bag is contaminated or punctured, it must be placed into a second biohazard bag. All bags should be securely closed for disposal.

Puncture-resistant containers located at the point of use are used to discard sharps, including needles and syringes, scalpel blades, unused sterile sharps, and discarded slides or tubes with small amounts of blood. To prevent needlestick injuries, needles and other contaminated sharps should not be recapped, purposefully bent, or broken by hand.

Transporting and storing regulated medical wastes within the healthcare facility while awaiting terminal treatment is often necessary. Both federal and state regulations address the safe transport and storage of on- and off-site regulated medical wastes. Healthcare facilities are required to dispose of medical wastes regularly to avoid accumulation.

Medical wastes requiring storage should be kept in labeled, leakproof, puncture-resistant containers under conditions that minimize or prevent foul odors. The storage area should be well ventilated and be inaccessible to pests. Any facility that generates regulated medical wastes should have a regulated medical waste management plan to ensure health and environmental safety as per federal, state, and local regulations.

Regulated medical waste, microbiologic waste such as untreated cultures, stocks, and amplified microbial populations, poses the greatest potential for infectious disease transmission, while sharps pose the greatest risk for injuries.

## 5.5 Sterilization and Disinfection

In the United States, nearly 50 million surgical procedures and even more invasive medical procedures—including more than 5 million gastrointestinal endoscopies—are performed each year (Bicket et al., 2024). Each procedure involves contact by a medical device or surgical instrument with a patient's sterile tissue or mucous membranes.

A major risk of all such procedures is the introduction of pathogens that can lead to infection. Failure to properly disinfect or sterilize equipment carries not only risks associated with the breach of host barriers, but also the potential for person-to-person transmission and the spread of environmental pathogens such as *Pseudomonas aeruginosa* (Josephs-Spaulding & Singh, 2021).

Depending on the intended use, healthcare policies must identify whether cleaning, disinfection, or sterilization is indicated. Instruments and devices are categorized as critical, semi-critical, and non-critical according to their level of tissue or mucous membrane contact and the associated infection risk.

Recent studies have documented a lack of compliance with established guidelines for disinfection and sterilization. This non-compliance and the increasing prevalence of multidrug-resistant (MDR) pathogens have led to numerous outbreaks and healthcare-associated infections (Josephs-Spaulding & Singh, 2021).

*Sterilization* is a comprehensive process used to destroy or eliminate all forms of microbial life—including bacteria, viruses, fungi, and highly resistant bacterial spores—through physical or chemical methods (Al-Otaibi et al., 2025).

*Disinfection* is a process that eliminates on inanimate objects many or all pathogenic microorganisms, except bacterial spores (Rowan et al., 2023). In healthcare settings, objects are usually disinfected using liquid chemicals or wet pasteurization. When selecting a disinfectant, its properties, toxicity, and material compatibility must be considered.

| Levels of Disinfection | |
|---|---|
| High-Level disinfection (HLD) | For cleaning patient-care equipment that meets mucous membranes. |
| Low-Level disinfection (LLD) | For cleaning the hospital environment or items that touch intact skin. |

Products used for sterilization and disinfection must be cleared or licensed by the FDA for their intended purpose. Because all disinfectants are inherently toxic, use the lowest effective level of disinfectant required.

## 5.6 Cleaning and Decontamination

*Cleaning* is done to remove visible contaminants from objects and surfaces. This is usually done manually or mechanically using water with detergents or enzymatic products. Thorough cleaning is essential prior to high-level disinfection and sterilization because remaining organic and inorganic materials can interfere with the effectiveness of these processes (Rowan et al., 2023).

*Decontamination* removes pathogenic microorganisms from objects, so they are safe to handle, process, use, or discard (Rowan et al., 2023).

## 5.7 Medical Device Reprocessing

Healthcare facilities must adhere to the manufacturer's Instructions for the proper cleaning, disinfection, and sterilization of all reusable medical equipment.

Facilities must designate personnel responsible for maintaining and overseeing proper reprocessing procedures. Designated staff members must be thoroughly trained in reprocessing each specific piece of equipment, with documentation verifying competency. Maintaining an accurate log of all equipment reprocessing cycles ensures compliance and traceability.

## 5.7.1 Special Pathogen Procedures

Instruments, medical devices, and equipment must be managed and reprocessed using recommended methods regardless of the patient's diagnosis, except for suspected *prion disease.** Special handling procedures apply to brain, spinal, or nerve tissue from patients with known or suspected prion disease (such as Creutzfeldt-Jakob disease). Consultation with infection control experts is required prior to performing procedures on such patients.

*Prion disease: occur when proteins in the body misfold and cause brain damage and other symptoms.

Industry guidelines as well as equipment and chemical manufacturer recommendations should be used to develop and update reprocessing policies. Written instructions must be readily available for each instrument and device.

