

Self-Study Syllabus

The content of this training curriculum established by the New York State Department of Health and the New York State Department of Education, meets the requirements for mandatory infection control training for health-care professionals in the State of New York



This self-study syllabus was developed by the Infection Control Professionals from Chapter 118, the Heart of New York Chapter, of the Association for Professionals in Infection Control and Epidemiology

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Background

In August 1992, Chapter 786 of the Laws of 1992 established a requirement that certain healthcare professionals licensed in New York State receive training on infection control and barrier precautions by July 1994 and every four years thereafter unless otherwise exempted.

The statute applies to the following professionals:

Dental hygienists

Dentists

Licensed practical nurses

Optometrists

Physicians

Physician assistants

Podiatrists

Registered professional nurses

Specialist assistants

*Medical students

*Medical residents

*Physician assistant students

(* These categories were added pursuant to legislation enacted in November, 2008.)

Goal of Infection Control Training as Mandated by Chapter 786

The goal of the infection control training requirement is to:

- Assure that licensed, registered, or certified health professionals understand how bloodborne pathogens may be transmitted in the work environment: patient to healthcare worker, healthcare worker to patient, and patient to patient
- Apply current scientifically accepted infection prevention and control principles as appropriate for the specific work environment
- Minimize opportunity for transmission of pathogens to patients and healthcare workers

Familiarize professionals with the law requiring this training and the professional misconduct charges that may be applicable for not complying with the law

For additional information on the training requirements for providers, participants, and documentation of completion, click on

https://www.health.ny.gov/professionals/diseases/reporting/communicable/infection/hcp_training.htm#syllabus

1. Element I

A. Professional Responsibility for Infection Prevention

- 1. Health-care professionals share responsibility to adhere to scientifically accepted principles and practices of infection prevention and control in all healthcare settings, and to oversee and monitor those medical and ancillary personnel for who the professional is responsible.**

B. Learning Objectives

- 1. At the conclusion of the course work or training on this element, the learner will be able to:**

- a. Recognize benefits to patient's healthcare workers of adhering to scientifically accepted principles and practices of infection prevention and control
- b. Recognize the professional's responsibility to adhere to scientifically accepted infection prevention and control practices in all healthcare settings, and the consequences of failing to comply
- c. Recognize the professional's responsibility to monitor infection prevention and control practices of those medical and ancillary personnel for whom he or she is responsible and intervene as necessary to assure compliance and safety

C. Sources and definition of standards of professional conduct as they apply to infection prevention and control

1. Rules of the Board of Regents, Part 29.2(a)(13)

- a. Unprofessional conduct in the area of infection prevention and control is defined as:
 1. Failing to use scientifically accepted infection prevention techniques as appropriate to each profession for the cleaning and sterilization or disinfection of instruments, devices, materials and work surfaces, utilization of protective garb, use of covers for contamination-prone equipment and the handling of sharp instruments. Such techniques shall include, but not be limited to:
 - a. Wearing of appropriate protective gloves at all time when touching blood, saliva, other body fluids or secretions, mucous membranes, non-intact skin, blood-soiled items or bodily fluid-soiled items, contaminated surfaces, and sterile body area, and during instrument cleaning and decontamination procedures
 - b. Discarding gloves used following treatment of a patient and changing to new gloves if torn or damaged during treatment of a patient; washing hands and donning new gloves prior to performing services for another patient; and washing hands and other skin surfaces immediately if contaminated with blood or other body fluids.
 - c. Wearing of appropriate masks, gowns or aprons, and protective eyewear or chin-length plastic face shields whenever splashing or spattering of blood or other

- body fluids is likely to occur.
- d. Sterilizing equipment and devices that enter the patient's vascular system or other normally sterile areas of the body.
 - e. Sterilizing equipment and devices that touch intact mucous membranes but do not penetrate the patient's body or using high-level disinfection for equipment and devices which cannot be sterilized prior to use for a patient.
 - f. Using appropriate agents, including but not limited to detergents for cleaning all equipment and devices prior to a sterilization or disinfection.
 - g. Cleaning by the use of appropriate agents, including but not limited to detergents, equipment and devices which do not touch the patient that only touch the intact skin of the patient.
 - h. Maintaining equipment and devices used for sterilization according to the manufacturer's instructions.
 - i. Adequately monitoring the performance of all personnel, licensed or unlicensed, for whom the licensee is responsible regarding infection control techniques.
 - j. Placing disposable used syringes, needles, scalpel blades, and other sharp instruments in appropriate puncture-resistant containers for disposal; and placing reusable needles, scalpel blades, and other sharp instruments in appropriate puncture-resistant containers until appropriately cleaned and sterilized.
 - k. Maintaining appropriate ventilation devices to minimize the need for emergency mouth-to-mouth resuscitation.
 - l. Refraining from all direct patient care and handling of patient care equipment when the health care professional has exudative lesions or weeping dermatitis and the condition has not been medically evaluated and determined to be safe or capable of being safely protected against in providing direct patient care or in handling patient care equipment.
 - m. Placing all specimens of blood and body fluids in well-constructed containers with secure lids to prevent leaking; cleaning any spill of blood or other body fluid with an appropriate detergent and appropriate chemical germicide.

2. Part 92 of title 10 (Health) of the Official Compilation of Codes, Rules and Regulations of New York:

- a. Chapter 786 of the Laws of 1992 amended the Education and Public Health Law establishing a requirement that certain healthcare professionals licensed in NY State must receive approved training in infection control and barrier precautions by July 1, 1994 and every four years thereafter. Infection Control training is to prevent the transmission of Human Immunodeficiency Virus (HIV) and Hepatitis B (HBV) in the course of professional practice.
 1. 92-2.1 required use of infection control practices. For physicians, registered physician assistants and specialist assistants, the definition of unprofessional conduct

shall include the failure to use scientifically accepted infection control practices to prevent transmission of disease pathogens from patient to patient, physician to patient, registered physician or special assistant to patient, employee to patient, and patient to employee, as appropriate to physicians, registered physician's assistants. Such practices shall include:

- a. Adherence to scientifically accepted standards for: handwashing; aseptic technique; use of gloves and other barriers for preventing bi-directional contact with blood and body fluids; thorough cleaning followed by sterilization or disinfection of medical devices; disposal of non-reusable materials and equipment; and cleaning between patients of objects that are visibly contaminated or subject to touch contamination with blood or body fluids.
 - b. Use of scientifically accepted injury prevention techniques or engineering controls to reduce the opportunity for patient and employee exposures.
 - c. Performance monitoring of all personnel, licensed or unlicensed, for whom the licensee is responsible regarding infection control techniques.
2. Other professional organizations and accrediting agencies providing guidelines, standards and recommended practices for infection prevention and control in healthcare settings:
- a. The Joint Commission
 - b. AHA – American Hospital Association
 - c. APIC – Association for Professionals in Infection Control and Epidemiology
 - d. SHEA – Society for Healthcare Epidemiology of America
 - e. CDC- Centers for Disease Control and Prevention
 - f. DNV – Det Norske Veritas Healthcare, Inc.

D. Implications of Professional Conduct Standards

1. Professional responsibility to adhere to infection control standards.
2. Professional responsibility for monitoring and overseeing the practice of others for who they are responsible.
3. Consequences of failing to follow accepted standards of infection prevention and control:
 - a. Increased risk of adverse health outcomes for patients and healthcare workers
 - b. Healthcare professionals may be subject to charges of professional misconduct
 1. Subjecting oneself to charges of unprofessional conduct:
 - a. Mechanisms for reporting unprofessional conduct: patients, family members, or co-workers can file charges against a health professional through their institution (i.e.: hospital or employer) or directly to the New York State Department of Health, Office of Health Systems Management (OHSM).
 - b. Investigation of the complaint is carried out by the hospital, employer, or OHSM.
 - c. Possible outcomes, depending on the severity of misconduct, include:
 1. Disciplinary action

2. Revocation of professional license
3. Professional liability

E. Methods of Compliance:

1. Participation in required infection prevention and control training.
2. Adherence to accepted principles and practices of infection prevention and control.

2. Element II

A. Transmission and control of infection in healthcare setting

1. Learning Objectives:

- a. Describe how pathogenic organisms may be spread in healthcare settings.
- b. Identify the factors which influence the outcome of an exposure to pathogenic organisms in healthcare settings.
- c. List strategies for prevention of transmission of pathogenic organisms.
- d. Describe how infection prevention concepts are applied in a professional practice.

2. Definitions:

- a. **Pathogen or infectious agent:** a biological, physical, or chemical agent capable of causing disease. Biological agents may be bacteria, viruses, fungi, protozoa, helminthes, or prions.
- b. **Portal of entry:** the means by which an infectious agent enters the susceptible host.
- c. **Portal of exit:** the means by which an infectious agent leaves the reservoir.
- d. **Standard precautions:** a group of infection prevention and control measures that combine the major features of universal precautions and body substance isolation and are based on the principle that all blood, body fluids, secretions, excretions except sweat, non-intact skin, and mucous membranes may contain transmissible infectious agents.
- e. **Transmission:** any mechanism by which a pathogen is spread by a source or reservoir to a person.
- f. **Reservoir:** any person, animal, insect, plant, soil, or substance (or combination of these), in which an infectious agent normally lives and multiplies, on which it depends for survival, and where it reproduces itself in such a manner that it can be transmitted to a susceptible host.
- g. **Common vehicle:** contaminated material, product, or substance that serves as a means of transmission of an infectious agent from a reservoir to one or more susceptible hosts through a suitable port of entry (may also be termed “fomite”).
- h. **Susceptible host:** a person or animal lacking effective resistance to a particular infectious agent.

- i. **Healthcare associated infection (HAI):** any infection which is acquired in a healthcare setting: manifestation of clinical illness may occur during or after discharge from the hospital or other healthcare facility, depending on the incubation period of the infection.
- j. **Incubation period:** the time between exposure to an infectious agent and the onset of disease.
- k. **Colonization:** presence of an infectious agent on skin, mucous membranes (nose, throat, vagina, intestinal tract), or wounds, or in urine, stool or secretions, without signs or symptoms of infection. The colonizing agent may later cause disease, or may be transmitted to other persons.
- l. **Carrier:** a person who is colonized or infected by an infectious agent for an extended time, often without symptoms, and who may transmit infection to others.

3. Transmission of infections

- a. “The Chain of Infection”: The pattern of spread of infection from one host to another susceptible host, or from the environment to a susceptible host. This chain requires a *pathogen*, a source or *reservoir*, a *portal of exit*, a *mode of transmission*, a *portal of entry*, and a *susceptible host*.



1. Infectious Agent:

- a. **Bacteria:** examples are Staphylococcus, Streptococcus, *Escherichia coli*, Pseudomonas, Rickettsia, Mycoplasma, Chlamydia, and *Mycobacteria* such as *tuberculosis*.
- b. **Viruses:** examples are influenza, common cold viruses, measles, mumps, chickenpox (varicella), hepatitis A, B, and C and HIV.
- c. **Fungi:** include yeasts (i.e.: *Candida*) and molds (i.e. *Aspergillus*).
- d. **Parasites:** include protozoa (i.e.: malaria, toxoplasmosis, pneumocystis), worms, and insects (i.e.: lice and scabies).
- e. **Prions:** (i.e.: Creutzfeldt-Jakob disease, Kuru, Human bovine Spongiform encephalitis also known as Mad Cow Disease) Proteinaceous infectious particles; different from viruses because of apparent lack of nucleic acid; made of glycoproteins, prions collect in the brain tissue as deposits in patient with prion disease.

2. Reservoirs Include:

- a. **People** – persons may be symptomatic or asymptomatic but capable of transmitting infection. *Carriers* do not have signs of infection but are capable

of transmitting infection to others, and include people who are in an incubation period of disease, those who have recovered yet continue to harbor a pathogen, and those who are healthy enough to not develop symptoms but may still be infected and spread infection.

- b. Insects or animals** – skunks, foxes, and bats are reservoirs of rabies which is transmitted directly by bites: wild mice and some other small mammals are reservoirs of Lyme Disease which is transmitted to humans from these animals by ticks.
- c. Inanimate Environment** – water, soil, food, counter tops, sinks, and medical equipment. Soil and water (including home and hospital hot water tanks) are reservoirs of *Legionella*, stagnant water is a reservoir of *Pseudomonas*; soil and dust are reservoirs of *Aspergillus*; soil is a reservoir of *Clostridium tetani*

3. Portals of Exit:

a. Pathogens are expelled by:

1. Coughing, sneezing, or bites
2. Draining skin lesions or wounds
3. Feces (diarrhea or formed stool)
4. Urine
5. Drainage of blood and other body fluids

4. Modes of Transmission:

a. Contact with a pathogen:

1. Direct contact: involves a direct body surface to body surface contact and physical transfer of microorganisms between a susceptible host and an infected or colonized person or reservoir.

