Infection Control

Transmission of Disease

What are hospital-acquired infections?
Also known as nosocomial infections, they are infections that are contracted while patients are in hospital. A 2012 Centers for Disease Control (CDC) report estimates “1.7 million infections and 99,000 deaths each year as a result of nosocomial infections. Of those infections:

- 32 percent of all healthcare-associated infection are urinary tract infections
- 22 percent are surgical site infections
- 15 percent are pneumonia (lung infections)
- 14 percent are bloodstream infections”

http://cdc.gov/ncidod/dhqp/hai.html

Consequences of contracting an infection while in hospital can include:

- The development of more serious health problems
- Longer stays in hospital
- Larger hospital bills.

Nosocomial infections are also termed hospital-acquired infections or healthcare-associated infections (HAI), terms that have become more common as they are used increasingly to describe certain well-known problems such as HAP, hospital-acquired pneumonia; to differentiate HAIs from community-acquired infections (CAI); and as terms of convenience when discussing the relatively recent rise of diseases caused by ‘Superbugs’, the drug-resistant organisms.

To review the CDC definition of HAIs, click the following link:


The chain of infection
Three components must be present for the transmission of germs to occur. This is known as the chain of infection. An infection is transmitted ONLY IF all three components of the chain are in place.

The three components are:

1. The host
2. The method of transmission
3. The receiver.

Host
The host is the place where germs grow and it is generally a human being. Inside the host, germs grow in blood, sputum, infected wounds, or other body fluids.

Method of transmission
The method of transmission is the way the germs travel from the host to the receiver. It may be a sneeze or a cough, through blood contact, or through direct contact.
**Receiver**
The receiver is the person who becomes infected. It is often someone especially susceptible to a germ, such as an infant or young child, an elderly person, a patient recovering from surgery, a patient with a chest tube, foley catheter or central IV line, or a person with weakened resistance from a certain disease.

**Methods of transmitting germs**
Germs may be transmitted through several different methods, and it is important to understand all of them.

There are four main methods of transmission:

1. **Droplets**
2. **Airborne**
3. **Blood borne**
4. **Direct contact**

- **Droplet Method:**
The droplets of a cough or sneeze can contain germs. If another person breathes in just one such droplet, that infection can spread. Examples include the common cold and the flu.

- **Airborne Method:**
Airborne germs, lighter than droplets, can live in the air for a long time. These germs, when breathed in by another person, can cause the spread of infection. Examples include tuberculosis, chicken pox, and measles.

- **Blood Borne Method:**
Germs can live in the bloodstream and in other body fluids that contain blood components, such as seminal fluid. A person's skin prevents germs from entering into the body, but if the skin is broken because of even a tiny cut, it is possible for infected blood of another individual to enter. Mucous membranes, found in the mouth, vagina, or rectum may also allow germs to spread through contact with blood and/or secretions containing blood. Unprotected sexual contact can lead to this method of transmission.

- **Direct Contact Method:**
Germs can spread by touching sores, body wastes (or other body fluids), or lacerations in the skin, and then touching an open cut or putting your hands in your mouth. Most direct contact occurs through a person's hands. An example is infection in a surgical incision that occurs as dressings are changed. The best protection against direct contact transmission is proper handwashing.

**How to prevent transmission of infections in hospital**
There are several steps that can be taken by hospital workers to protect patients from developing infections.

Those steps include:

- Following the Infection Control policies of your facility
- Identifying the people, patients, and staff, who are most at risk
- Washing your hands
- Staying healthy by getting plenty of rest, eating properly, and exercising
- Getting vaccinated against flu and hepatitis B
- Washing your hands
- Following the standard recommended precautions with everyone
NOT coming to work if you are sick.

Hand Hygiene

Hand Hygiene and The Joint Commission’s National Patient Safety Goals
The Joint Commission’s National Patient Safety Goals for 2009 include Goal 7, Reduce the risk of health care associated infections, and sub goal, 07.01.01, Comply with current World Health Organization (WHO) hand hygiene guidelines or Centers for Disease Control and Prevention (CDC) guidelines. This section of the Infection Control lesson titled, Hand Hygiene, teaches to the CDC guidelines.