## Factors Influencing Contamination Potential

The risk and potential for contamination depend on several key factors:

- type of device or environmental surface
- potential for external or internal contamination
- frequency of hand contact with the device or surface
- potential for contamination with body substances or environmental sources of microorganisms
- level of contamination

## 5.7.2 Reprocessing Steps

Reprocessing of medical equipment involves three sequential steps:

1. Pre-cleaning removes soil, debris, and lubricants from internal and external surfaces and should be done as soon as possible after use.
2. Cleaning can be performed manually (scrubbing with brushes) or mechanically using automated washers. Cleaning solutions must be changed according to the manufacturer's guidelines.
3. Disinfection or sterilization is done once cleaning is completed. The item must be disinfected or sterilized depending on its intended use.

Disinfection requires sufficient contact time with a chemical solution. Sterilization requires sufficient exposure time to heat, chemicals, or gases.

At any point in reprocessing or handling, breaks in infection control practices can compromise the integrity of instruments, medical devices, or equipment. Specific factors include:

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

Differing levels of disinfection and sterilization methods and agents are based on the area of professional practice, setting, and scope of responsibilities. Professionals who practice in settings where handling, cleaning, and reprocessing is performed elsewhere should understand core infection control concepts and principles. A thorough understanding of Standard Precautions, personal protective equipment, and principles of cleaning, disinfection, and sterilization are essential.

Designation and physical separation of patient care areas from cleaning and reprocessing areas is strongly recommended by NYSDOH. Each medical facility must determine appropriate reprocessing practices and select appropriate methods, taking into consideration:

- antimicrobial efficacy
- time constraints and requirements for various methods
- compatibility of equipment and materials
- toxicity
- residual effect (the product's antimicrobial effect when used repeatedly over several days)
- ease of use
- stability (concentration, potency, efficacy of use, and effect of organic material)
- odor
- cost
- monitoring requirements

### 5.7.3 Single Use Devices

A single-use device (SUD) is a device that is intended for one use or on a single patient during a single procedure. Approximately 20% to 30% of U.S. hospitals report that they reuse at least one type of SUD (Hennein et al., 2022).

The reprocessing of certain SUDs is permitted in the United States under the Food, Drug, and Cosmetic Act. Federal regulations require that all reprocessed SUDs be clearly labeled as "reprocessed" and contain the name of the reprocessor (Hennein et al., 2022).

The Food and Drug Administration considers SUD reprocessors to be device "manufacturers," requiring them to comply with the same rigorous regulatory standards as original equipment manufacturers. Reprocessors are also subject to premarket review, and must submit data demonstrating effective cleaning, sterilization, and functional performance to ensure that the reprocessed device is substantially equivalent to the original device (Hennein et al., 2022).

The reuse of SUDs is controversial due to concerns about the potential risks of infection, cross contamination, material fatigue, and device failure. While many healthcare facilities in the United States use reprocessed SUDs for their cost and environmental savings, institutions such as the Department of Veterans Affairs continue to restrict or prohibit their use entirely to eliminate risk to patient safety (Hennein et al., 2022).

# 6. Element VI: Protecting Healthcare Workers

*Prevention and management of infectious or communicable diseases in healthcare workers.*

Approximately 5.6 million healthcare workers are at risk of occupational exposure to bloodborne pathogens and other infectious materials in the United States (Yun et al., 2023). Protecting these workers is a foundational element of a healthcare organization's general program for infection control and prevention.

An *infectious disease* is a clinically manifested disease of humans or animals resulting from an infection. A *communicable disease* is an illness due to a specific infectious agent or its toxic products that arises through transmission of that agent from an infected person, animal, or inanimate source to a susceptible host.

Occupational health strategies, as applied to infection control, are a set of activities intended to assess, prevent, and control infections and communicable diseases in healthcare workers.

Healthcare personnel include paid and unpaid persons working in healthcare settings who have the potential for exposure to infectious materials, including body substances, contaminated medical supplies and equipment, contaminated environmental surfaces, or contaminated air. These personnel include those involved in direct patient care, students and trainees, contractual staff, and personnel not directly involved in patient care but potentially exposed to infectious agents.

Protecting healthcare workers is an integral part of a healthcare organization's general program for infection control and prevention. This includes:

- educating personnel about the principles of infection control
- working with the infection control department to monitor and investigate potentially harmful infectious exposures and outbreaks among personnel
- providing care to personnel for work-related illnesses or exposures
- identifying work-related infection risks
- instituting appropriate preventive measures

Preventing infectious diseases and occupational injuries reduces absenteeism and disability, ensures a safe work environment for all personnel, and decreases the transmission of infectious agents.

## 6.1 Infection Control Training

All licensed healthcare professionals in New York State are required to receive training on infection control and barrier precautions every four years through a NYS- approved provider. Documentation of appropriate training must be maintained both by the course provider and course participant.

All new employees, or employees being transferred into jobs involving potential exposure to blood or OPIM, must receive bloodborne pathogen training before assignment to tasks where an occupational exposure may occur. Retraining is required annually, or when changes in procedures or tasks affecting occupational exposure occur.

Healthcare personnel must be informed of the possible health effects of exposure to infectious agents (such as hepatitis B, hepatitis C, and HIV) and hazardous chemicals (such as ethylene oxide and formaldehyde). Information must be consistent with OSHA requirements, and facilities must identify the specific areas and tasks where potential exposure exists.