Example: Scabies, STI's, mononucleosis, MRSA

2. Indirect contact: involves contact of a susceptible host with a contaminated intermediate object, usually inanimate.

Example: MRSA, C. difficile, hookworm, tetanus

- b. Respiratory droplet:** transmission occurs with exposure to droplets containing microorganisms generating from an infected person propelled a short distance (3-6 feet) and deposited on the hosts conjunctivae, nasal mucosa and mouth.



Example: Influenza, Rubella, and Pertussis, Strep Throat, Common Cold

- c. **Respiratory airborne:** infections acquired by inhalation of aerosols composed of small infectious particles which are suspended in the air. Infection may spread widely in a room, corridor, or through a ventilation system.

Example: Tuberculosis, Chickenpox, Measles

- d. **Common vehicle:** contaminated food, water, medication, intravenous fluid or other product which transmits infection to 2 or more persons.

Example: Hepatitis A, Bacillus cerus, cholera

- e. **Vector-Borne:** transmission via an insect or animal carrier.

Example: Malaria, Zika virus, Lyme disease

5. Portals of Entry:

- a. **Entry sites:** non-intact skin, mucous membranes; gastrointestinal, respiratory, and genitourinary tracts; across placenta to fetus.
- b. **Mechanisms:** via ingestion, inhalation, endotracheal tube, bladder catheter, percutaneous injury (i.e.: needle stick), vascular access, surgical incision, etc.

6. Susceptible Host:

The final link in the chain of infection is the susceptible host, which depends on genetic or constitutional factors, immunity, and other factors which affect an individual's ability to resist infection or limit pathogenicity.

B. Factors Influencing the Outcome of Exposures

1. Host Factors:

- a. **Natural barriers:** intact skin, mucous membranes and their secretions, normal flora, the flow of tears and urine, respiratory cilia, and gastric acid are all natural barriers to infection.
- b. **Host immunity:** protective antibodies that are directly formed against a specific pathogen in response to past infection, vaccination, or toxoid, or indirectly through the placenta from mother to child or from the administration of antitoxin or immunoglobulin.

2. Pathogen or Infectious Agent Factors:

- a. **Infectivity:** ability of a pathogen to invade and replicate in a host
- b. **Pathogenicity:** capacity of a microorganism to cause disease
- c. **Virulence:** the extent of disease that is caused by a pathogen

- d. **Size of Inoculum:** number of organism that is transferred to the host; some organisms require only a few to cause disease while others require many in order to cause disease
- e. **Route of Exposure:** the portal of entry of the organism influences the ability to cause infection
- f. **Duration of Exposure:** amount of time the host was exposed to the pathogenic reservoir

3. **Environmental Factors:**

- a. **Contamination of environment:** fomites: cleanliness of air, water, and food supply, cleanliness of floors and surfaces around patient, and proper sanitation can prevent the spread of infection from the environment to patients
- b. **Contamination of equipment:** equipment that is not cleaned and disinfected between patients or when soiled can spread infectious agents from patient to patient

C. **Methods to prevent the spread of pathogenic organisms in healthcare settings**

1. **Standard Precautions:**

- a. **Respiratory Hygiene/Cough Etiquette: these measures apply to patients, visitors, and healthcare workers with signs of respiratory infection. The measures include:**
 - 1. Covering your mouth and nose with a tissue when coughing or sneezing.
 - 2. Disposing of the tissue into a waste can.
 - 3. Cleaning your hands after having contact with respiratory secretions.

Respiratory hygiene can help prevent the spread of infection from person to person by interrupting the portal of exit and preventing the dispersal of respiratory droplets. Persons with respiratory symptom should have spatial separation of at least 3-6 feet between themselves and others.

b. **Safe injection practice (See Element III)**

- 1. Use of masks during spinal/epidural access procedures: Facemasks should be worn by the healthcare workers anytime there is an injection of material or insertion of a catheter into the epidural or subdural spaces. Outbreaks of meningitis have been identified in patients following these procedures from healthcare workers who did not wear a facemask. The infections are caused by the normal oral flora of the healthcare workers getting transferred to the central nervous system (CNS) of the patient during the procedure through normal breathing or coughing.

2. **For patients infected with organisms other than bloodborne pathogens:**

- a. Early identification of an infectious process in a patient can allow healthcare workers to take precautions to limit the spread to healthcare workers and other patients.
- b. Prompt/appropriate isolation of highly transmissible or airborne organisms can limit or

prevent the spread of infection by interrupting the mode of transmission.

- c. Appropriate treatment can reduce the infectivity and transmissibility of an infectious agent.

3. Control of routes of transmission:

- a. **Hand hygiene:** cited as the single most important practice to reduce transmission of infectious agents, and typically includes either the use of an alcohol-based hand rub, or soap and water hand washing.
 - 1. Alcohol-based hand rubs (ABHR) may be in gel, rinse, wipe, or foam form. Unless hands are visibly soiled, ABHR is a method of choice for hand hygiene. ABHR is more convenient, less drying, and has superior microbicidal activity than soap and water. When using ABHR:
 - a. Put product on hands and rub hands together
 - b. Cover all surfaces until hands feel dry (around 20 seconds)
 - 2. Soap and Water is the method of choice whenever hands are visibly soiled. There may be instances when this method is preferred over ABHR, such as during an outbreak of *C. difficile*, or after using the restroom. The CDC recommends:
 - a. Wet your hands first with water
 - b. Apply soap and rub hands together vigorously for 15-20 seconds, covering surfaces of the hands and fingers
 - c. Rinse hands with clean water
 - d. Dry with disposable towel and use clean towel to turn off faucet
 - e. Avoid use of hot water to prevent excess drying out skin
 - 3. When to perform hand hygiene:
 - a. Before eating
 - b. Before and after having direct contact with a patient's intact skin (such as taking a pulse, performing a physical examination, or lifting a patient in bed)
 - c. After contact with blood, body fluids or excretions, mucous membranes, non-intact skin, or wound dressing
 - d. After contact with inanimate objects (including medical equipment) in the immediate vicinity of the patient
 - e. If hands will be moving from a contaminated body site to a clean body site during patient care
 - f. Before donning gloves
 - g. After doffing gloves
 - h. After using the restroom
 - 4. Factors influencing efficacy of hand hygiene:
 - a. Lotions: these products should only be used if they are approved by your facility. They can be beneficial in protecting skin integrity, but can interfere with the microbicidal action of hand hygiene products.

- b. Fingernails:
 - 1. Germs can live under artificial nails even after washing with soap and water, or using ABHR
 - 2. Artificial nails or nail extensions should not be worn when providing direct care to high-risk patients (i.e.: ICU or ORs)
 - 3. Natural nail tips should be no long than ¼ inch in length.
 - c. Jewelry: the skin under rings contains more germs than comparable areas of skin on fingers without rings. Pay particular attention to these areas when performing hand hygiene
- 4. Use of appropriate barriers: see element IV for more information**
- a. Personal protective equipment (PPE) refers to a variety of barriers and respirators used alone or in combination to protect the mucus membranes, airway, skin and clothing from contact with infectious materials.
 - b. Selection should be made based on the nature of the interaction and the likely mode of transmission.
 - c. When donning PPE, ensure that the skin and/ or clothes are adequately protected.
 - d. When doffing PPE, ensure that skin and clothing are not contaminated during removal.
 - e. Designated containers to dispose of used PPE should be located near the site of removal to facilitate disposal and containment of contaminated PPE.
 - f. Hand hygiene is always the final step after removing and disposing of PPE.
- 5. Isolation and cohorting of patients infected with communicable diseases:**
- a. Standard precautions: apply to all patients in all healthcare settings regardless of the suspected or confirmed presence of an infectious agent and are used with every encounter with every patient. They are a set of infection control practices and PPE that protect the healthcare worker from infection. Standard precautions include:
 - 1. Hand hygiene
 - 2. Use of PPE whenever there is an expectation of possible exposure to blood or body fluid:
 - a. Respiratory hygiene and cough etiquette, which include:
 - 1. Covering the mouth and nose with a tissue when coughing or sneezing
 - 2. Disposal of tissues in trash receptacle
 - 3. Hand hygiene after cough, sneeze, or use of tissue.
 - 4. Use of a surgical mask on a coughing person (patient, worker, or visitor), if tolerated
 - 5. Spatial separation (3-6 feet) of persons with respiratory infection and others, if possible
 - b. Keeping the environment clean using facility-approved disinfectants:
 - 1. Using facility-approved disinfections to clean patient equipment

3. Safe Injection Practices:
 - a. Not using single dose vials for multiple patients.
 - b. Single-use syringes and needles
 - c. Face masks for epidural/spinal procedures
 - d. Never using insulin pens for more than one patient
 - e. Never using lancet devices on more than one patient
4. Keeping clean laundry covered, and not holding it against your clothing while carrying it.
 - a. Carrying dirty laundry rolled in a ball, away from your clothing, with gloved hands
5. Careful handling of sharps:
 - a. Wear gloves when handling sharps container
 - b. Engage safety devices before disposal
 - c. Dispose of sharps in puncture-resistant container
 - d. Do not recap, bend, break, or attempt to handle used needles
- b. Transmission-based precautions are based on interrupting the mode of transmission for known or suspected pathogens which are spread through contact, droplet, or airborne routes. Modes of transmission vary based on type of organism, and some infectious organisms may be transmitted by more than one route.
 1. Contact (direct) transmission occurs when microorganisms are transferred from one infected person to another person without a contaminated intermediate object or person. Opportunities for direct transmission between patients and healthcare personnel include:
 - a. Blood or body fluid from a patient enters a healthcare worker's body through contact with a mucous membrane or breaks in the skin.
 - b. Mites from a scabies-infested person is transferred to the skin of a non-infected person through direct ungloved contact with skin.
 - c. A healthcare worker develops a herpetic whitlow on a finger after contact with herpes simplex virus (HSV) by providing oral care to a patient without gloves.
 - d. HSV is transmitted to a patient from a herpetic whitlow on a healthcare worker's ungloved hand.
 2. Contact (indirect) transmission involves the transfer of an infectious agent through a contaminated intermediate object or person, such as:
 - a. Transmission of an infectious agent from one patient to another through the contaminated hands of a healthcare worker who does not perform hand hygiene between patients
 - b. Patient-care devices (i.e.: thermometers, stethoscopes, and glucometers) which are contaminated with blood or body fluids are not cleaned and disinfected between patients.