The purpose of hand hygiene
Hand hygiene is a term for the behaviors that healthcare workers perform to prevent the spread of germs and nosocomial infections. Hand hygiene includes handwashing with soap and water or with an alcohol hand rub, and keeping fingernails clean and short.

Hand hygiene is the most important thing you can do to prevent the spread of germs and nosocomial infections - infections that patients acquire while under medical care that are not related to their original illness.

It is estimated that 2.4 million Americans acquire an infection in a hospital each year and that these infections cause or contribute to 100,000 deaths per year. Half of these infections are preventable by proper-hand hygiene.

Routine hand hygiene helps prevent the spread of germs:

- From one person to another
- From one part of the body to another, such as from hands to eyes or mouth
- To other articles such as food, door handles, and dishes.

Hand hygiene also prevents the spread of diseases such as:

- Hepatitis
- Gastrointestinal diseases that cause diarrhea
- Colds and flu.

Six steps in routine handwashing with soap and water
Handwashing with soap and water, when done correctly is an effective way for hospital staff to prevent the spread of deadly germs.

The six steps in routine handwashing are:

1. Wet hands thoroughly under running water. Warm or hot water is best.
2. Lather with soap from a dispenser rather than a bar. Your facility may require that you use an anti-microbial soap.
3. Wash hands thoroughly, for 15 seconds, using friction. Be sure to include the backs, palms, wrists, between fingers, and under fingernails.
4. Rinse hands thoroughly under running water.
5. Leave the water running and use a paper towel or an air dryer to dry hands thoroughly.
6. Turn off the water using the paper towel. This prevents you from picking up germs left on the tap from your hands, the hands of another person, or airborne germs.
Alcohol hand rubs (See below) are approved in some hospitals as an alternative to washing with soap and running water.

If you wish, you may use a hospital-approved hand lotion, to protect your hands and prevent damage from over washing. Lotions with a water-based, greaseless formula are best. They should also be silicone-free and petroleum-free to prevent damage to latex gloves.

**Alcohol hand rubs**
Healthcare workers use alcohol-based hand rubs as a convenient and effective method to maintain prevent the spread of germs.

Alcohol hand rubs are waterless; healthcare workers pour the solution directly from the bottle onto their hands. In busy areas or in situations in which handwashing stations are not available, alcohol hand rubs are a convenient alternative.

Alcohol hand rubs are effective. They rapidly kill germs on the hands, and regrowth of germs is generally slow. Many studies have confirmed that alcohol hand rubs are at least as effective as soap and water in preventing the transfer of healthcare-related germs.

The four steps to using an alcohol hand rub are:
1. Pour the alcohol hand rub in the palm of one hand (use the amount recommended by the manufacturer)
2. Rub both hands together
3. Rub all parts of the wrist, hand, and fingers
4. Rub until completely dry

**When Not to Use an Alcohol Hand Rub**

Use soap and water to remove large amounts of visible dirt, body fluids, or other materials.

**Skin Dryness and Irritation**

Frequent use of alcohol hand rubs can cause skin dryness and irritation. Routine use of skin lotion will help prevent this problem. Many alcohol hand rubs already contain skin conditioners.

Skin lotions with a water-based, greaseless formula are best. They should also be silicone-free and petroleum-free to prevent damage to latex gloves.

**Situations that require handwashing**

If you are not sure whether or not you should wash your hands, **wash your hands either with soap and water or an alcohol hand rub**. All areas of the hospital are at risk of spreading germs and infections.

Situations that require routine handwashing with soap and water or an alcohol rub:

- When coming on duty
- Before and after patient contact
- Before putting gloves on and after taking them off
- Before eating
- Before preparing medication
- After using the toilet
- After sneezing or coughing into hands
- After contact with objects that might be contaminated
- After any accidental exposure to body fluids, mucous membranes, or skin with cuts and sores.

**Long natural nails and artificial nails increase infection risk**

Artificial nails and long natural fingernails retain more germs than short, natural nails - even after careful handwashing.

Nosocomial infections have been linked to long natural nails and to artificial nails worn by healthcare workers.