### 6.1.1 Infectious Agents

Occupational exposure to bloodborne pathogens is governed by OSHA's Bloodborne Pathogens Standard (29 CFR 1910.1030). Employers must implement safety measures such as universal precautions, make the hepatitis B vaccine available, and offer post-exposure evaluation and follow-up.

#### Personal Protective Equipment (PPE) Training and Protocols

Healthcare workers must receive training in the selection and proper use of personal protective equipment (PPE). Employers must ensure that workers wear appropriate PPE to prevent exposure to infectious agents or chemicals. The employer is responsible for making such equipment and training available at no cost to their employees, in accordance with OSHA's Personal Protective Equipment Standard (29 CFR 1910 Subpart I) and the Bloodborne Pathogens Standard.

### 6.1.2 Occupational Monitoring Programs

Healthcare facilities must establish a program for monitoring occupational exposure to regulated chemicals that adheres to state and federal regulations. This includes initial determination, periodic monitoring, employee notification within 15 days of results, and the maintenance of employee medical and exposure records (29 CFR 1910.1047; 29 CFR 1910.1048).

### 6.1.3 Dermatological Restrictions and Guidelines

Healthcare workers with exudative lesions or weeping dermatitis of the hands must be excluded from direct patient care activities and handling patient care equipment until the condition resolves, minimizing the risk of transmitting infectious materials or exacerbating skin barrier disruption.

## 6.2 Medical Assessments

The NYSDOH Code 405.3 requires that all healthcare workers in New York be medically evaluated prior to employment in hospitals and diagnostic and treatment centers. This evaluation must include:

- a medical history physical exam
- documentation of immunity for measles, mumps, rubella (MMR), varicella, and hepatitis B, as well as current status for tetanus, diphtheria, and pertussis (Tdap)
- baseline (pre-placement) tuberculosis (TB) screening consisting of:
    - Individual risk assessment
    - Symptom evaluation
    - TB testing

Routine annual TB testing is no longer recommended unless there is a known exposure or ongoing transmission. Although universal annual testing has been phased out, the following requirements remain (CDC, 2019):

- All personnel must receive yearly education on TB risk factors, signs/symptoms, and infection control protocols.
- Facilities may still elect to perform testing for personnel in high-risk roles or settings.
- Personnel with untreated latent TB infection should undergo an annual symptom screen to ensure they have not progressed to active disease.

## 6.3 Vaccines

### 6.3.1 Measles, Mumps, and Rubella (MMR)

Current New York State regulations (10 NYCRR Section 405.3) require all healthcare personnel to demonstrate immunity to measles and rubella. While mumps immunity is highly recommended by the CDC and required by many New York facilities to prevent outbreaks, the state's legal mandate focuses primarily on measles and rubella.

For personnel born in *1957 or later*, immunity is established by:

- Documented positive serologic titers for measles, mumps, and rubella. Results labeled as "equivocal" or "indeterminate" must be treated as non-immune.
- Vaccination records:
    - Measles and mumps: Two doses of live virus vaccine, with the first dose administered on or after the first birthday and the second dose at least 28 days later.
    - Rubella: At least one dose of live virus vaccine administered on or after the first birthday.

For personnel born *before 1957*:

- Rubella: Birth before 1957 is not acceptable evidence of immunity in New York. Personnel must have a positive titer or documentation of at least one dose of the rubella vaccine.
- Measles and mumps: While birth before 1957 generally suggests naturally acquired immunity, the CDC and NYSDOH strongly recommend at least one dose of MMR for unvaccinated personnel in this age group who do not have laboratory proof of immunity.
- Outbreak protocol: During a mumps or measles outbreak, healthcare facilities should provide two doses of MMR vaccine to personnel born before 1957 who lack evidence of immunity (CDC, 2024).

### 6.3.2 Hepatitis B Virus (HBV)

Employers must provide the Hepatitis B vaccine series to all employees with occupational exposure risk within 10 days of initial assignment at no cost.

Vaccination and post-vaccination testing include (CDC, 2025, August 29):

- Primary series: HCP should receive the standard three-dose series (0, 1, and 6 months) or the FDA-approved two-dose series (Heplisav-B) administered 1 month apart.
- Serologic testing: Antibody testing (anti-HBs) must be performed 1–2 months after the final dose of the series.
    - Immune: no further testing or boosters are needed
    - Non-responder: the individual should complete a second vaccine series.
- Second series: If the second series fails to produce immunity, the person is a "non-responder. Non-responders must be tested for HBsAg to rule out chronic infection. If negative for HBsAg, they are considered susceptible and must receive Hepatitis B Immune Globulin (HBIG) following any significant exposure.