- c. Shared toys which are not cleaned between pediatric patients can transmit respiratory viruses (i.e.: respiratory syncytial virus) or pathogenic bacteria (i.e.: *Pseudomonas aeruginosa*).
 - d. Instruments which are not adequately cleaned between patients before disinfection and sterilization (i.e.: surgical equipment, endoscopes).
3. Droplet transmission occurs when the respiratory droplets of an infected individual travel to the mucosal surfaces of a susceptible individual, generally over short distances. Respiratory droplets are generated when the infected person coughs, sneezes, or talks, or during certain medical procedures such as intubation or CPR. Susceptible mucosa includes the nose, eyes, and mouth, and therefore, a procedure or surgical mask should be worn by the susceptible individual when in close proximity to the infected individual, generally defined as within 3 feet but may be up to 6 feet. Eye protection such as goggles or a face shield may also be worn to protect the conjunctiva. Examples of organisms spread through the droplet route include:
- a. Influenza
 - b. *Neisseria meningitidis* (bacterial meningitis)
 - c. *Bordetella pertussis* (whooping cough)
4. Airborne transmission occurs by dissemination of small particles of respiratory secretions containing microbes that are infectious over time and long distances. They may even be inhaled and cause infection in susceptible individuals who never had face-to-face contact with the infected individual because these particles can be carried on air currents to remote locations. It is for this reason that special air handling and ventilation systems are needed to contain and safely remove the infectious agent. Healthcare personnel who care for someone on airborne precautions should be fitted with a special NIOSH certified N95 or higher respirator. Examples of diseases spread by the airborne route include:
- a. Tuberculosis
 - b. Chicken Pox
 - c. Measles

6. Host support and protection:

- a. Vaccination: certain immunizations are recommended for healthcare workers and patients to protect from common or easily transmissible infectious diseases.
 - 1. Hepatitis B vaccine is required to be offered by employers of healthcare workers and has contributed to the sharp decline in occupational exposure to this highly transmissible organism.
 - 2. Varicella vaccine may be offered to workers who have not had the vaccine, or chicken pox, in their lifetime.
 - 3. Healthcare workers are encouraged to be vaccinated (if not proven immune) to common childhood illnesses such as rubella and measles to prevent outbreaks in

- vulnerable populations such as neonates.
4. Annual influenza vaccination has been shown to reduce the incidence of institutional outbreaks.
 5. Healthcare workers should receive periodic boosters against *Bordetella pertussis*.
 6. Pediatric patients should be screened at each visit/ admission, and vaccines offered as appropriate.
 7. Adult patients should be screened at each visit/ admission for recommended vaccines based on age and risk factors.
 8. Other vaccines as recommended by ACIP based on age and risk factors.
- b. Post-exposure prophylaxis is a preventive treatment or vaccine given after exposure to an infectious agent, in order to prevent illness or infection. For Example:
1. Antibiotics given after exposure to meningococcal disease.
 2. Hepatitis B vaccine and Hepatitis B immune globulin given to a susceptible individual after exposure to blood containing Hepatitis B virus.
 3. Varicella-zoster immune globulin given to a susceptible individual after exposure to chicken pox.
 4. Antiretroviral medications given after exposure to HIV infected blood.
 5. Please note that timing between exposure and prophylaxis is very important. Any occupational exposure to potentially infected blood or body fluid should be immediately evaluated by an employee health or emergency room provider so that post-exposure prophylaxis can be given in time to prevent infection.
- c. Protecting skin and immune system integrity can prevent an infectious agent from finding a susceptible host. Broken skin surfaces can serve as a portal of entry, and a compromised immune system can prevent a host from fighting an infectious agent.
1. Use of ABHR and facility-approved lotions to prevent dermatitis of hands.
 2. Reduce the exposure of immuno-compromised individuals to infectious agents by appropriate PPE use and patient placement away from others with transmissible illness, even mild.
 3. Avoid unnecessary use of IVs, central lines, urinary catheters, and other invasive devices.
7. **Environmental control measures are those measures meant to reduce the likelihood of the patient environment serving as a reservoir of disease. The measures include:**
1. Cleaning, disinfection, and sterilization of patient care equipment (Element V).
 2. Environmental cleaning (housekeeping) is the routine care, cleaning, and disinfection of environmental surfaces, especially frequently touched surfaces in patient care areas.
 3. Appropriate ventilation minimizes the risk of infection from droplet or airborne organisms, and protection from dust and debris.
 4. Waste management controls keep potentially infectious waste contained.

5. Linen and laundry management ensures that contaminated laundry that may contain blood or body fluid is handled in a way that prevents exposure to the worker, is washed at temperatures which will kill microorganisms, and that clean laundry is kept covered to protect from contamination.
6. Food service areas are kept clean and disinfected to prevent transmission of foodborne illness.
8. **Engineering and work practice controls remove or reduce a workplace hazard through the use of technology (see Element III).**
9. **Training and education of healthcare workers** is essential for ensuring that infection control practices and policies are understood and followed. Training and education should be provided to anyone who has contact with patient in a healthcare setting upon orientation, anytime there is a change in policy or practice, and at regular intervals to ensure competency. Licensed Health Professionals are responsible to take an infection control course at least every 4 years to maintain their licensure in New York State. If any of the material provided in this training module is not well understood by the reader, they should seek clarification through an Infection Preventionist at their facility or from the source material before continuing to care for patients. It is the reader's professional responsibility and a condition of licensure to follow infection control guidelines

References:

Centers for Disease Control and Epidemiology, Principles of Epidemiology
Centers for Disease Control and Epidemiology, Standard Precautions for all Patient Care
Centers for Disease Control and Epidemiology, 2007 Guideline for Isolation Precautions:
Preventing Transmission of Infectious Agents in Healthcare Settings

3. **Element III**

A. **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.**

1. **Learning Objectives**

- a. Upon completion of course work or training on this element, the learner will be able to:
 1. Define healthcare-associated disease transmission, engineering controls, safe injection practices and work practice controls
 2. Describe specific high-risk practices and procedures that increase the opportunity for healthcare worker and patient exposure to potentially infectious material
 3. Describe specific measures to prevent transmission of bloodborne pathogens from patient to patient, healthcare worker to patient, and patient to healthcare worker via contaminated injection equipment

4. Identify work practice controls designed to eliminate the transmission of bloodborne pathogens during use of sharp instruments (i.e.: scalpel blades and their holders (if not disposable), lancets, lancet platforms/ pens, puncture devices, injections)
5. Identify where engineering or work practice controls can be utilized to prevent patient exposure to bloodborne pathogens

2. Definitions

- a. **Healthcare-associated infections (HAIs): Infections associated with healthcare** delivery in any setting (i.e.: hospitals, long-term care facilities, ambulatory setting, homecare).
- b. **Engineering controls:** controls (i.e.: sharps disposal containers, self-sheathing needles, safer medical devices, such as sharps with engineered sharps injury protections and needleless systems) that isolate or remove the bloodborne pathogens hazard from the workplace.
- c. **Injection safety (or safe injection practices):** a set of measures taken to perform injections in an optimally safe manner for patients, healthcare personnel, and others. A safe injection does not harm the recipient, does not expose the provider to any avoidable risks and does not result in waste that is dangerous for the community. Injection safety includes practices intended to prevent transmission of bloodborne pathogens between one patient and another, or between a healthcare worker and a patient, and also to prevent harm such as needle stick injuries.
- d. **Work practice controls:** Controls that reduce the likelihood of exposure to bloodborne pathogens by altering the manner in which a task is performed (e.g. prohibiting recapping of needles by a two handed technique).

B. Content Outline

1. High risk practices and procedures (by exposure type) capable of causing healthcare acquired infection with bloodborne pathogens:

- a. Percutaneous exposures
 1. Exposures occurring through handling/disassembly/disposal/reprocessing of contaminated needles and other sharp objects:
 - a. Manipulating contaminated needles and other sharp objects by hand. (i.e.: removing scalpel blades from holders, removing needles from syringes).
 - b. Delaying or improperly disposing (i.e.: leaving contaminated needles or sharp objects on counters/workspaces or disposing in non-puncture-resistant receptacles).
 - c. Recapping contaminated needles and other sharp objects using a one handed technique.
 2. Performing procedures where there is poor visualization, such as:

- b. Blind suturing
 - c. Non-dominant hand opposing or next to a sharp
 - d. Performing procedures where bone or metal fragments are produced
- b. Mucous membrane/non-intact skin exposures
 - 1. Direct blood or body fluids contact with the eyes, nose, mouth, or other mucous membranes via:
 - a. Contact with contaminated hands
 - b. Contact with open skin lesions/dermatitis
 - c. Splashes or sprays of blood or body fluids (i.e.: during irrigation or suctioning)
- c. Parenteral exposures
 - 1. Injection with infectious material may occur during:
 - a. Administration of parenteral medication
 - b. Sharing of blood monitoring devices (i.e.: glucometers, hemoglobin meters, lancets, lancet platforms/pens)
 - c. Infusion of contaminated blood products or fluids

2. Safe injection practices and procedures designed to prevent disease transmission from patient to patient and healthcare worker to patient.

- a. Unsafe injection practices have resulted in the following:
 - 1. Transmission of bloodborne viruses, including hepatitis B (HBV) and C (HCV) viruses to patients.
 - 2. Notification of thousands of patients of possible exposure to bloodborne pathogens and recommendation that they be tested for hepatitis C virus, hepatitis B virus, and human immunodeficiency virus (HIV).
 - 3. Referral of providers to licensing boards for disciplinary action.
 - 4. Malpractice suits filed by patients.
- b. Pathogens including HCV, HBV, and human immunodeficiency virus (HIV) can be present in sufficient quantities to produce infection in the absence of visible blood.
 - 1. Bacteria and other microbes can be present without clouding or other visible evidence of contamination.
 - 2. 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.
 - 3. All used injection supplies and materials are potentially contaminated and should be discarded appropriately.
- c. Providers should:
 - 1. Maintain aseptic technique throughout all aspects of injection preparation and administration:
 - a. Medications should be drawn up in a designated “clean” medication area that is not adjacent to areas where potentially contaminated items are placed.

- b. Use a new sterile syringe and needle to draw up medications while preventing contact between the injection materials and the non-sterile environment.
 - c. Ensure proper hand hygiene (i.e.: alcohol based hand rub or hand washing) before handling medications.
 - d. If a medication vial has already been opened, the rubber septum must be disinfected with alcohol prior to piercing each time.
 - e. Never leave a needle or other device (i.e.: “spikes”) inserted into a medication vial septum or IV bag/bottle for multiple uses. This provides a direct route for microorganisms to enter the vial and contaminate the fluid.
 - f. Medication vials must be discarded upon expiration or anytime there are concerns regarding the sterility of the medication. The United States Pharmacopeia (USP) General Chapter 797 recommends multi-dose vials be dated and discarded within 28 days. Refer to: www.cdc.gov/injectionsafety/providers/provider_faqs_multivials.html
2. Never administer medications from the same syringe to more than one patient, even if the needle is changed.
 3. Never use the same syringe or needle to administer IV medications to more than one patient, even if the medication is administered into IV tubing, regardless of the distance from the IV insertion site.
 - a. All of the infusion components from the infusate to the patient’s catheter are a single interconnected unit.
 - b. All of the components are directly or indirectly exposed to the patient’s blood and cannot be used for another patient.
 - c. Syringes and needles that intersect through any port in the IV system also become contaminated and cannot be used for another patient or used to re-enter a non-patient specific multi dose vial.
 - d. Separation from the patient’s IV by distance, gravity and/or positive infusion pressure does not ensure that small amounts of blood are not present in these items.
 4. Dedicate vials of medication to a single patient.
 - a. Medications packaged as single use must never be used for more than one patient.
 1. Never combine leftover contents for later use;
 2. Medications packaged as multi use should be assigned to a single patient whenever possible;
 3. Never use bags or bottles of intravenous solution as a common source of supply for more than one patient.
 5. Never use peripheral capillary blood monitoring devices packaged as single patient use on more than one patient:
 - a. Restrict use of peripheral capillary blood sampling devices to individual patients.
 - b. Never reuse lancets. Consider selecting single use lancets that permanently retract upon puncture.

C. Safe injection practices and procedures designed to prevent disease transmission from patient to healthcare worker.

1. Refer to OSHA guidelines, available at:

http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=id=10051

2. <http://www.oneandonlycampaign.org/partner/new-york>

3. Evaluation/surveillance of exposure incidents

1. Identification of who is at risk for exposure
2. Identification of what devices cause exposure
 - a. ALL sharp devices can cause injury and disease transmission if not used and disposed properly.
 1. Devices with higher disease transmission risk (hollow bore), and
 2. Devices with higher injury rates (“butterfly” type IV catheters, devices with recoil action), blood glucose monitoring devices (lancet platforms/pens)
 3. Identification of areas/settings where exposures occur
 4. Circumstances by which exposures occur
 5. Post exposure management (see Element VI)

4. Engineering controls

1. Use safer devices whenever possible to prevent sharps injuries
 - a. Evaluate and select safer devices
 - b. Passive vs. active safety features
 - c. Mechanisms that provide continuous protection immediately
 - d. Integrated safety equipment vs. accessory devices
 1. Properly educate and train all staff on safer devices.
 2. Consider eliminating traditional or non-safety alternatives whenever possible.
 3. Explore engineering controls available for specific areas/settings.
2. Use puncture resistant containers for the disposal and transport of needles and other sharp objects.
 - a. Refer to published guidelines for the selection, evaluation and use (i.e.: placement) of sharps disposal containers.
 1. National Institute for Occupational Safety and Health (NIOSH) guidelines available at: <http://www.cdc.gov/niosh/topics/bbp/#prevent>
 2. NYSDOH recommendations “Household Sharps – Dispose of Them Safely”, available at: <http://www.health.state.ny.us/publications/0909.pdf>
 - b. Use splatter shields on medical equipment associated with risk prone procedures (i.e.: locking centrifuge lids).