As a result, the Centers for Disease Control (CDC) issued recommendations on long natural nails and artificial nails:

- Do not wear artificial fingernails or extenders when having direct contact with patients at high risk (e.g., those in intensive-care units or operating rooms)
- Keep natural nail tips less than ¼ inch long.

Your organization may already have put in place specific requirements for nail type and length. Know your healthcare organization’s policy regarding this important issue.
Presented here, as an example, are typical elements of a fingernail policy for workers providing direct patient care:

- No artificial fingernails (may be limited to specific high-risk areas)
- Fingernails will not extend more than ¼ inch beyond fingertips
- Fingernail polish must not be chipped

**Standard Precautions**

**Two levels of precautions**
Healthcare workers are often exposed to the body fluids of patients, including blood. Because serious diseases can be transmitted not only through blood, but also by other means, the Center of Disease Control (CDC) has recommended a two-level or "two-tier" system of precautions to prevent the spread of infections.

The two tiers of precautions are:

1. Standard Precautions
2. Special Precautions

**Standard Precautions**
The CDC has recommended that ALL patients be treated according to Standard Precautions which provide protection against the spread of diseases through contact with blood or other body fluids. Follow Standard Precautions with ALL patients at ALL times.

**Special Precautions**
The CDC has also recommended that certain Special Precautions be added to the Standard Precautions for diseases that spread in ways other than through infected blood.

**The meaning of Standard Precautions**
Standard Precautions are practices designed to help prevent the spread of diseases carried by the blood. They are called standard because they apply to everyone. Nobody, not even you, can tell by looking at a person whether or not that person is HIV-positive or has some other disease. That means you need to apply Standard Precautions when dealing with ALL patients.

All body substances of all patients are considered potentially infectious. Traces of blood cannot always be seen and may be present in any body fluid. If you are involved in any situation involving blood or other body fluids, be sure to follow Standard Precautions to avoid contact with them on your skin or mucous membranes.

Use Standard Precautions to reduce your risk at work. Protect yourself and others. Keep in mind the incidence of AIDS is growing in the over-50 population.

**The basics of Standard Precautions**
Be sure to use all precautionary practices recommended by your facility. Some basic practices that can keep you from coming into contact with the body fluids of another person include:

- Hand protection
- Body protection
- General protection.

**Hand protection**
Protect your hands by wearing latex/hypoallergenic gloves (the correct size) when:
Body protection
Wear gown, mask, and goggles to cover any part of your body that could be splashed or sprayed (or otherwise come in contact with) the blood and/or body fluids of another person (for example, when caring for a trauma patient in the Emergency Department or when assisting in a procedure where exposure is possible).

General protection
- Dispose of all materials containing blood in the proper waste containers.
- Use a barrier device such as a shield or mask instead of performing direct mouth-to-mouth ventilations during CPR.
- Avoid contact with blood from needles by using safety devices provided by your facility.
- Never recap a needle (if you miss, you could jab your finger).
- Dispose of all sharps (needles, blades, IV catheters) in the proper disposal box.
- Wash your hands after removing gloves.
- Do not eat, drink, put on make-up or put in contact lenses in areas where exposure to body fluids is possible.

Devices are available, such as safety syringes and special IV catheters, that help protect health care workers. The Occupational Safety and Health Administration (OSHA) directs medical agencies to use recommended safety devices. Although they take a little time to learn, the effort could save a life - maybe yours.

Know and follow your facility's procedures for reporting injury and/or exposure to body fluids. Your facility has an Employee Exposure Control Plan that lists all areas where precautions are needed and also has procedure to follow if you are exposed to blood or other body fluids. It is important to know what the plan is and to follow it if you are exposed. Report ANY needlestick-type injury or ANY other exposure to blood or body fluids. You will need to be evaluated and may also need follow-up care.

If you have any questions about how to follow Standard Precautions in your organization, ask your supervisor.

Special Precautions

Two levels of precautions
Health care workers are exposed to the body fluids of patients, including blood. Because serious diseases can be transmitted not only through blood, but also by other means, the Center of Disease Control (CDC) has recommended a two-level or "two-tier" system of precautions to prevent the spread of infections.