### 6.3.3 Hepatitis C Virus (HCV)

Hepatitis C management shifted significantly following the 2020 CDC updated guidelines, which remain the standard in 2026. Clinicians should universally screen (CDC, 2025, January 31):

- all adults 18 and older at least once in their lifetime, except in settings where the prevalence of hepatitis C virus (HCV) infection (HCV RNA-positivity) is under 0.1%
- all pregnant women during each pregnancy, except in settings where the prevalence of HCV infection (HCV RNA-positivity) is under 0.1%

Clinicians should use an FDA-approved HCV antibody test followed by an NAT for HCV RNA test when antibody is positive/reactive. Tests include CDC, 2025, January 31):

- HCV antibody test (anti-HCV, e.g., enzyme immunoassay [EIA])
- Nucleic acid test (NAT) to detect presence and levels (quantitative) of HCV RNA.

Follow-up testing is typically performed at 3 to 6 weeks (HCV RNA) or 4 to 6 months (anti-HCV) to detect early infection, as modern antiviral treatments are highly effective when started early).

There is no vaccine or effective immunoglobulin (PEP) for HCV. There is no vaccine to prevent hepatitis C. Therefore, the best way to prevent infection is by avoiding behaviors that can transmit the virus.

### 6.3.4 Influenza (Flu)

Current NYSDOH regulations (Section 2.59 of the State Sanitary Code) require all healthcare facilities to provide annual influenza vaccinations to personnel. Personnel who are not vaccinated against the current season's influenza must wear a surgical or procedure mask while in areas where patients or residents are present during the time when influenza is prevalent.

Routine annual influenza vaccination of all persons aged ≥6 months who do not have a contraindication to vaccination continues to be recommended. Flu vaccine types include (Grohskopf et al., 2025):

- Quadrivalent Inactivated Influenza Vaccine (IIV4): The standard injectable vaccine covering four strains.
- Recombinant Influenza Vaccine (RIV4): Egg-free injectable option.
- Live Attenuated Influenza Vaccine (LAIV4): Nasal spray for healthy, non-pregnant individuals aged 2 to 49. Contraindication: LAIV should not be used by healthcare personnel caring for patients in protected environments (e.g., bone marrow transplant units).

## 6.3.5 Other Recommended or Mandate Requirements

Pertussis: All healthcare personnel must maintain up-to-date protection against pertussis, especially to protect vulnerable patient populations.

Tdap: Healthcare personnel who have not previously received a dose of Tdap (tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis) should receive one dose as soon as possible, regardless of the interval since their last Td booster. Vaccination remains a critical priority for healthcare workers with direct contact with infants under 12 months of age and pregnant patients (CDC, 2025 June).

Following the initial Tdap, healthcare personnel should receive a booster dose of either Tdap or Td every 10 years. Tdap is now preferred over Td for these decennial boosters to maintain pertussis immunity. Healthcare personnel who are pregnant should receive a dose of Tdap during each pregnancy (ideally between 27 and 36 weeks' gestation) to provide passive immunity to the newborn (CDC, 2025 June).

Chickenpox: Varicella (chickenpox): The NYSDOH requires evidence of immunity to varicella for all healthcare personnel. Evidence of Immunity is defined by at least one of the following (CDC, 2025 June):

- Documentation of vaccination: Two doses of varicella-containing vaccine administered at least 28 days apart.
- Laboratory evidence: Documented positive serologic titers for varicella-zoster virus (VZV) IgG.
- Diagnosis history: Documentation of a history of varicella (chickenpox) or herpes zoster (shingles) based on diagnosis by a healthcare provider.

Susceptible personnel who lack evidence of immunity should receive the two-dose vaccine series before or at the start of employment.

## 6.3.6 Work Restrictions and Symptom Management

In accordance with updated infection control protocols, New York State healthcare facilities must implement strict "illness-at-work" policies to prevent healthcare-associated infections. Healthcare personnel must be evaluated immediately if they exhibit symptoms of potentially communicable diseases, including but not limited to:

- fever, persistent cough, or shortness of breath
- new or unexplained rash or skin lesions
- draining wounds or localized skin infections
- active vomiting or diarrhea

Healthcare personnel exhibiting these symptoms must be excluded from direct patient contact and common staff areas until they are clinically determined to be non-infectious. During the "prevalent" respiratory virus season (typically late fall through spring), specific masking mandates may apply for personnel not vaccinated against influenza (NYSDOH, 2026, April).

# 7. Element VII: Sepsis Awareness and Education

Sepsis is the body's extreme, life-threatening response to an infection. It occurs when the immune system's response goes into overdrive, releasing chemicals into the blood that trigger widespread, systemic inflammation. Without timely recognition and intervention, sepsis can cause tissue damage, organ failure, and death.

## 7.1 Scope of Sepsis

Sepsis, a syndrome of acute organ dysfunction secondary to infection, is a common cause of hospitalization and death. In addition to being deadly, sepsis also contributes to new and worsened morbidity. Patients experience heightened risk for further health deterioration, hospital readmission, and death in the months, and even years, after the acute resolution of sepsis (Prescott et al., 2023).

In a typical year at least 1.7 million adults in America develop sepsis, leading to nearly 270,000 deaths. Sepsis contributes to more than a third of all hospital deaths. Sepsis, or the infection causing sepsis, starts outside of the hospital in nearly 87% of cases (NYSDOH, 2024 September).