D. Work Practice Controls

1. General Practices

- a. Hand hygiene including the appropriate circumstances in which alcohol-based hand sanitizers and soap and water hand washing should be used (see Element II)
- b. Proper procedures for cleaning of blood and body fluid spills:
 1. Initial removal of bulk material followed by disinfection with an appropriate disinfectant.
- c. Proper handling/disposal of blood and body fluids, including contaminated patient care items.
- d. Proper selection, donning, doffing, and disposal of personal protective equipment (PPE) as trained (see Element IV).
- e. Proper protection of work surfaces in direct proximity to patient procedure treatment area with appropriate barriers to prevent instruments from becoming contaminated with bloodborne pathogens.
- f. Preventing percutaneous exposures:
 1. Avoid unnecessary use of needles and other sharp objects.
 2. Use care in the handling and disposing of needles and other sharp objects.
 - a. Avoid recapping unless absolutely medically necessary.
 - b. When recapping, use only one-hand technique or safety device.
 - c. Pass sharp instruments by use of designated “safe zones”.
 - d. Disassemble sharp equipment by use of forceps or other devices.

E. Modify Procedures to Avoid Injury:

1. Use forceps, suture holders, or other instrument for suturing.
2. Avoid holding tissue with fingers when suturing or cutting.
3. Avoid leaving exposed sharps of any kind on a patient procedure/treatment work surface.
4. Appropriately use safety features
 - a. Always activate safety features
 - b. Never circumvent safety features

Reference:

CDC: Guidelines for Disinfection and Sterilization in Healthcare Facilities, 2008

CDC: Guidelines for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Setting, 2007

NYSDOH: Infection Prevention Training Updates for Elements III and V, August 2008

4. Element IV

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

1. Learning Objectives:

- a. Describe the circumstances which require the use of barriers and personal protective equipment (PPE) to prevent patient and healthcare worker (HCW) contact with potentially infectious material;
- b. Identify specific barriers and/or PPE for patient and HCW protection from exposure to potentially infectious material.

2. Definitions:

- a. **Personal Protective Equipment (PPE):** specialized clothing or equipment (i.e.: gloves, gowns, masks, goggles) worn by a HCW for protection against a hazard, (toxic or infectious).
- b. **Barrier:** Equipment such as gloves, gowns, aprons, masks, or protective eyewear, which when worn, can reduce the risk of exposure of the healthcare worker's skin or mucous membranes to potentially infective materials.

B. Types of PPE Criteria for Selection

1. Gloves:

- a. When to be worn: gloves must be worn for all anticipated hand contact with blood, potentially infectious body fluids, mucous membranes (oropharynx, GI, respiratory, and genitourinary tracts), non-intact skin or wounds, and when handling items contaminated with blood or body fluids. Gloves must be worn during all invasive procedures and all vascular access procedures, including all phlebotomies and insertion of IVs or other vascular catheters.
- b. Sterile and non-sterile gloves:
 1. Sterile gloves are required to prevent transmission of infection from HCW to patient in surgery and in other procedures associated with a high risk of infection due to interruption of normal host defenses. (i.e.: insertion of central venous catheters and urinary catheterization).
 2. Non-sterile gloves are used to reduce transmission of infection in situations where sterility is not required (i.e.: oral or vaginal examination, cleaning a spill, emptying suction containers, urine drainage bags, or bedpans) or where sterile technique does not necessitate sterile gloves (i.e.: phlebotomy, peripheral IV catheter insertion).





2. **Glove Material:**

- a. Latex, nitrile or vinyl gloves are used for most medical, dental, and laboratory procedures discussed above. Since gloves can be torn, they should be inspected prior to use. Disposable, single use gloves must be replaced as soon as practical if contaminated, punctured, or damaged during use. Double-gloving or puncture resistant liners can be used to decrease the risk of percutaneous injury and exposure to blood/body fluids.
- b. Latex Gloves: usually tan in color, more pliable with a tighter fit, but contain proteins that can cause HCW and patient allergies
- c. Vinyl Gloves: usually white in color, less irritation, not associated with allergy reactions, but are less pliable and do not fit as tightly.
- d. Nitrile Gloves: rubber based nitrile gloves are resistant to punctures, chemicals, blood products, nicks, and abrasions. They are not latex and allergy free.
- e. Utility gloves are used for heavy duty housekeeping chores. They may be decontaminated and reused unless they are cracked, peeling, torn, or punctured.
- f. Hypo-allergenic gloves or glove liners are available.

C. Cover Garb: Protective attire to prevent contamination of skin, mucous membranes, work clothes, and undergarments. (regular work clothes, uniforms, surgical scrubs are not considered protective attire).

1. **Types of cover garb:**

a. **Gowns (with sleeves) are worn:**

1. When splashing, spraying, spattering of blood/body fluids is anticipated,
2. When blood/body fluid contamination of arms is anticipated:
 - a. Aprons (no sleeves) may be worn for lesser degrees of exposure
 - b. Laboratory coats are worn in laboratory settings.



b. **Permeability characteristic/ definitions:**

1. Impervious: Fluids will not pass through
2. Fluid resistant: Resists penetration of fluids under most circumstances
3. Permeable: Easily penetrated by fluids

- c. **Choice of gown or apron** depends on the level of blood or body fluid exposure anticipated. Fluid resistant gowns are suitable for most situations; extra fluid resistant sleeves can be worn over a gown, and/or an impervious apron can be worn under a gown, to improve protection against soak-through during prolonged or high blood loss surgical procedures. Impervious gowns may be preferable for procedures with the highest risk of blood exposure. Impervious gowns may be less comfortable since the material does not breathe well.

2. Masks



a. Types of masks

1. **Surgical mask:** purpose is to protect the patient by preventing discharge of contaminated nasal and oral secretions from the wearer during a procedure, and thereby reduce risk of wound infection.
2. **Surgical or procedure mask with face shield:** purpose is to protect the wearer's eyes, nose and mouth from exposure to splattered or splashed blood or body fluids.
3. **Particulate respirator:** purpose is to filter out, and protect wearer from inhalation of airborne infectious particles of very small size. An OSHA class, N-95 respirator is an acceptable respirator for protection from small droplet inhalation such as with tuberculosis. Positive Air Purifying Respirators (PAPRs) may also be worn by those unable to be fitted with an N-95 type respirator.

b. Characteristics of masks:

1. **Filtration characteristics of the material:** surgical masks may effectively block discharge of large droplets into the air, but the material is not an effective filter to prevent inhalation of very small, aerosolized particles characteristic of TB and airborne diseases. Particulate respirators provide an increased level of filtration. A wet mask is less effective and should not be used.
 2. **Face Seal:** a tight seal around the edges of a particulate respirator is essential to its effectiveness. If loose fitting, contaminated air is drawn in around the edges of the mask with each inhalation, instead of the air being drawn through the filter. If face seal is not achieved or not possible, a PAPR can be used as an alternative.
- c. **Face shields:** protect eyes, nose, and mouth from exposure to blood or body fluids via splash, splatter, or spray.
- d. **Eye protection (goggles, safety glasses, or face shield):** should be worn during all major surgical procedures and whenever splashes/sprays of blood or body fluid may be generated. Ordinary glasses are not acceptable unless a solid side shield is added to the eyewear.
- e. **Shoe covers, leg covers, boots, and head covers** are appropriate attire whenever heavy exposure to blood/body fluids is anticipated, usually in surgery. Most situations such as these involve surgical procedures in which caps or hoods are already required for

sterility. Shoe/leg and head covers should be removed and discarded before leaving the operation room suite.

- f. **Other barriers:** (i.e.: application of wound dressings to reduce risk of exposure to blood/body fluids).

3. Choosing PPE based on reasonably anticipated interaction:

- a. Potential contact with blood or other potential infectious material via:
 1. Contact with any bleeding or drainage: use gloves plus impervious gown or apron.
 2. Blood/body fluid splashes, sprays, splatters: use gloves, (fluid resistant) gown, mask, and eye protection or face shield. These are appropriate for general surgery, obstetrics, and dentistry.
 3. Large droplet vs. airborne (aerosol) pathogen: gown, a face shield, or surgical mask plus eye protection, will protect against inoculation of large droplets or splatter into mouth, nose, and eyes. Optimal protection against airborne disease (i.e.: TB, influenza, measles, chickenpox) requires a particulate respirator (such as N-95 or PAPR).

4. Choose PPE base on volume of fluid expected:

- a. Minimal fluid expected may only require gloves.
- b. Large volumes of fluid expected, generating splashes, sprays, or splatters use (fluid resistant) gown, mask and eye or face protection with solid side shield to protect mouth, eyes, nose, and face and shoe covers. It is important to evaluate risk before performing a task, don appropriate PPE to protect yourself and the patient.

5. Choosing barriers/ PPE based on intended need:

- a. **Patient Safety:**
 1. **Select sterile barriers and PPE for invasive procedures :**(i.e.: sterile gowns, gloves, dressings in surgery). Maximum sterile barriers for central line insertion practices including mask, sterile gown, large sterile drape, sterile gloves and cap.
 2. **Select surgical masks for prevention** of droplet contamination from healthcare workers to patients' wounds or during any spinal injections. The mask provides a fluid barrier to protect the patient and healthcare worker from mucous membrane exposure.
- b. **Employee Safety:**
 1. Barriers for prevention of contamination. To protect yourself, it is essential to have a barrier between you and the potentially infectious material.
 2. Masks for prevention of exposure to communicable disease. Use appropriate mask to prevent an exposure. Surgical mask for (i.e.: influenza, meningitis), particulate respirator such as N-95 or PAPR is required for (i.e.: TB, measles, chickenpox, or during aerosol generating procedures).
 3. Healthcare workers must perform hand hygiene between patient and contact with patient's environment.

D. Guidance on Proper Utilization of PPE/Barriers:

1. Proper Fit

- a. Gloves: too small may tear; too large do not provide for required dexterity.
- b. Mask: must fit snugly around mouth and nose, with metal band molded across bridge of nose, and straps or ties in place. Mask becomes contaminated if hung around the neck, below the nose, or below the chin – must be discarded.
- c. Gowns: impervious or fluid resistant according to its use should cover skin and clothes.

2. Integrity of barrier: check for holes, tears, or damage before use

- a. Inspect PPE for tears or holes before use. Replace gloves as soon as practical if damaged during use.
- b. Masks should be replaced if damaged or wet.

3. Disposable vs. Reusable Barriers and PPE

- a. Disposable items should not be reused.
- b. Reusable items (PAPR) must be properly cleaned and reprocessed before reuse.
- c. Surgical masks are replaced after each use, and between patients. Particulate respirators are often used for longer periods of time, but should be replaced if damaged, soiled, or wet.
- d. All PPE, whether disposable or reusable, must be removed after the user completes the procedure they were intended for, before leaving the work area, and hands must be washed after removing gloves.

4. Potential for cross-contamination if PPE is not changed between patients

- a. Gloves, gowns, aprons, and surgical masks must be changed between patient contacts. Never wear the same gloves or other PPE patient-to-patient.

http://www.who.int/gpsc/5may/Glove_Use_Information_Leaflet.pdf

https://www.cdc.gov/handhygiene/PDF/CDC_HandHygiene_Brochure.pdf

<https://www.cdc.gov/oralhealth/infectioncontrol/faq/hand.htm>

<http://professionals.site.apic.org/files/2013/09/DosDonts-of-Gloves.pdf>

Hand hygiene must be performed before putting gloves on and after gloves are removed. Gloves do not completely prevent penetration of bacteria and viruses, and the moist environment inside a glove can provide growth of bacteria on the skin.

5. Under and over utilization of barriers and PPE

- a. Under-utilization places HCWs and patients at unnecessary risk.
- b. Over-utilization of barriers wastes resources, may intimidate patients, and may interfere with patient care.