The two tiers of precautions are:
Standard Precautions
The CDC has recommended that ALL patients be treated according to Standard Precautions. Follow the procedures outlined by your particular facility. Anyone could have a disease that is spread through the blood or other body fluids. Many people are unaware they have a disease, and many do not tell others they have a disease. Due to confidentiality laws, workers are sometimes told only on a need to know basis, and you may not need to know. To protect yourself and others from infection, follow Standard Precautions with ALL patients at ALL times.

Special Precautions
Special Precautions are practices used in health care to help prevent the spread of diseases that can be transmitted without contact with body fluids. They are implemented after a patient has been diagnosed and the method of transmission is known. The Special Precautions are always used in addition to Standard Precautions.

Special Precautions are used to prevent the spread of disease through germs transmitted by:

1. Droplets
2. Air
3. Contact (direct or indirect).

Droplet Precautions
Droplets infected with germs can cause infections. They can come from a sneeze or from procedures, such as suctioning. The germs are not carried very far because droplets are heavy.

Infections that can be spread through droplets and require droplet Special Precautions include:

- Pneumonia
- Influenza
- Meningitis.

Protection against droplet infection is important for anyone who will be close to (within three feet of) the patient - caregivers, other patients, and family members. The patient and their family should be instructed about precautions used. Droplet Precautions are used in addition to Standard Precautions.

Examples of Special Droplet Precautions:

- Caregivers wear a mask.
- Patients remain in their rooms as much as possible.
- Patients wear a mask when they go to other areas of the hospital (for X-rays, for example).
- Patients with same type of infection may share a room.

Airborne Precautions
Airborne germs are found in tiny droplet nuclei - much smaller than droplets - that are spread by coughing, sneezing, talking, or breathing. Droplet nuclei are so small that they can travel long distances, remain in the air for a long time, and are tiny and light enough to travel through a ventilation system.
Infections that can be spread through the air and require airborne Special Precautions include:

- Tuberculosis
- Chicken pox
- Measles (rubeola).

Protection is important for everyone in the area. Airborne Precautions are used in addition to Standard Precautions. Patients and their families should be instructed about Airborne Precautions being used.

Examples of Special Airborne Precautions:

- Provide patients with a private room, preferably a special negative pressure room that vents to the outside and changes its air several times per hour.
- Keep the door to the patient's room closed.
- Keep patients in their rooms. If it is necessary for the patient to leave the room, he/she must wear a surgical mask.
- Do not enter the room of a patient with chicken pox or measles, unless you have been vaccinated or have already had the disease.
- Encourage patients to use tissues for coughs and sneezes and to dispose of them immediately.
- With tuberculosis patients, wear a special mask before entering and while in the room.

**Contact Precautions**

Germs spread through contact are found on the skin and excretions of infected patients. They are spread through direct contact with others or indirectly through germs found on room surfaces or on patient-care articles.

Infections that can be spread through direct and indirect contact and require Special Precautions include:

- Hepatitis A
- Scabies
- Lice
- Shigella
- Salmonella
- Methicillin-Resistant Staphylococcus Aureus (MRSA)
- Staphylococcus skin infections.

Protection is important for everyone entering the room. Patients and their families should be instructed about precautions being used.

Examples of Special Contact Precautions:

- Wash hands thoroughly after any patient contact.
- Wear a protective gown if clothing might come into contact with patient drainage as a result of splashing or gross contamination of room surfaces.
- Wear gloves if contact with contaminated surfaces is possible.
- Change gloves after contact with infected material (such as wound drainage, feces, etc.).
- Remove gloves when leaving the room.
- Wash hands thoroughly after removing gloves.
- DO NOT share patient equipment.
### Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td><strong>Case fatality rate</strong></td>
<td>The reported case fatality rate (CFR) is a measure of the severity of a disease and is defined as the proportion of reported cases of a specified disease or condition which are fatal within a specified time. <em>World Health Organization, 2014</em></td>
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<tr>
<td><strong>Disseminated Intravascular Coagulation (DIC)</strong></td>
<td>A systemic process of thrombosis and hemorrhage that is initiated by several disorders. DIC, in response to EHD, is an acute onset of blood leaking from wounds, IVs, and catheters; deep tissue bleeding; and anemia.</td>
</tr>
<tr>
<td><strong>Index patient</strong></td>
<td>The first patient in a particular population with a disease or condition that is being described or investigated. It may be the first patient with that condition. It may or may not be the first person in that population to actually have the condition, and it may or may not be the person who represents the source of subsequent transmissions. Sometimes referred to Patient Zero.</td>
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<tr>
<td><strong>Infectivity</strong></td>
<td>The ability of an agent/pathogen to infect a host. A highly infective agent requires less exposure to cause an infection. Measles is an example of a highly infective pathogen. Leprosy is a minimally infective pathogen.</td>
</tr>
<tr>
<td><strong>Natural reservoir</strong></td>
<td>The living organism or inanimate object in which normally resides an agent that causes a disease or condition in humans.</td>
</tr>
<tr>
<td><strong>Secondary infection/secondary outbreak</strong></td>
<td>In the transmission of a disease from the one infected individual to another, that subsequent infection is a secondary infection. A secondary outbreak is a series of newly infected individuals resulting from exposure to one individual.</td>
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<tr>
<td><strong>Virulence</strong></td>
<td>The number of clinical cases resulting in severe morbidity and death. Case Fatality Rates (CFR) are often used as a measure of virulence. Rabies, with a CFR approaching 100% is extremely virulent. Chickenpox, though almost 100% infective, is minimally virulent.</td>
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### Etiology (origin of the Ebolavirus and of EVD)

Ebola refers to both the disease and the causative agent, the Ebolavirus. The disease is also known as Ebola Hemorrhagic Fever (EHF), and as Ebola Virus Disease (EVD). EVD is a type of viral hemorrhagic fever (VHF), a general category of diseases caused by different viruses, but sharing in common the symptoms of fever and of being complicated by disseminated intravascular coagulation.

Dengue and Yellow Fever are VHFs, though their respective causative agents are not closely related to the Ebolavirus. EHF and Marburg Virus Disease are severe forms of VHF caused by filoviruses, a family of viruses that have an elongated, filamentous shape.
'Ebolavirus’ is now the preferred term to refer to the Ebolavirus genus, the family of closely related viruses. There are five subtypes, or species, of the Ebolavirus:

- Ebola virus (EBOV)
- Sudan virus
- Tai Forest virus
- Bundibugyo virus
- Ebola-Reston

The Ebola virus (EBOV) is responsible for most outbreaks and is the pathogen responsible for the current outbreak that originated in West Africa. All but the Reston variety were first identified in Central or West (sub-Saharan) Africa. The Reston variety originates in the Philippines and is not infectious to humans.

EVD in humans is a zoonosis, a disease transmitted from animals to humans—rabies is another example. Humans are exposed to the virus when they come in contact with an infected animal, killing, butchering, drying, eating, and selling wild animals for food (bushmeat) is a common practice and has been associated with EVD. Monkeys and bats are common sources of bushmeat.

Ebolavirus has been documented only in mammals, especially bats, monkeys, and apes. There is no current evidence that insects can be infected with or transmit Ebolavirus.

Sporadic epidemics of disease caused by Ebolavirus kill non-human primates, monkeys, and antelope (an animal epidemic is more correctly termed an epizootic). These epizootics may be related to human outbreaks. Some research suggests that fruit bats may be a natural reservoir, but this is not yet confirmed. As with rabies, there may be several animal reservoirs.

**Summary of etiology**

Ebola is both a virus, e.g. EBOV, and a disease, e.g., EVD

- The natural reservoir of Ebola is an animal or animals living in Western and Central Africa. The disease is transmitted to humans when they have close contact with an infected animal.
- EBOV is a highly infective and virulent pathogen

The current outbreak of EVD and its spread to the United States

In 1976, two separate sub-Saharan African outbreaks of the disease were the first attributed to the Ebola virus. Since then, there have been several sporadic outbreaks of the disease. The EBOV...
strain was originally referred to as Zaire Ebola virus in recognition of its role in this initial outbreak in Zaire, now known as the Democratic Republic of Congo.

This most recent concern with EVD is a result of a March, 2014 outbreak in Guinea, a West African country. After spreading to Sierra Leone and Liberia by August 2014, the World Health Agency (WHO) declared an international public health emergency. As of October, 2014, more than 9,000 cases and 5,000 deaths have been reported worldwide, and those numbers, according to WHO, may be underreported.