Severe sepsis and septic shock impact approximately 73,000 adults and almost 600 children in New York each year. In 2018, almost 24% of these adult patients died from sepsis. The NYSDOH works with hospitals around the state to reduce death from sepsis. From 2015 to 2019 this work saved more than 16,000 lives (NYSDOH, 2024 September).

Most individuals who develop sepsis have at least one underlying medical condition, such as a weakened immune system or chronic lung disease. Nearly 25% to 33% of people with sepsis have visited healthcare services in the week before their hospitalization. Sepsis is the number one cost of hospitalization in the United States, consuming more than $62 billion in annual in-hospital costs (CDC, 2026, March 23).

The high mortality rate related to sepsis can be attributed to two factors: (1) difficult and often delayed diagnosis and (2) the lack of sepsis-specific treatments. The difficulty of sepsis diagnosis, especially early in disease, can result in delayed treatment with antibiotics (or monoclonal antibodies and antivirals, in the case of COVID-19) (Hancock et al., 2025).

This delay drastically increases mortality rates: for every hour that appropriate antibiotic therapy is delayed, the in-hospital mortality rate can increase significantly, with numbers often cited of up to 7.6% in septic shock (Hancock et al., 2025).

## 7.2 NYS Sepsis Care Improvement Initiative and "Rory's Regulations"

Beginning in 2014, each acute care hospital in New York State that provides care to patients with sepsis is required by an amendment to Title 10 of the New York State Codes, Rules, and Regulations (Sections 405.2 and 405.4) to develop and implement evidence-informed sepsis protocols that describe their approach to both early recognition and treatment of sepsis patients (Sheikh et al., 2024).

This legislation, known as "Rory's Regulations," was enacted following the tragic death of 12-year-old Rory Staunton from sepsis, making New York the first state in the United States to mandate regulations for sepsis protocols (Sheikh et al., 2024).

These laws require hospitals to:

- Provide suitable training, resources, and equipment for healthcare providers to quickly recognize and treat sepsis in both adults and children (Sheikh et al., 2024).
- Gather sepsis data to improve the quality of care and provide this data to the state annually.

Hospitals must also Implement a Parents' Bill of Rights that allows parents or guardians to always stay with pediatric patients. They must also review medical tests with the patient or the patient's parent or guardian before discharging a child patient (Sheikh et al., 2024).

Hospitals are required to report data to the NYSDOH. This is used to calculate each hospital's performance on key measures of early treatment and protocol use. Hospitals are also required to submit sufficient clinical information on each patient with sepsis to allow the Department of Health to develop a methodology to evaluate "risk-adjusted" mortality rates for each hospital (Dierkes et al., 2022).

Risk adjustment permits comparison of hospital performance and takes into consideration the different mix of demographic and comorbidity attributes, including sepsis severity, of patients cared for within each hospital (Dierkes et al., 2022).

Between 2014 and 2016, following the implementation of Rory's Regulations, the use of protocols for sepsis care in adults increased from approximately 74% to nearly 85%. During this period, mortality decreased from 30% to 25% (Dierkes et al., 2022). Recent studies highlight that New York's regulatory approach continues to serve as a model for policy standards in other states and countries seeking to improve early recognition and outcomes for sepsis patients (Sheikh et al., 2024).

## 7.3 Causes of Sepsis

Sepsis is not a condition that arises on its own; it is a life-threatening, dysregulated host response triggered by a primary infection. It generally stems from infections located in the lungs, urinary tract, skin, abdomen, or other parts of the body (Srdić et al., 2024).

Invasive medical procedures can introduce bacteria directly into the bloodstream, precipitating the condition. A wide variety of microbes can trigger sepsis, including Gram-negative and Gram-positive bacteria, fungi, and viruses. Severe infections and widespread pathophysiological damage are also factors (Srdić et al., 2024).

The increased use of broad-spectrum antimicrobials that eliminate competing bacterial pathogens, as well as the rising use of immunosuppressive agents and invasive procedures have led to an increase in fungal infections.

An infection alone is often not sufficient to trigger sepsis. It usually requires a pre-existing patient susceptibility or vulnerability. Patients with compromised immune systems, older adults, and those with chronic diseases are significantly more susceptible to progressing from an infection to sepsis (Sepsis Alliance, 2026).

While most cases (can be 80%–87%) originate in the community, a substantial portion of severe cases develop in patients already hospitalized for other reasons. Hospital-acquired or hospital-onset sepsis typically affects critically ill patients with indwelling devices and is associated with higher mortality rates and greater healthcare utilization (Sepsis Alliance, 2026).

## 7.4 Early Recognition

In a classic, uncomplicated infection, the body's immune response is self-limiting. The immune forces are called into action, the infection is controlled, and inflammation resolves. Sepsis, however, is characterized by a dysregulated and life-threatening host response to an infection (Srdić et al., 2024).