6. Supply availability and accessibility

- a. General PPE: Protective equipment, including PPE for eyes, face, head, and extremities, protective clothing, respiratory devices, and protective shields shall be provided, used, and maintained in a sanitary and reliable condition wherever it is necessary by reason of hazards of process, infectious material, environment, chemical hazards, radiological hazards, or mechanical irritants encountered in a manner capable of causing injury or impairment in the function of any part of the body through absorption, inhalation, or physical contact. (29CFR 1910.132(a))

E. Appropriate user education: selection, donning, doffing, and disposal

1. Key Points about PPE

- a. Perform hand hygiene before and after donning and doffing
- b. Don before contact with the patient, generally before entering the room
- c. Remove and discard carefully in receptacles provided, either at the doorway or immediately outside patient room; remove respirator outside room

2. Sequence for donning PPE (contamination of PPE will affect sequence – be practical)

<https://www.cdc.gov/hai/pdfs/ppe/PPE-Sequence.pdf>

- a. Gown first
- b. Mask or respirator
- c. Goggles or Face Shield
- d. Gloves
 - 1. How to don a gown
 - a. Select appropriate type and size
 - b. Opening is in the back
 - c. Secure at neck and waist
 - d. If gown is too small, use two gowns (gown 1 ties in front/ 2 ties in back)
 - 2. How to don a mask
 - a. Place over nose, mouth and chin
 - b. Fit flexible nose piece over nose bridge
 - c. Secure on head with ties or elastic
 - d. Adjust to fit
 - 3. How to don a particulate respirator
 - a. Select a fit tested respirator
 - b. Place over nose, mouth, and chin
 - c. Fit flexible nose piece over nose bridge
 - d. Secure on head with elastic
 - e. Adjust to fit
 - f. Perform a fit check

1. Inhale – respirator should collapse
2. Exhale – check for leakage around face
4. How to don eye and face protection
 - a. Position goggles over eyes and secure to the head using the ear pieces or headband
 - b. Position face shield over face and secure on brow with headband
 - c. Adjust to fit comfortably
5. How to don gloves
 - a. Don gloves last
 - b. Select correct type and size
 - c. Insert hands into gloves
 - d. Extend gloves over isolation gown cuffs
 1. In addition to wearing PPE, you should also use safe work practices
 - a. Keep gloved hands away from face
 - b. Avoid touching or adjusting other PPE
 - c. Remove gloves if they become torn; perform hand hygiene before donning new gloves
 - d. Limit surfaces and items touched

3. Sequence for doffing PPE

- a. Gloves
- b. Face shield or goggles
- c. Gown
- d. Masks or Respirator
 1. How to remove gloves
 - a. Grasp outside edge near wrist
 - b. Peel away from hand, turning glove inside-out
 - c. Slide ungloved fingers under the wrist of the remaining glove
 - d. Peel off from inside, creating a bag for both gloves
 - e. Discard in waste container
 2. How to remove goggles or face shield
 - a. Grasp ear or head pieces with ungloved hands
 - b. Lift away from face
 - c. Place in designated receptacle for reprocessing or disposal
 3. Removing gown
 - a. Unfasten ties
 - b. Peel gown away from neck and shoulder
 - c. Turn contaminated outside toward the inside
 - d. Fold or roll into a bundle
 - e. Discard in waste container as appropriate

4. Removing a mask
 - a. Untie the bottom, then top tie
 - b. Remove from face
 - c. Discard into designated waste container
5. Removing a particulate respirator (outside of patient's room)
 - a. Lift the bottom elastic over your head first
 - b. Then lift off the top elastic (done slowly to prevent respirator from "snapping" off the face)
 - c. Discard into waste container (outside of patient's room)

F. Hand Hygiene

1. Perform hand hygiene immediately after removing PPE

- a. If hands become visibly contaminated during PPE removal, wash hands before continuing to remove PPE.

G. Guidance for specific PPE requirements in the event of an emerging novel infectious disease: Follow local/state/federal health department recommendations

References:

https://www.health.ny.gov/diseases/communicable/influenza/seasonal/providers/prevention_of_influenza_transmission/

CDC PPE Use in Healthcare Settings

OSHA 29 CFR 1910.132(a)

5. Element V

A. 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

1. Learning Objectives

- a. At the conclusion of coursework or training on this element, the learner will be able to :
 1. Define cleaning, disinfection, and sterilization;
 2. Differentiate between non-critical, semi-critical, and critical medical devices
 3. Describe the three(3) levels of disinfection (i.e.: low, intermediate, high)
 4. Recognize the importance of the correct application of reprocessing methods for assuring the safety and integrity of patient care equipment in preventing transmission of bloodborne pathogens
 5. Recognize the professional's responsibility for maintaining a safe patient care environment in all healthcare settings

6. Recognize strategies for, and importance of, effective and appropriate pre-cleaning, chemical disinfection, and sterilization of instruments and medical devices aimed at preventing transmission of bloodborne pathogens

2. Definitions

- a. **Contamination:** the presence of microorganisms (i.e.: bacteria, viruses) on an item or surface (i.e.: blood pressure cuff, surgical instruments)
- b. **Cleaning:** the process of removing all foreign material (i.e.: dirt, body fluids, lubricants) from objects by using water and detergents or soap and washing or scrubbing the object.
- c. **Critical Device:** an item that enters sterile tissue or the vascular system (i.e.: intravenous catheters, needles for injections, surgical items). These must be sterile prior to contact with tissue.
- d. **Decontamination:** the use of physical or chemical means to remove, inactivate, or destroy bloodborne pathogens on a surface or item to the point where they are no longer capable of transmitting infectious particles.
- e. **Disinfection:** the use of chemical procedures that eliminates virtually all recognized pathogenic microorganisms but not necessarily all microbial forms (i.e.: bacterial endospores) on inanimate objects.
- f. **High Level Disinfection:** disinfection that kills organisms, except high levels of bacterial spores, and is effected with a chemical germicide cleared for marketing as a sterilant by the US Food and Drug Administration (FDA).
- g. **Intermediate Level Disinfection:** disinfection that kills mycobacteria, most viruses, and bacteria with a chemical germicide registered as a “tuberculocidal” by the US Environmental Protection Agency (EPA).
- h. **Low Level Disinfection:** disinfection that kills some viruses and bacteria with a chemical germicide registered as a hospital disinfectant by the EPA.
- i. **Non-Critical Device:** an item that contacts intact skin but not mucous membranes (i.e.: blood pressure cuffs, oximeters). It requires low-level disinfection.
- j. **Semi-critical Device:** an item that comes in contact with mucous membranes or non-intact skin and minimally requires high-level disinfection (i.e.: oral thermometers, vaginal specula).
- k. **Sterilization:** the use of a physical or chemical procedure to destroy all microbial life, including highly resistant bacterial endospores.

B. Cleaning of patient-care devices

1. In hospitals, perform most cleaning, disinfection, and sterilization of patient-care devices in a central processing department in order to more easily control quality.
2. Meticulously clean patient-care items with water and detergent, or with water and enzymatic cleaners before high-level disinfection or sterilization procedures.

3. Remove visible organic residue (i.e.: residue of blood and tissue) and inorganic salts with cleaning. Use cleaning agents that are capable of removing visible organic and inorganic residues. Clean medical devices as soon as practical after use (i.e.: at the point of use) because soiled materials become dried onto the instruments.
4. Dried or baked materials on the instrument make the removal process more difficult and the disinfection or sterilization process less effective or ineffective.
5. Perform either manual cleaning (i.e.: using friction) or mechanical cleaning (i.e.: with ultrasonic cleaners, washer-disinfector, washer-sterilizers).
6. If using an automatic washer/disinfector, ensure that the unit is used in accordance with the manufacturer's recommendations.
7. Ensure that the detergents or enzymatic cleaners selected are compatible with the metals and other materials used in medical instruments. Ensure that the rinse step is adequate for removing cleaning residues to levels that will not interfere with subsequent disinfection/sterilization process.
8. Inspect equipment surfaces for breaks in integrity that would impair either cleaning or disinfection/sterilization. Discard or repair equipment that no longer functions as intended or cannot be properly cleaned, and disinfected or sterilized.

C. Indications for sterilization, high-level disinfection, and low-level disinfection

1. Before use on each patient, sterilize critical medical and surgical devices and instruments that enter normally sterile tissue or the vascular system or through which a sterile body fluid flows (i.e.: blood).
2. Before use on each patient, provide, at a minimum, high-level disinfection for semi-critical patient-care equipment (i.e.: gastrointestinal endoscopes, endotracheal tubes, anesthesia breathing circuits, and respiratory therapy equipment) that touches either mucous membranes or non-intact skin.
3. Perform low-level disinfection for non-critical patient-care surfaces (i.e.: bedrails, over-the-bed table) and equipment (i.e.: blood pressure cuff) that touch intact skin.

D. Selection and use of low-level disinfectants for noncritical patient-care devices

1. Process non-critical patient-care devices using a disinfectant and the appropriate concentration of germicide.
2. Disinfect non-critical medical devices (i.e.: blood pressure cuff) with an EPA registered hospital disinfectant using the label's safety precautions and use directions.
3. Ensure that, at a minimum, non-critical patient-care devices are disinfected when visibly soiled and on a regular basis (such as after use on each patient or once daily or once weekly).
4. If dedicated, disposable devices are not available, disinfect non-critical patient-care equipment after using it on a patient and before using this equipment on another patient.

E. Methods of sterilization

1. Steam is the preferred method for sterilizing critical medical and surgical instruments that are not damaged by heat, steam, pressure, or moisture.
2. Cool steam or heat sterilized items before they are handled or used in the operative setting.
3. Follow the sterilization times, temperatures, and other operating parameters (i.e. gas concentration, humidity) recommended by the manufacturers of the instruments, the sterilizer, and the container or wrap used, and that are consistent with guidelines published by government agencies and professional organizations.
4. Use low-temperature sterilization technologies (i.e.: EtO, hydrogen peroxide gas plasma) for reprocessing critical patient-care equipment that is heat or moisture sensitive.
5. Sterilization using the peracetic acid immersion system can be used to sterilize heat sensitive immersible medical and surgical items.
6. Critical items that have been sterilized by the peracetic acid immersion process must be used immediately (i.e.: items are not completely protected from contamination, making long-term storage unacceptable).
7. Dry heat sterilization (i.e.: 340°F for 60 minutes) can be used to sterilize items (i.e.: powders, oils) that can sustain high temperatures.
8. Comply with the sterilizer manufacturer's instructions regarding the sterilizer cycle parameters (i.e.: time, temperature, concentration).
9. Because narrow lumen devices provide a challenge to all low temperature sterilization technologies and direct contact is necessary for the sterilant to be effective, ensure that the sterilant has direct contact with contaminated surfaces (i.e.: scopes processed in peracetic acid must be connected to channel irrigators).

F. Packaging

1. Ensure that packaging materials are compatible with the sterilization process and have received FDA 510(K) clearance.
2. Ensure that packaging is sufficiently strong to resist punctures and tears to provide a barrier to microorganisms and moisture.

G. Storage of Sterile Items

1. Ensure the sterile storage area is a well-ventilated area that provides protection against dust, moisture, insects, and temperature and humidity extreme.
2. Store sterile items so that packaging is not compromised (i.e.: punctured, bent).
3. Label sterilized items with a load number that indicates the sterilizer used, the cycle or load number, the date of sterilization, and, if applicable, the expiration date.
4. The shelf life of a packaged sterile item depends on the quality of the wrapper, the storage conditions, the conditions during transport, the amount of handling, and other events (moisture)

that compromise the integrity of the package. If event-related storage of sterile items is used, evaluate packages before use for loss of integrity (i.e. torn, wet, or punctured). The pack can be used unless the integrity of the packaging is compromised.

5. If the integrity of the packaging is compromised (i.e.: torn, worn or punctured), repack and reprocess the pack before use.
6. If time related storage of sterile items is used, label the pack at the time of sterilization with an expiration date. Once this date expires, reprocess the pack.

H. Reuse of single-use medical devices

1. Adhere to the FDA enforcement document for single-use devices reprocessed by hospitals. FDA considers the hospital that reprocesses a single-use device as the manufacturer of the device and regulates the hospital using the same standards by which it regulates the original equipment manufacturer.

I. Potential for contamination is dependent upon:

1. Type of instrument, medical device, equipment, or environmental surface:

- a. Potential for external contamination (i.e.: presence of hinges, crevices, use of blood pressure cuffs from one patient to another).
- b. Potential for internal contamination (i.e.: presence of lumens, exposure to blood/body fluids).
- c. Physical composition, design, or configuration of the instrument, medical device, equipment, or environmental surface.
- d. Frequency of hand contact with instrument, medical device, equipment, or environmental surface.
- e. Potential for contamination with body substances or environmental sources of microorganisms.
- f. Potential for contamination from outdated or damaged supplies.

J. Level of contamination is dependent upon:

1. Types of microorganisms (i.e.: bacteria, viruses, spores)
2. Number of microorganisms
3. Potential for cross-contamination and the identification of practices which can contribute to touch contamination
 - a. Clean and dirty work areas should be separated to reduce cross contamination of supplies
 - b. Environmental cleaning must be performed on a regular basis to reduce the microbial load on surfaces.
 - c. Hand hygiene must be performed before and after the touching of environmental surfaces.