Ebolavirus has two characteristics that make it such a deadly agent: it is highly infective and virulent. The virus is easily transmitted between individuals and it kills a high proportion of its victims. Without treatment, EHR’s case fatality rate (CFR) is 90%. With modern medical treatment, the CFR is about 56%. The CFR of this current widespread outbreak in several West African countries is estimated at 71%.

In late September, 2014, Ebola was diagnosed for the first time in the United States. A Liberian visiting family in Dallas was diagnosed with EVD and died a few days later. By October 14, two nurses who had cared for that patient in Dallas were diagnosed with the disease. As of October 20, more than 70 employees of Texas Presbyterian Hospital were being monitored.

Five Americans have been evacuated to the US from West Africa for Ebola treatment. They have been treated at Emory University Hospital in Atlanta, Nebraska Medical Center in Omaha, University of Nebraska Medical Center in Omaha, and National. In addition, as of October 16, one of the infected nurses from Dallas was being treated at the National Institutes of Health (NIH) in Bethesda, Maryland.

**Summary of the current outbreak of EVD and its spread to the United States**
- Ebola was first identified in sub-Saharan Africa in 1976
- The first identified U.S. case occurred in Dallas
- Two secondary cases have been diagnosed in healthcare workers who cared for the Dallas patient
- EVD patients have been, or are being, treated in the U.S. in Dallas, Atlanta, Omaha, and Bethesda

**Signs and symptoms and exposure risk**

A still apt clinical descriptions from the 1976 outbreak says "The illness is characterized with a high temperature of about 39°C, hematemesis, diarrhea with blood, retrosternal abdominal pain, prostration with "heavy" articulations, and rapid evolution death after a mean of three days."

Symptoms usually begin within two to 21 days as a sudden, flu-like state characterized by malaise, fever greater than 100.4 F., muscle and joint pain, headache, and sore throat. These symptoms are often followed in day or more by nausea, vomiting, diarrhea, and abdominal pain.

Within a few days, some patients experience shortness of breath, chest pain, severe headaches, confusion, and a maculopapular rash. DIC may occur within five or more days.

Death usually occurs within six to 16 days.

Recovery usually begins within seven to 14 days from symptom onset. Survivors may have chronic muscle, joint, liver, and hearing difficulties.
Current recommendations from CDC when evaluating a patient for EVD include:

**Clinical findings**
- Fever > 100.4 F
- Severe headache
- Weakness
- Muscle pain
- Vomiting
- Diarrhea
- Abdominal pain
- Unexplained hemorrhage

**Exposure risk, high versus low**
In addition to symptomatology, the probability of EVD varies with the risk of exposure:
- Contact with blood, body fluids, or human remains of a known or suspected Ebola patient
- Residence in or travel to an area with a current EVD outbreak
- Handling of bats, rodents, or primates in sub-Saharan Africa

The CDC makes the following recommendations regarding evaluating patients for Ebola based on level of risk.

**High-risk exposure**
Test all persons for Ebola virus who, within 21 days of a high risk exposure, experience an onset of fever and/or other clinical symptoms or indicative lab findings. High-risk exposure includes:
- Skin, percutaneous, or mucous membrane exposure to blood or body fluids from an infected person
- Handling infected blood, body fluids, or decedent without appropriate personal proactive equipment (PPE) or biosafety precautions

**Low-risk exposure**
Evaluate further for possible testing, all persons who, within 21 days of low-risk exposure, for severity of illness, lab findings such as platelet counts, and alternative diagnoses. Low risk exposure includes:
- Household, community, or healthcare facility contact with a person with Ebola disease—a contact is defined as being with three feet of within the room or care area for a prolonged period of time while not wearing PPE, or having a brief direct contact such as handshaking while not wearing PPE.
- Recent residence in or visit to an outbreak area

**Summary of evaluating for presence of EVD; signs and symptoms and exposure risk**
- Upon patient presentation, two categories of information will help determine whether or not EVD is present: 1. Signs and symptoms, and 2. Exposure risk.
- Know the CDC symptom list and the CDC definitions of high and low risk exposure.
Infection Prevention and Control

Transmission

Once a human is infected by contact with an infected animal, then human to human transmission occurs. Those at the highest risk for EVD are the patient’s family, close friends, healthcare providers, and death care providers.