The first symptoms of sepsis are non-specific (fever, blood pressure, respiratory rate, and heart rate, elevated white blood cell count) making early diagnosis difficult. Based on the most recent Sepsis-3 criteria, sepsis is diagnosed if there is documented or suspected infection along with an indication of organ dysfunction, represented by an increase of two or more points in the *Sequential Organ Failure Assessment* (SOFA) score (Hancock et al., 2025).

Unlike a typical infection, in sepsis, the natural checks and balances fail. Instead of tapering off, the pro-inflammatory forces and immune mediators spread systemically beyond the infected region, leading to significant physiological and biochemical abnormalities (Zimmermann et al., 2021).

The immune response begins as pro-inflammatory signal molecules enter the bloodstream in large numbers. As these molecules travel through the vascular system, they cause dilation and increased permeability (leaking) of the endothelium lining the blood vessels (Zimmermann et al., 2021).

The usual orderly movement of oxygen, nutrients, and fluids through the capillary walls is disrupted. As a result of this microvascular dysfunction, vital organs become hypoxic (starved of oxygen), which can ultimately lead to multiple organ dysfunction or failure (Srdić et al., 2024).

If the dysregulated response continues, organ hypoxia and damage progress to severe sepsis. This is defined as life-threatening organ dysfunction caused by a dysregulated host response to infection, severely increasing the likelihood of mortality (Prescott et al, 2026).

Septic shock can develop when the circulatory system fails and the arterial wall muscles can no longer contract sufficiently to maintain adequate blood pressure despite adequate fluid resuscitation. This stage is associated with a dramatic decline in survival rates (Prescott et al, 2026).

The systemic collapse that occurs in sepsis was previously categorized as *Systemic Inflammatory Response Syndrome* (SIRS). SIRS can be triggered by a variety of non-infectious causes, including pancreatitis, trauma, or burns. When it is driven by a confirmed or suspected microbial infection, it is classified as sepsis. Unlike other forms of SIRS, sepsis requires immediate source control and antimicrobial treatment to remove or control the primary source of the infection within the first hour of recognition (Prescott et al, 2026).

## 7.5 Treatment

The initial step in the treatment of sepsis is to stop the infection, protect vital organs, and prevent a drop in blood pressure. International clinical practice guidelines recommend the prompt identification of sepsis and treatment with broad-spectrum antibiotic agents and intravenous fluids. For patients presenting with septic shock, empiric antimicrobials should be administered within 1 hour, whereas in sepsis without shock, the target remains within 3 hours to allow time to evaluate alternative diagnoses (Kamath et al., 2023).

Diagnostic modalities include blood cultures and other testing to identify the source and site of infection and organ dysfunction. Treatment includes the administration of appropriate IV antimicrobial therapy, with source identification and de-escalation of antibiotics as soon as feasible. These recommendations are supported by observational studies and guidelines suggesting that early treatment with antibiotics and intravenous fluids reduces the number of avoidable deaths (Kamath et al., 2023).

## 7.6 Patient Education and Prevention

Sepsis is a medical emergency. A person with sepsis should look ill and should seek immediate care for worsening infection and signs and symptoms. Time matters. Call your doctor or go to the emergency department immediately if you suspect sepsis.

Healthcare providers can help patients and family members protect themselves against sepsis by teaching the signs and symptoms of sepsis and the importance of prompt and early treatment. If you have an infection and don't get better or start feeling worse, ask your doctor, "Could this infection be leading to sepsis?"

Infection prevention is a critical part of preventing sepsis. This includes proper hand hygiene, wound care, and vaccination. Be aware that children and older adults, as well as immunocompromised people and those with chronic illnesses, are at higher risk for contracting sepsis than the general population.

Warning signs and symptoms of sepsis include:

- altered mental state, confusion
- shortness of breath
- fever, clammy or sweaty skin
- extreme pain or discomfort
- high heart rate

Some steps you can take to prevent infections include taking good care of chronic conditions and getting recommended vaccines. Also:

- Know the symptoms of sepsis.
- Practice good hygiene, such as handwashing, and keeping cuts clean until healed.
- Act fast. Get medical care immediately when an infection is not getting better or if it gets worse.

Always remember, sepsis is a medical emergency. Time matters. Giving relevant history and information to healthcare providers can help with early identification and treatment of sepsis, leading to improved outcomes.

**The Need for Sepsis Awareness: Dana Mirman's Story** CDC's Safe Healthcare Blog, 2024

In 2011, a lack of awareness of sepsis—a disease responsible for more American deaths each year than breast cancer, prostate cancer, and AIDS combined—nearly cost me my life. It began with a little bump on my shoulder one afternoon. I did not know that within 24 hours, that small bump would develop into life-threatening septic shock and I would find myself in the ICU.

The little bump became swollen, and I developed symptoms that felt like the worst flu of my life. My husband discovered my temperature was over 104 degrees, and rushed me to the emergency room, on a hunch that this was not an ordinary "flu." He had never heard of sepsis. I had heard the word, but thought it was a rare, largely obsolete disease. I didn't know anything about the symptoms and certainly had no idea it could be happening to me.