K Choice/level of reprocessing sequence

1. Based on intended use (see definitions):

- a. Critical instruments and medical devices (i.e.: surgical instruments) that require sterilization (i.e.: thermal, chemical, sterrad)
 1. Enter sterile tissue or vascular system
 2. Pre-cleaning is critical
 3. Maintain sterility until use
- b. Semi-critical instrument and medical devices (i.e.: vaginal specula, scopes) minimally require high level disinfections
 1. Contact mucous membranes
 2. Contact non-intact skin
- c. Non-critical instruments and medical devices (i.e.: blood pressure cuffs) minimally require cleaning and low level disinfection
 1. Contact intact skin

2. Based on manufacturer's recommendations:

- a. Compatibility among equipment components, materials, and chemical used
- b. Equipment heat and pressure tolerance
- c. Time and temperature requirements for reprocessing

L. Recognizing potential sources of cross-contamination in the healthcare environment

1. Surfaces or equipment which requires cleaning between patient procedures/treatments.
2. Practices that contribute to hand hygiene contamination and the potential for cross-contamination.
3. Consequences of reuse of single use/disposable instruments, medical devices or equipment.
4. Factors that have contributed to contamination in reported cases of disease transmission.
5. At any point during reprocessing or handling, breaks in infection control practices can compromise the integrity of instruments, medical devices or equipment.
6. Any environmental surface, equipment, or device contaminated with blood or body fluids should be cleaned and disinfected immediately.

M. Factors that have contributed to contamination in reported cases of disease transmission

1. At any point during the reprocessing or handling, breaks in infection control practices can compromise the integrity of instruments, medical devices or equipment.
2. Any environmental surface, equipment, or device contaminated with blood or body fluids should be cleaned and disinfected immediately.
3. Failure to reprocess or dispose of items between patients (i.e.: cleaning of blood pressure cuffs

between patient use resulting in the transmission of multidrug resistant organism).

4. Inadequate cleaning (i.e.: commodes that have not been cleaned adequately can contribute to the transmission of Clostridium difficile).
5. Inadequate disinfection or sterilization (i.e.: surgical instruments that have not followed manufacturer's guidelines for disinfection and sterilization can lead to an increase in post-operative wound infections).
6. Contamination of disinfectant or rinse solutions (i.e.: pseudomonas contaminated disinfectant causing the contamination of bronchoscopes).
7. Improper packaging, storage and handling (i.e.: stacking of heavy surgical equipment resulting in tears in the wraps making the item unsterile).
8. Inadequate/inaccurate record keeping of reprocessing requirements.

The CDC recommendations for reprocessing are presented below.

Equipment Reprocessing Guidelines

Risk of Infection	Use of Device	Examples of Devices	Procedure Before Use
Non-Critical	Contacts intact skin, but not mucous membranes	Crutches; bed board; blood pressure cuffs	Intermediate to low level disinfection
Semi-Critical	Contacts mucous membranes or non-intact skin	non-invasive flexible and rigid fiber-optic endoscopes, endotracheal tubes; anesthesia breathing circuits; cystoscopes	Sterilization if feasible or at least high level disinfection
Critical	Enters normally sterile tissue or vascular system	Surgical instruments, cardiac catheters; implants; pertinent components of heart lung oxygenators, blood component of hemodialyzers; laparoscopes; bronchoscopes	Sterilization

Note: The CDC recommends that scopes be sterilized, if feasible, and if sterilization is not feasible, high level disinfection should be utilized <http://www.cdc.gov/hicpac/pdf/Flexible-Endoscope-Reprocessing.pdf>

CDC: Guidelines for Disinfection and Sterilization in Healthcare Facilities, 2008
 APIC Text of Infection Control and Epidemiology, 4th Edition, 2014

6. Element VI

A. Prevention and control of infectious and communicable diseases in healthcare workers

1. Learning Objective:

- a. Recognize the role of Occupational Health Strategies in protecting healthcare workers (HCWs) and patients.
- b. Recognize non-specific disease findings which should prompt evaluation of HCWs.
- c. Identify occupational health strategies for preventing the transmission of bloodborne pathogens, tuberculosis (TB) to healthcare workers.
- d. Identify resources for evaluation of HCWs infected with HIV, HBV, and HCV.

2. Definitions:

- a. **Infectious Disease:** a clinically manifested disease of man or animal resulting from infection.
- b. **Communicable Disease:** an illness due to specific infectious agent which is acquired through transmission of that agent from an infected person, animal, or inanimate reservoir to a susceptible host.
- c. **Occupational Health strategies:** as applied to Infection Prevention, a set of activities intended to assess, prevent, and control infections and communicable diseases in HCWs.

B. Overview of occupational health strategies for infection prevention.

1. Goals of occupational health strategies:

- a. Prevent disease transmission from HCWs to patients and staff
- b. Protect susceptible HCWs from infectious or communicable diseases.

2. Strategies to assess HCWs for disease risks:

a. Pre-placement and periodic health assessments:

1. Immunization/screening programs are targeted at several diseases and provide protection from vaccine-preventable diseases for both HCW and those under their care. The US. Public Health Services Advisory Committee on Immunization Practices (ACIP) addresses recommended immunization practices.
2. Immunizations for Healthcare Personnel:

<https://www.cdc.gov/vaccines/schedules/downloads/adult/adult-combined-schedule.pdf>

a. **Hepatitis A:** Indicated for Laboratory and those working with primates.

Transmission is facilitated by intimate personal contact (household, sexual, etc.) poor hygiene, unsanitary conditions, or contaminated water, milk, food, especially raw shellfish. Additional risk factors include childcare exposure, intravenous drug use, travel to an endemic area, chronic institutionalization, men who have sex with men, and occupation (sewage worker, pediatric nurse).

b. **Hepatitis B (HBV):** HBV vaccination is highly recommended; must be offered at no

charge to all HCWs whose work involves risk of exposure to blood/body fluids.

- c. **Influenza:** Indicated for persons caring for high-risk patients. Annual immunization is recommended. The NYS Public Health and Health Planning Council (PHHPC) adopted the “Prevention of Influenza Transmission by Healthcare and Residential Facility and Agency Personnel” regulation, under its authority located in Public Health Law Sections 225, 2800, 2803, and 4010. The regulations require that facilities document the influenza vaccination status of all personnel to which the regulations apply each year and require unvaccinated personnel to wear a surgical mask at all times while in areas where patients or residents may be present during periods that the Commissioner of Health determines increased influenza activity is underway. Additional information can be found:
https://www.health.ny.gov/professionals/nursing_home_administrator/dal_nh_13-04_flu_mask_requirement.htm
- d. **Rubeola (measles):** Adults born after 1957 without a history of physician diagnosed measles serological immunity, or documentation of having received 2 doses of vaccine.
- e. **Mumps:** Adults born after 1957 without a history of physician diagnosed measles serological immunity, or documentation of having received 2 doses of vaccine.
- f. **Rubella (German measles):** Indication: Unimmunized women of childbearing age and health care personnel. Documentation of immunity (1 dose of vaccine or positive antibody titer) required of all HCWs born in 1957 or later.
- g. **Polio:** laboratory and other healthcare personnel who come in contact with the live virus. Immunization schedule: First 2 doses separated by 4 to 6 weeks, and the third dose 6-12 months after the second dose.
- h. **Td (tetanus and diphtheria):** person without history and an unknown history of Td immunizations or > 10 years since last dose.
- i. **Tdap (tetanus, diphtheria, and pertussis):** Healthcare personnel with direct patient contact, healthy adults 19-64 or close contacts of those <1 year of age. Immunization schedule: 1 time dose.
- j. **Varicella (chickenpox):** vaccine is indicated for HCWs who do not have either a reliable history of varicella or serologic evidence of immunity, particularly indicated for HCW who have contact with persons at high risk for serious complications.
- k. **Tuberculosis Screening:**
 - 1. Tuberculosis (TB): Baseline TB screening of employees should be conducted with an approved test. The tuberculin skin test (TST) can be used to screen for tuberculosis infection, using the Mantoux method with 5 tuberculin units of purified protein derivative (PPD). Mantoux test results can only be interpreted by trained competent HCW. Any employee found to be positive upon initial TB screening should undergo a clinical evaluation, including a baseline chest x-ray

examination. If previously negative, the TST or QFT (QuantiFERON-TB Gold Test) should be performed. If previously positive, a screen for symptoms should be performed and the employee evaluated as appropriate. Routine, annual follow-up chest x-rays are not required.

2. Screening for other communicable diseases
 - a. Health assessments (history and physicals) on hire annually
3. Symptoms requiring immediate evaluation by a licensed medical professional and possible restriction from patient care activities and return to work
 - a. Fever
 - b. Cough
 - c. Rash
 - d. Vesicular lesions, weeping dermatitis
 - e. Draining wounds, open exposed sores
 - f. Diarrhea or vomiting
4. Management strategies for potentially communicable conditions
 - a. Appropriate evaluation and furlough
 - b. Limiting contact with susceptible (close patient contact)
 - c. Furlough until non-infectious
5. Specific occupational strategies for prevention and control and bloodborne pathogen transmission.
 - a. Healthcare worker exposure risk education:
 1. Potential agents (HBV, HCV, HIV)
 - a. Prevention Strategies:
 1. HBV vaccination (including safety, efficacy, components, and recommendations for use);
 2. Hand hygiene;
 3. Appropriate PPE and barrier precautions;
 4. Sharps safety;
 5. Standard and Universal Precautions.
6. Post-exposure evaluation and management
 - a. Bloodborne pathogens:
 1. Prompt evaluation by licensed medical professional
 2. Risk assessment in occupational exposures
 3. Recommendations for approaching source patient and healthcare worker evaluations
 4. Recommendations for post-exposure prophylaxis emphasizing the most current NYSDOH and CDC Guidelines
 5. Post-exposure management of patients and other healthcare workers when exposure is a healthcare worker:

- a. Professional obligation to inform patients exposed to a healthcare worker's blood or other potentially infectious material.
 - 1. Tuberculosis:
 - a. Recommendations for post-exposure prophylaxis emphasizing the most current NYS guidelines.
 - 2. Varicella, Measles, Mumps, Rubella, Pertussis:
 - a. Consult the most current Federal, State, or Local requirements for post-exposure evaluation and management
- 7. Notification of Healthcare Workers/ Public
 - a. Evaluation of healthcare workers infected with HIV, HBV, and/ or HCV or other bloodborne pathogens.
 - 1. Review NYSDOH policy on HIV testing of healthcare workers.
<http://www.health.ny.gov/diseases/aids/providers/testing/index.htm>
 - 2. Criteria for evaluating infected healthcare workers for risk of transmission.
 - a. Nature and scope of professional practice;
 - b. Techniques used in performance of procedures that may pose a transmission risk to patients;
 - c. Assessed compliance with infection control standards;
 - d. Presence of weeping dermatitis, draining or open skin wounds;
 - e. Overall health:
 - 1. Physical Health
 - 2. Cognitive Health
 - 3. Expert panels for evaluation of healthcare workers infected with bloodborne pathogens.

Reference: APIC Text of Infection Control and Epidemiology, 4th Edition, 2014 – Chapter 103

Reference: https://www.health.ny.gov/professionals/hospita_administrator/letters/2009/2009-01-08_tb_screening.htm

https://www.health.ny.gov/professionals/nursing_home_administrator/docs/dal_06-03_guidelines_for_tuberculosis_control.pdf

7. Element VII

A. Sepsis Awareness and Education

1. Learning Objective:

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

2. Definitions:

NYSDOH: <https://www.health.ny.gov/diseases/conditions/sepsis/>
https://www.health.ny.gov/press/reports/docs/2015_sepsis_care_improvement_initiative.pdf

Sepsis - a clinical syndrome in which patients have an infection that is accompanied by signs of a systemic response.