A person with EVD is considered infectious as soon as they experience symptoms of the disease. Symptoms occur, usually between two and 21 days after exposure, though that period may extend up to 40 days in rare cases. A recovered patient can no longer transmit the disease, except in via semen which can transmit Ebolavirus up to three months after recovery.

Person to person transmission of the virus occurs with close personal contact with the blood or body fluids of an infected individual, living or dead. It is currently undetermined whether direct skin to skin contact can transmit Ebola.

Though most scientific and public health organizations say Ebola is not transmitted over long distance via aerosol particles. However, Ebolavirus can be aerosolized by coughing, diarrhea, and sneezing. Patient care activities that can possibly aerosolize Ebolavirus include:

- "Bilevel Positive Airway Pressure (BiPAP), bronchoscopy, sputum induction, intubation and extubation, and open suctioning of airways.” CDC’s Standard, Contact, and Droplet Precautions, October 17, 2014

As a result of the possibility of aerosolization and the extreme virulence of the pathogen, CDC recommendations include the use of respirator masks.

Ebolavirus can enter the body via the nose, mouth, eyes, cuts, and abrasions.

Ebolavirus can be transmitted through contact with:

- Blood and body fluids such as (but not limited to) saliva, vomit, feces, sweat, tears, breast milk, urine, and semen
- Contaminated needles and syringes
- Infected animals
- (Possibly) skin to skin contact

Prevention of hospital acquired infections in healthcare workers

WHO guidelines for prevention of EVD HAIs include the following key points:

- Ensure that Standard Precautions are in place and rigorously adhered to when caring for ALL patients regardless of condition.
- When not wearing PPE, maintain a distance of at least three feet from anyone suspected of having EVD.
- As soon as practical, isolate patients who have, or are suspected to have, EVD in single rooms or in specific cohort areas. Keep confirmed cases separate from suspected cases.
- Healthcare workers caring for these patients should only be assigned to these patients.
- PPE in isolation areas must include gloves, gown, boots/closed shoes with overshoes, mask, and eye protection for splashes (CDC has added respirator masks and disposable full face shield to this requirement).
Adhere to regular and rigorous environmental cleaning and decontamination; manage handling or waste, linen, and sharps according to guidelines.

- Ensure safe processing of lab samples.
- Maintain all prevention measures when handling decedents.
- Immediately evaluate, care for, and isolate if necessary healthcare workers exposed to blood or body fluids from suspected or confirmed EVD patients.

The CDC continues to evolve new and better guidance for the prevention of hospital acquired infection in response to encounters with EVD at Emory, Nebraska Medical Center, and National Institutes of Health. **This enhanced guidance is centered on three principles** (From CDC Fact Sheet, *Tightened Guidance for U.S. Healthcare Workers on Personal Protective Equipment for Ebola*):

- All healthcare workers undergo rigorous training and are practiced and competent with PPE, including putting it on and taking it off in a systemic manner
- No skin exposure when PPE is worn
- All workers are supervised by a trained monitor who watches each worker putting PPE on and taking it off.

Healthcare personnel followed these principles while caring for patients treated at Emory University Hospital, Nebraska Medical Center and the National Institutes of Health Clinical Center; **none contracted the illness.**

**Principle #1: Rigorous and repeated training**

Focusing only on PPE gives a false sense of security of safe care and worker safety. Training is a critical aspect of ensuring infection control. Facilities need to ensure all healthcare providers practice numerous times to make sure they understand how to appropriately use the equipment, especially in the step by step putting on and taking off of PPE. CDC and partners will ramp up training offerings for healthcare personnel across the country to reiterate all the aspects of safe care recommendations.

**Principle #2: No skin exposure when PPE is worn**

Given the intensive and invasive care that U.S. hospitals provide for Ebola patients, the tightened guidelines are more directive in recommending **no skin exposure** when PPE is worn.