When I arrived at the hospital, I was the sickest I had ever been in my life. My temperature was soaring, my blood pressure was falling, and my arm was in excruciating pain. I soon learned the bump on my arm actually was a skin infection, which had led to cellulitis. The doctors acted quickly, and I was admitted to the ICU, where I vacillated between life and death. I was cognizant enough to worry whether I would make it out of the hospital and if so, whether all my limbs would be coming home with me.

After several terrifying, agonizing days, I began to recover, transitioning first out of the ICU and then out of the hospital. I went home to begin a deceptively arduous recovery. Having survived and avoided severe complications like amputations, I expected my recovery would be swift, but it was not. Weeks turned to months, even years, before I began to feel like "myself" again. I did not know about post-sepsis or post-ICU syndrome, which can affect many sepsis and ICU patients. It took nearly three years to get my strength back, although some of the physical and emotional impacts still linger.

As difficult as my recovery was, I am lucky to be alive. I am lucky that the doctors and nurses at my hospital were aware of sepsis. They saved my life. Others—who either do not make the decision to seek emergency medical care, or whose symptoms are overlooked or misdiagnosed—are not as lucky. But surviving sepsis should not be a matter of luck. The public and medical professionals must be aware of sepsis. We must know the name of this deadly disease, and we must know the symptoms. By being aware of the symptoms, we will be able to save more lives. The CDC's efforts to increase sepsis awareness and improve treatment will result in fewer lives lost to this sudden, swift, and often-fatal disease.

[Continue to next page for course references]

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[Continue to next page to start quiz]

# 9. Quiz: NY Infection Control (366) (26 questions)

1. Healthcare associated infections are associated with the use of indwelling medical devices, surgical procedures, post-operative wound care, and contamination of the healthcare surfaces and equipment.

a. True b. False

2. HAIs can be caused by any infectious agent, including bacteria, fungi, and viruses.

a. True b. False

3. Hospitals currently measure their infection control practices by:

a. Benchmarks.
b. Zero tolerance.
c. Patient population statistics.
d. Funding considerations.

4. New York State mandates that all health professionals take responsibility for monitoring infection prevention practices for all licensed and unlicensed workers for whom they are responsible.

a. True b. False

5. Infection control and prevention practices are evidence-based measures designed to prevent the transmission of healthcare-associated infections to protect patients, healthcare workers, and visitors.

a. True b. False

6. Viruses are about 100 times smaller than bacteria, and they are more susceptible to antibiotics than bacteria.

a. True b. False

7. A reservoir is a place where germs live and grow. The most common reservoirs in healthcare facilities are:

a. Patient call buttons.
b. People.
c. Bathrooms.
d. IV stands.

8. Droplet precautions are designed to interrupt this means of transmission, and respiratory hygiene practices should be used when caring for any person with active respiratory symptoms.

a. True b. False

9. Standard precautions protect patients and healthcare workers from many bacterial and viral infections, including bloodborne pathogens. When we use standard precautions, we are in full compliance with Universal Precautions.

a. True b. False

10. Because tuberculosis is the most common disease transmitted by a true airborne route, the CDC recommends three levels of TB controls

a. Environmental, sharps prevention, and respiratory protection controls.
b. Droplet, airborne, and sterile processing.
c. Administrative, environmental, and respiratory protection controls.
d. Droplet, airborne controls, and hand hygiene.

11. Alcohol hand rubs do kill most germs including viruses, but they do not remove dirt and debris from your hands.

a. True b. False

12. Regarding the reuse of needles and syringes:

a. The syringe may be reused but the needle may not.
b. Neither the needle nor the syringe may ever be reused.
c. Needles may be reused if they are properly disinfected.
d. Syringes may be reused if they are properly disinfected.

13. Work practice controls reduce the likelihood of exposure by altering the way a task is performed.

a. True b. False

14. As many as one-third of all sharps injuries in the hospital setting occur during sharps disposal. Which sharps device is responsible for the most injuries in the workplace?

a. IV catheter stylets.
b. Hypodermic needles.
c. Disposable syringes.
d. Suture needles.

15. Personal protective equipment (PPE) provided by the employer for protection against infectious materials ordinarily includes gowns, lab coats, gloves, mask, face shields, and goggles.

a. True b. False

16. Masks are used for three primary what purpose in healthcare settings:

a. To protect workers from contact with infectious material from patients.
b. To protect patients from exposure to infectious agents carried in the workers' mouths or noses when they are engaged in procedures requiring sterile technique.
c. To put on coughing patients, to limit potential dissemination of infectious respiratory secretions from the patient to others.
d. All of the above.

17. All work areas must be maintained in a clean and sanitary condition. This function is called:

a. Environmental cleaning.
b. Protective cleaning.
c. Facility cleaning.
d. Housekeeping.