Severe Sepsis - sepsis of sufficient severity that the function of major organ systems in the body (such as heart, kidney, brain and others) is impaired. (Reported to NYSDOH and CMS) (NYS DOH, n.d.-a)

Septic Shock - Patients with severe sepsis that have continued organ system impairment and/or low blood pressure that does not respond to treatment with adequate fluid replacement. (Reported to NYSDOH and CMS) (NYS DOH, n.d.-a)

NYSDOH: https://www.health.ny.gov/regulations/public_health_law/section/405/

8 (ii) Definitions: **Severe Sepsis for pediatrics** is defined as sepsis plus one of the following: cardiovascular organ dysfunction or acute respiratory distress syndrome (ARDS) or two or more organ dysfunctions-consistent with International Pediatric Sepsis Consensus Conference definition. (Reported to NYSDOH) (NYS DOH, n.d.-a)

Some of the Sepsis Advocacy Groups are:

Get Ahead of Sepsis is the CDC's national effort to improve sepsis care through early suspicion/ recognition and timely treatment, as well as preventative initiatives aimed at infections that could lead to sepsis. (CDC, 2018b)

<https://www.cdc.gov/sepsis/get-ahead-of-sepsis/index.html>

New York State Sepsis Care Improvement Initiative: A statewide quality improvement initiative to improve early detection and intervention for patients with sepsis to decrease mortality and improve measures of care. This initiative requires hospital sepsis protocols with data submission to NYS, including clinical case information. Statewide rates and trends and hospital-specific rates and trends are reported. See Hospital Quality Performance Reports:

[New York State Report on Sepsis Care Improvement Initiative: Hospital Quality Performance 2016 Report \(PDF\)](#)

https://www.health.ny.gov/press/reports/docs/2015_sepsis_care_improvement_initiative.pdf

Sepsis Alliance: Largest advocacy organization in the U.S., established in 2007 to save lives and reduce suffering by raising awareness of sepsis as a medical emergency among the general public and healthcare professionals. (Sepsis Alliance, n.d.-a) <https://www.sepsis.org/sepsis/definition/>

Surviving Sepsis Campaign (SSC): An international collaborative (a workgroup of the Society for Critical Care Medicine and the European Society of Intensive Care Medicine) recommending resuscitation and management care bundles for the recognition and treatment of severe sepsis/septic shock. These guidelines were last updated in 2016. (Rhodes et al., n.d.) <https://www.sepsis.org/sepsis/definition/>

Surviving Sepsis Campaign Guidelines:

<https://link.springer.com/article/10.1007/s00134-017-4683-6>

The Rory Staunton Foundation for Sepsis Prevention: Advocacy organization established in April, 2012 after the death of their child, to ensure that no other child or young adult dies of sepsis resulting from the lack of a speedy diagnosis and immediate medical treatment. (Rory Staunton Foundation, n.d.).

<https://rorystauntonfoundationforsepsis.org/about-our-foundation-2/>

I. **Sepsis-scope of the problem (prevalence and mortality)**

<https://rorystauntonfoundationforsepsis.org/wp-content/uploads/2018/04/RSF-Sepsis-Fact-Sheet-2018.pdf>

- a) Sepsis is a life-threatening medical emergency that requires early recognition and intervention. Sepsis begins outside the hospital for the vast majority (nearly 80%) of sepsis patients (Reinhart et al., 2017). Pediatric experts estimate about 55 percent of patients develop sepsis before they get to the hospital (Children’s Hospital Association, 2016a). Sepsis can start with something as simple as a scrape or as complex as surgery.
- b) Sepsis Around the Globe:
 - An estimated 30 million people around the world each year have Sepsis and
 - At least 6 million people die. (Reinhart et al., 2017)
 - In the developing world, sepsis accounts for between 60-80% of deaths per year,
 - More than 6 million newborns and children will have Sepsis every year (Kissoon et al., 2011)
- c) Sepsis in the United States:
 - More than 1.5 million people in the United States develop sepsis each year. (CDC, 2018a)
 - Over 250,000 people die each year from sepsis in the United States (CDC, 2018a).
 - The rate of Sepsis is increasing at a rate of about 10% each year in the United States. This is largely due to an aging population (Rhee et al., 2017).
 - One in five severe sepsis patients are readmitted to hospital within 30 days.
 - Among those readmitted within 30 days, 40% will have another episode of severe sepsis on readmission (Donnelly, Hohmann, & Wang, 2015).

- Sepsis is the #1 cause of hospital inpatient mortality:
 - Sepsis is the leading cause of death in U.S. hospitals. (CDC, 2018a)
 - As many of half of all patients who die in U.S. hospitals have sepsis. (Liu et al., 2014)
 - Approximately 5,000 children in the United States die each year from sepsis (Children’s Hospital Association, 2016a)
 - Every hour delay in antibiotic administration increases mortality by 8% (Children’s Hospital Association, 2016a)
- #1 most expensive diagnosis in hospital (excluding live childbirth) –
 - Sepsis is the most expensive condition treated in U.S. hospitals, costing nearly \$24 billion annually.
 - Sepsis is THE most expensive condition billed to Medicare (Torio & Moore, 2016). And the cost of sepsis is increasing annually by a rate of 11.9%. (Torio & Andrews, 2013)
 - The economic cost of treating pediatric sepsis is estimated to be \$4.8 billion annually (Randolph & McCulloh, 2014)

d) Sepsis and Children:

- Sepsis is the leading cause of death for infants and children worldwide (Randolph & McCulloh, 2014).
- 40,000 children in the United States are hospitalized each year with sepsis (Children’s Hospital Association, 2016a).
- Nearly half (47%) need to be readmitted to the hospital at least once after surviving sepsis (Sepsis Alliance, n.d.-b)
- 38% of children who survive sepsis sustain lifelong disabilities (Children’s Hospital Association, 2016b).

e) Sepsis in NYS: <https://www.health.ny.gov/diseases/conditions/sepsis/>

- Severe sepsis and septic shock impact approximately 50,000 patients in NYS each year.
- On average almost 30% of patients died from this syndrome prior to the implementation of the New York State Sepsis Care Improvement Initiative. Of the pediatric patients, approximately 9% die in the hospital (Friedrich, 2017).
- In addition, many more may experience lifelong impairments because of the broad impact that sepsis may have on organ and tissue function. Per the Sepsis Alliance, up to 50% of survivors suffer from post-sepsis syndrome. This includes dialysis, nerve damage, and etcetera (Sepsis Alliance, n.d.-a). <https://www.sepsis.org/sepsis/definition/>

II. New York State Sepsis Improvement Initiative and Rory Staunton’s Law

a) Purpose

- i. Early recognition of sepsis is the responsibility of all healthcare providers.
 1. Most sepsis cases are community-acquired
 2. 7 in 10 patients with sepsis had recently used healthcare services or had chronic conditions requiring frequent medical care.
 3. Sepsis awareness and education is included as part of required course work or training in infection control practices stipulated in:

- a. NYS Public Health Law § 239-a
https://www.health.ny.gov/regulations/public_health_law/section/239/
 - b. Education Law § 6505-b
https://newyork.public.law/laws/n.y._education_law_section_6505-b
- b) Hospital regulations
- i. Required reporting to NYSDOH & Centers for Medicare and Medicaid Services on sepsis bundle use and outcomes. Refer to:
<https://www.cdc.gov/sepsis/clinicaltools/index.html>
 - ii. Rory's Regulations: 10 NYCRR 405.2 and 405.4 were implemented in 2013. They require hospitals in New York State to adopt evidenced-based sepsis protocols to ensure early diagnosis and treatment of sepsis, provide sepsis education to staff, and report metrics on the care of Sepsis patients that have organ dysfunction (Severe Sepsis and Septic Shock) within the healthcare system. This is the beginning of the New York State Sepsis Care Improvement Initiative. Rory's Regulation and this improvement initiative are largely due to the advocacy of the Rory Staunton Foundation.
Refer to Sepsis Regulations: Guidance Document 405.4 (a)(4)
https://www.health.ny.gov/regulations/public_health_law/section/405/
- c) NYS Sepsis Improvement Goals
<http://hca-nys.org/wp-content/uploads/2017/11/NYS-Dept-of-Health-Innovation-Initiatives.pdf>
- Increase the capacity of clinicians in NYS to recognize and treat sepsis
 - Reduce adverse outcomes
 - Decrease variation for sepsis mortality between hospitals

III. Causes of Sepsis

An **INFECTION** occurs when germs enter a person's body and multiply, causing illness, organ and tissue damage, or disease. If that infection isn't stopped, it can cause a life-threatening condition called **SEPSIS**.

<https://www.cdc.gov/sepsis/basic/index.html>

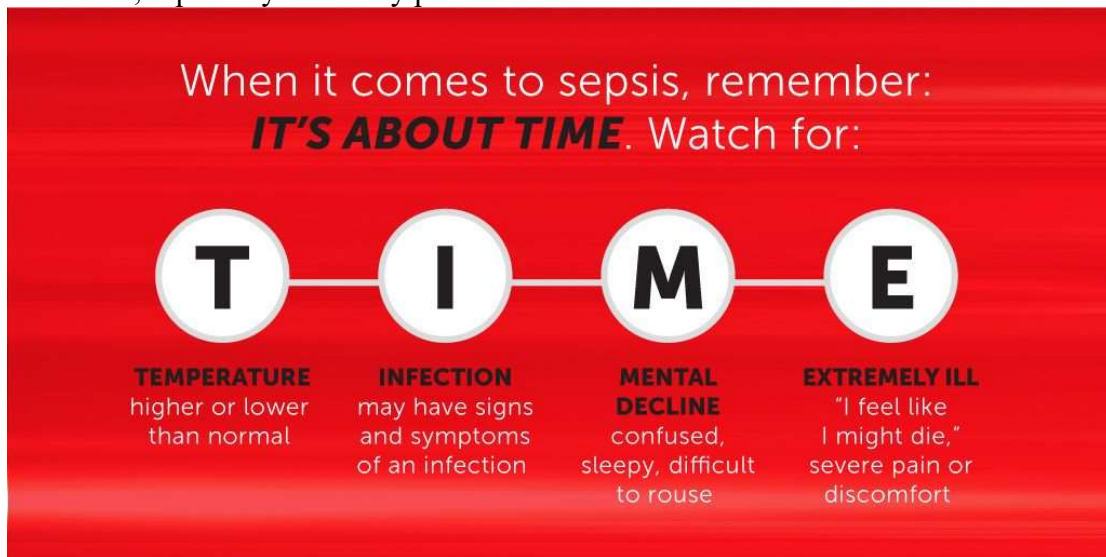
- i. Any infection can trigger sepsis
- ii. There are populations at increased risk of developing sepsis
 1. extremes of age – pediatrics (children younger than one); adults 65 and older
 2. chronic medical conditions (e.g., diabetes, lung disease, cancer, and kidney disease)
 3. people with weakened immune systems (e.g., COPD, RA, transplants)
 4. Asplenia including those with sickle-cell disease or status post- splenectomy
 5. patients with indwelling lines (e.g., PICC lines, broviacs, ports) and devices (e.g., Cochlear implants, baclofen pumps) can also be at risk for invasive infections
- iii. While any infection CAN cause Sepsis, most cases of sepsis will originate in the:
 - lungs (pneumonia),
 - kidneys or urinary tract (urinary tract infection),
 - skin, and
 - gut
- iv. The source of the infection is an important determinant of antibiotic treatment and clinical outcomes. The most frequently identified pathogens that cause sepsis in adults are:

- *Staphylococcus aureus* (staph),
 - *Escherichia coli* (*E.coli*), and
 - *Streptococcus*, Group A or B.
2. In pediatric age group common causes of sepsis include
 - *Streptococcus pneumoniae*,
 - *Neisseria meningitidis*, and
 - *Staphylococcus aureus*.
 3. Sepsis in the neonate (< 1 month old) is usually caused by
 - *Streptococcus agalactiae* (group B *Streptococcus*) and
 - Less commonly, *Escherichia coli*.

https://www.cdc.gov/sepsis/pdfs/hcp/HCP_infographic_protect-your-patients-from-sepsis-P.pdf

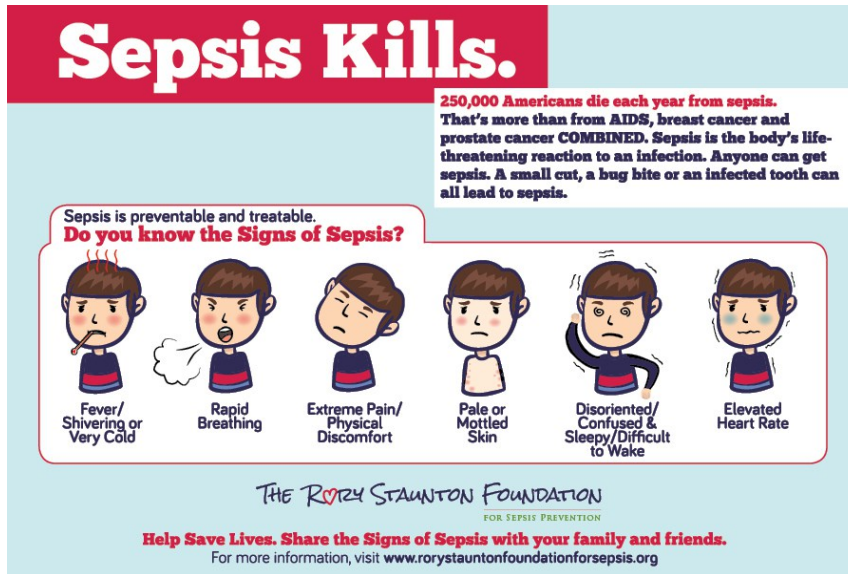
IV. Early Recognition of Sepsis

Manifestations of sepsis may be subtle and vary by types of infections and populations – symptoms of sepsis are usually non-specific and include fever, chills, and constitutional symptoms of fatigue, malaise, anxiety, or confusion. Symptoms may be absent in serious infections, especially in elderly patients.