8. The reuse of SUDs is controversial due to concerns about the potential risks of infection, cross contamination, material fatigue, and device failure.

a. True b. False

19. *Decontamination* removes pathogenic microorganisms from objects so they are safe to reuse.

a. True b. False

20. Protecting healthcare workers is an integral part of a healthcare organization's general program for infection control and prevention. This includes:

a. Education
b. Investigating potentially harmful exposures
c. Providing care to personnel who have been exposed to potentially harmful pathogens
d. All of the above

21. Current New York State regulations (10 NYCRR Section 405.3) require all healthcare personnel to demonstrate immunity to measles and rubella.

a. True b. False

22. Sepsis is:

a. Caused by poor nutrition.
b. The body's extreme response to an infection.
c. Not common in New York State.
d. An infectious disease caused by rat bites.

23. Classic signs and symptoms of sepsis include:

a. Slight fever, low blood sugar, low white blood count.
b. No fever, decreased blood lactate level, low white blood count, and narrowed pulse pressure.
c. Fever, tachypnea, tachycardia, and high white blood cell count.
d. Fever, cough, low blood sugar, and hyper alertness.

24. Older patients suffering from sepsis can present with atypical symptoms. This can include:

a. Combativeness, nausea, and diarrhea.
b. The absence of classical symptoms such as fever, tachycardia, and hypoxemia.
c. Low blood sugar, jaundice, and hyper alertness.
d. Hyperactivity, intention tremor, and one-sided weakness.

25. Septic shock can develop when the circulatory system fails and the arterial wall muscles can no longer contract sufficiently to maintain adequate blood pressure despite adequate fluid resuscitation.

a. True b. False

26. The first step in the treatment of sepsis is:

a. Restrict fluids and provide supportive care.
b. Wait for a blood culture to determine the causative organism.
c. Observe for worsening symptoms.
d. Stop the infection, protect the vital organs, and prevent a drop in blood pressure.

[Continue to next page for answer sheet]

# Answer Sheet: NY Infection Control (366)

Name (Please print)_____

Date_____

Passing score is 80%

| | |
|---|---|
| 1. _____ | 14. _____ |
| 2. _____ | 15. _____ |
| 3. _____ | 16. _____ |
| 4. _____ | 17. _____ |
| 5. _____ | 18. _____ |
| 6. _____ | 19. _____ |
| 7. _____ | 20. _____ |
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| 9. _____ | 22. _____ |
| 10. _____ | 23. _____ |
| 11. _____ | 24. _____ |
| 12. _____ | 25. _____ |
| 13. _____ | 26. _____ |

[Continue to next page for course evaluation]

# Course Evaluation: NY Infection Control (366)

Please use this scale for your course evaluation. Items with asterisks * are required.

1 = Strongly agree 2 = Agree 3 = Neutral 4 = Disagree 5 = Strongly disagree

*Upon completion of the course, I was able to:

1. Summarize the most prevalent risk factors for healthcare-associated infections. 1 2 3 4 5

2. Define "zero tolerance" as it applies to infection prevention. 1 2 3 4 5

3. Recall and explain each of the six links in the Chain of Infection. 1 2 3 4 5

4. Outline the use of engineering and work practice controls to reduce the opportunity for exposure to potentially infectious material (POIM). 1 2 3 4 5

5. Explain both the importance and practice of hand hygiene in preventing HAIs. 1 2 3 4 5

6. Understand the importance of cleaning, disinfection, and sterilization. 1 2 3 4 5

7. State the signs and symptoms of sepsis and the importance of early recognition. 1 2 3 4 5

*The author(s) are knowledgeable about the subject matter. 1 2 3 4 5

*The author(s) cited evidence that supported the material presented. 1 2 3 4 5

*Did this course contain discriminatory or prejudicial language? Yes No

*Was this course free of commercial bias and product promotion? Yes No

*As a result of what you have learned, will make any changes in your practice? Yes No

If you answered Yes above, what changes do you intend to make? If you answered No, please explain why.

*Do you intend to return to ATrain for your ongoing CE needs?

_____Yes, within the next 30 days. _____Yes, during my next renewal cycle.

_____Maybe, not sure. _____No, I only needed this one course.

*Would you recommend ATrain Education to a friend, co-worker, or colleague?

_____Yes, definitely. _____Possibly. _____No, not at this time.

*What is your overall satisfaction with this learning activity? 1 2 3 4 5

*Navigating the ATrain Education website was:

_____Easy. _____Somewhat easy. _____Not at all easy.

*How long did it take you to complete this course, quiz, and course evaluation?

_____60 minutes (or more) per contact hour _____59 minutes per contact hour

_____40-49 minutes per contact hour _____30-39 minutes per contact hour

_____Less than 30 minutes per contact hour

I heard about ATrain Education from:

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_____18 to 30 _____31 to 45 _____46+

I completed this course on:

_____My own or a friend's computer. _____A computer at work.

_____A library computer. _____A tablet.

_____A cellphone. _____A paper copy of the course.

Please enter your comments or suggestions here:

[Continue to next page for registration and payment]

# Registration: NY Infection Control (366)

Please answer all of the following questions (* required).

*Name: _____

*Email: _____

*Address: _____

*City and State: _____

*Zip: _____

*Country: _____

*Phone: _____

*Professional Credentials/Designations:

_____

*License Number and State: _____

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