<https://www.sepsis.org/sepsis/symptoms/>

- a) Signs and symptoms that may be associated with sepsis in persons with confirmed or suspected infection can include: <https://www.cdc.gov/sepsis/basic/index.html>
 - i. Altered mental state, shortness of breath, fever, or shivering or feeling very cold, decreased temperature, clammy or sweaty skin, extreme pain or discomfort, high heart rate, less urine production than normal



https://i0.wp.com/rorystauntonfoundationforsepsis.org/wp-content/uploads/2015/10/SepsisKills_Web_100ppi.jpg?ssl=1

ii. Signs and symptoms:

Pediatrics – Difficulty in recognizing pediatric sepsis: symptoms – like less interest in feeding or playing, fever, lethargy, vomiting or diarrhea, low BP, fast heart rate, SOB or trouble breathing, or irritable or confused - can mimic a number of other common illnesses; few pediatric patients present with the same – or same number of – symptoms; there is no one indicator for sepsis; sepsis has a low awareness; providers and families may not even consider it as a possibility; there are no specific tests that point to sepsis.

<https://www.childrenshospitals.org/Quality-and-Performance/Quality-Improvement/Sepsis/Resources/Sepsis-Fact-Sheet>

The elderly - may not show typical signs of infection but they may show a sudden change in mental status, becoming confused, or a worsening of dementia and confusion. Sleepiness, often severe, is a common complaint. Symptoms may be absent in serious infections in elderly patients.

iii. As Sepsis worsens, we need to view it as Shock:

1. **Severe Sepsis**: think of it as compensated shock: Sepsis plus at least one sign of hypoperfusion or organ dysfunction, that is new, and not explained by other known etiology of organ dysfunction. If we intervene early and correct the hypoperfusion, we can stop or at least delay the onset of Septic Shock – Early intervention = better outcomes.
2. **Septic Shock**: think of it as decompensated shock: Severe sepsis associated with refractory hypotension (BP<90/60) despite adequate fluid resuscitation and/or a serum lactate level ≥ 4.0 mmol/L. When the body is unable to compensate (maintain an adequate blood pressure), we suffer organ damage and can cause organ failure. Time is of essence; early treatment is necessary to prevent death.
3. As with any shock, Tachycardia is one of the earliest signs. If we wait for low blood pressure, we have missed our opportunity to prevent organ damage. Low blood pressure is a late sign of shock.

4. As a general rule, the more rapid the onset of symptoms, the higher the associated mortality.
- iv. Early Warning System (EWS): uses a physiologic scoring system to help staff recognize high risk patients before their condition deteriorates and allows intervention by the Rapid Response Team (bringing critical care expertise to the patient bedside (or wherever it's needed):
MEWS - Modified Early Warning System:
<https://innovations.ahrq.gov/qualitytools/modified-early-warning-system-mews>
PEWS – Pediatric Early Warning System
<https://innovations.ahrq.gov/qualitytools/pediatric-early-warning-pew-score-system>
<https://www.childrenshospitals.org/Site-Search?query=PEWS>

V. Principles of Sepsis Treatment (sepsis and septic shock):

- a. Research shows that rapid, effective sepsis treatment, which includes antibiotics, Crystalloid fluids to maintain blood flow to vital organs, and treating the source of infection, can save lives. Early identification and appropriate management in the initial hours after sepsis develops improves outcomes.
- b) Prompt diagnosis and treatment are critical for optimal outcomes; there is increased morbidity/mortality with delayed recognition and response. There is a measurable increase in mortality for each hour of delay. (Ferrer et al., n.d.) (Kumar et al., n.d.)
- c) Recommended diagnostic modalities include: initial resuscitation and at least two sets of blood cultures (aerobic and anaerobic) before starting antimicrobial therapy if doing so results in no substantial delay in antimicrobials; urine cultures, and other testing to identify source and site of infection and organ dysfunction.
- d) Recommended treatment of sepsis includes: administration of appropriate intravenous (IV) antimicrobial therapy as soon as possible after recognition and **within 1 hour** for both sepsis and septic shock, with source identification and de-escalation of antibiotics as soon as feasible
- e) **Know your facility's existing guidance for diagnosing and managing sepsis**
- f) Refer to: Clinical Resources (guidelines and bundles to implement guidelines)
<https://www.cdc.gov/sepsis/clinicaltools/index.html> and
<http://www.survivingsepsis.org/Guidelines/Pages/default.aspx>

VI. Patient Education and Prevention <https://www.cdc.gov/sepsis/get-ahead-of-sepsis/patient-resources.html>

58% of American adults have never heard the word sepsis according to the Sepsis Alliance website @ <https://www.sepsis.org/about/>.

- a) Prevent infection: **Hand Hygiene**, wound care (keep cuts clean until healed), take good care of chronic conditions and get recommended vaccines
https://www.cdc.gov/sepsis/pdfs/Consumer_infographic_four-ways-to-get-ahead-of-sepsis-P.pdf
- i. Risk factors (High-risk patients) – Make sure we are educating those who are at high risk of

developing Sepsis from an infection (young, old, immune suppressed, comorbid conditions, etcetera) See Section III

- b) Warning signs and symptoms of sepsis - See image below
- c) Seek immediate care for worsening infection and signs and symptoms of sepsis
- d) Giving relevant history and information to clinicians



Quick References:

https://www.cdc.gov/sepsis/pdfs/hcp/HCP_infographic_protect-your-patients-from-sepsis-P.pdf

https://www.cdc.gov/sepsis/pdfs/Consumer_fact-sheet_protect-yourself-from-sepsis-P.pdf

https://www.cdc.gov/sepsis/pdfs/Consumer_fact-sheet_protect-yourself-and-your-family-P.pdf

<https://www.cdc.gov/vitalsigns/pdf/2016-08-vitalsigns.pdf>

CDC Patient Resources: <https://www.cdc.gov/sepsis/get-ahead-of-sepsis/patient-resources.html>

Sepsis Fact Sources:

<https://www.cdc.gov/sepsis/datareports/index.html>

<https://jamanetwork.com/journals/jama/fullarticle/1873131>

<https://www.ncbi.nlm.nih.gov/pubmed/28903154>

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4537666/>

<http://www.nejm.org/doi/full/10.1056/NEJMp1707170#t=article>

<https://www.hcup-us.ahrq.gov/reports/statbriefs/sb204-Most-Expensive-Hospital-Conditions.jsp>

<https://www.ncbi.nlm.nih.gov/pubmed/24199255>

<https://www.ncbi.nlm.nih.gov/pubmed/21897156> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3916372/>

<https://www.childrenshospitals.org/Quality-and-Performance/Quality-Improvement/Sepsis/Resources/Sepsis-Fact-Sheet>

<https://www.childrenshospitals.org/quality-and-performance/quality-improvement/sepsis/resources/sep>

<https://www.sepsis.org/sepsis-and/children/>

<http://hca-nys.org/wp-content/uploads/2017/11/NYS-Dept-of-Health-Innovation-Initiatives.pdf>

<https://rorystauntonfoundationforsepsis.org/wp-content/uploads/2018/04/RSF-Sepsis-Fact-Sheet-2018.pdf>

References:

- CDC. (2018a). Data Reports | Sepsis. Retrieved July 24, 2018, from <https://www.cdc.gov/sepsis/datareports/index.html>
- CDC. (2018b). Educational Materials | Sepsis. Retrieved July 24, 2018, from <https://www.cdc.gov/sepsis/education/index.html>
- Children's Hospital Association. (2016a). What is Sepsis. Retrieved July 24, 2018, from <https://www.childrenshospitals.org/Quality-and-Performance/Sepsis/Resources/Sepsis-Fact-Sheet>
- Children's Hospital Association. (2016b). What is Sepsis. Retrieved July 26, 2018, from <https://www.childrenshospitals.org/Quality-and-Performance/Sepsis/Resources/Sepsis-Fact-Sheet>
- Donnelly, J. P., Hohmann, S. F., & Wang, H. E. (2015). Unplanned Readmissions After Hospitalization for Severe Sepsis at Academic Medical Center-Affiliated Hospitals. *Critical Care Medicine*, 43(9), 1916–27. <https://doi.org/10.1097/CCM.0000000000001147>
- Ferrer R, Martin-Loeches I, Phillips G, et al. Empiric antibiotic treatment reduces mortality in severe sepsis and septic shock from the first hour: results from a guideline-based performance improvement program. *Crit Care Med*. 2014;42, 1749-1755.
- Friedrich, M. (2017). New York State Department of Health Innovation Initiatives. Retrieved from <https://hca-nys.org/wp-content/uploads/2017/11/NYS-Dept-of-Health-Innovation-Initiatives.pdf>
- Kissoon, N., Carcillo, J. A., Espinosa, V., Argent, A., Devictor, D., Madden, M., ... Global Sepsis Initiative Vanguard Center Contributors. (2011). World Federation of Pediatric Intensive Care and Critical Care Societies: Global Sepsis Initiative*. *Pediatric Critical Care Medicine*, 12(5), 494–503. <https://doi.org/10.1097/PCC.0b013e318207096c>
- Kumar A, Roberts D, Wood KE, et al. Duration of hypotension before initiation of effective antimicrobial therapy is the critical determinant of survival in human septic shock. *Crit Care Med*. 2006;34, 1589-1596.
- Liu, V., Escobar, G. J., Greene, J. D., Soule, J., Whippy, A., Angus, D. C., & Iwashyna, T. J. (2014). Hospital Deaths in Patients With Sepsis From 2 Independent Cohorts. *JAMA*, 312(1), 90. <https://doi.org/10.1001/jama.2014.5804>
- NYS DOH. (n.d.-a). Sepsis. Retrieved July 24, 2018, from <https://www.health.ny.gov/diseases/conditions/sepsis/>
- NYS DOH. (n.d.-b). Sepsis Regulations: Guidance Document 405.4 (a)(4). Retrieved July 24, 2018, from

https://www.health.ny.gov/regulations/public_health_law/section/405/

- Randolph, A. G., & McCulloh, R. J. (2014). Pediatric sepsis: important considerations for diagnosing and managing severe infections in infants, children, and adolescents. *Virulence*, 5(1), 179–89. <https://doi.org/10.4161/viru.27045>
- Reinhart, K., Daniels, R., Kisson, N., Machado, F. R., Schachter, R. D., & Finfer, S. (2017). Recognizing Sepsis as a Global Health Priority — A WHO Resolution. *New England Journal of Medicine*, 377(5), 414–417. <https://doi.org/10.1056/NEJMp1707170>
- Rhee, C., Dantes, R., Epstein, L., Murphy, D. J., Seymour, C. W., Iwashyna, T. J., ... CDC Prevention Epicenter Program. (2017). Incidence and Trends of Sepsis in US Hospitals Using Clinical vs Claims Data, 2009-2014. *JAMA*, 318(13), 1241. <https://doi.org/10.1001/jama.2017.13836>
- Rhodes, A., Evans, L. E., Alhazzani, W., Levy, M. M., Antonelli, M., Ferrer, R., ... Dellinger, R. P. (n.d.). Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock: 2016. *Intensive Care Medicine*, 43(3), 304–377. <https://doi.org/10.1007/s00134-017-4683-6>
- Rory Staunton Foundation. (n.d.). About Our Foundation. Retrieved July 24, 2018, from <https://rorystauntonfoundationforsepsis.org/about-our-foundation-2/>
- Sepsis Alliance. (n.d.-a). Definition of Sepsis. Retrieved July 24, 2018, from <https://www.sepsis.org/sepsis/definition/>
- Sepsis Alliance. (n.d.-b). Sepsis and Children. Retrieved July 26, 2018, from <https://www.sepsis.org/sepsis-and/children/>
- Torio, C. M., & Andrews, R. M. (2013). *National Inpatient Hospital Costs: The Most Expensive Conditions by Payer, 2011: Statistical Brief #160. Healthcare Cost and Utilization Project (HCUP) Statistical Briefs*. Agency for Healthcare Research and Quality (US). Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/24199255>
- Torio, C. M., & Moore, B. J. (2016). *National Inpatient Hospital Costs: The most expensive conditions by payor, 2013*. Retrieved from <https://www.hcup-us.ahrq.gov/reports/statbriefs/sb204-Most-Expensive-Hospital-Conditions.jsp>