CDC is recommending all of the same PPE included in the August 1, 2014 guidance, with the addition of coveralls and single-use, disposable hoods. **Goggles are no longer recommended as they may not provide complete skin coverage in comparison to a single-use, disposable full-face shield** (bold added by author). Additionally, goggles are not disposable, may fog after extended use, and healthcare workers may be tempted to manipulate them with contaminated gloved hands. PPE recommended for U.S. healthcare workers caring for patients with Ebola includes:

- Double gloves
- Boot covers that are waterproof and go to at least mid-calf or leg covers
- Single-use fluid resistant or impermeable gown that extends to at least mid-calf or coverall without integrated hood
- Respirators, including either N95 respirators or powered air purifying respirator (PAPR)
- Single-use, full-face shield that is disposable
- Surgical hoods to ensure complete coverage of the head and neck
• Apron that is waterproof and covers the torso to the level of the mid-calf (and that covers the top of the boots or boot covers) should be used if Ebola patients have vomiting or diarrhea

The guidance describes different options for combining PPE to allow a facility to select PPE for their protocols based on availability, healthcare personnel familiarity, comfort and preference while continuing to provide a standardized, high level of protection for healthcare personnel.

The guidance includes having:

• **Two specific, recommended PPE** options for facilities to choose from. Both options provide equivalent protection if worn, put on and removed correctly.

• **Designated areas for putting on and taking off PPE**. Facilities should ensure that space and layout allows for clear separation between clean and potentially contaminated areas.

• **Trained observer to monitor PPE** use and safe removal.

• **Step-by-step PPE** removal instructions that include:
  - Disinfecting visibly contaminated PPE using an EPA-registered disinfectant wipe prior to taking off equipment.
  - **Disinfection of gloved hands** using either an EPA-registered disinfectant wipe or alcohol-based hand rub between steps of taking off PPE.

**Principle #3: Trained monitor**

CDC is recommending a trained monitor actively observe and supervise each worker putting PPE on and taking it off. This is to ensure each worker follows the step by step processes, especially to disinfect visibly contaminated PPE. The trained monitor can spot any missteps in real-time and immediately address.

**PPE is Only One Aspect of Infection Control**

It is critical to focus on other prevention activities to halt the spread of Ebola in healthcare settings, including:

• Prompt screening and triage of potential patients
• Designated site managers to ensure proper implementation of precautions
• Limiting personnel in the isolation room
• Effective environmental cleaning

**Think Ebola and Care Carefully**

The CDC reminds health care workers to “Think Ebola” and to “Care Carefully.” Health care workers should take a detailed travel and exposure history with patients who exhibit fever, severe headache, muscle pain, weakness, diarrhea, vomiting, stomach pain, unexplained hemorrhage. If the patient is under investigation for Ebola, health care workers should activate the hospital preparedness plan for Ebola, isolate the patient in a separate room with a private bathroom, and to ensure standardized protocols are in place for PPE use and disposal. Health care workers should not have physical contact with the patient without putting on appropriate PPE.
Summary of Infection Transmission and Control

- Know the CDC three principles of guidance: rigorous and repeated training, no skin exposure, and trained monitor.

PPE points of emphasis

The following information expands on the PPE points of emphasis in the previous Infection prevention and transmission section. The information is copied directly from the CDC document linked in the Resources section of this course: "Guidance on Personal Protective Equipment To Be Used by Healthcare Workers During Management of Patients with Ebola Virus Disease in U.S. Hospitals, Including Procedures for Putting On (Donning) and Removing (Doffing)"

Healthcare workers must understand the following basic principles to ensure safe and effective PPE use, which include that no skin may be exposed while working in PPE:

Donning

- PPE must be donned correctly in proper order before entry into the patient care area and not be later modified while in the patient care area. The donning activities must be directly observed by a trained observer.
- Double gloving provides an extra layer of safety during direct patient care and during the PPE removal process. Beyond this, more layers of PPE may make it more difficult to perform patient care duties and put healthcare workers at greater risk for percutaneous injury (e.g., needlesticks), self-contamination during care or doffing, or other exposures to Ebola. If healthcare facilities decide to add additional PPE or modify this PPE guidance, they must consider the risk/benefit of any modification, and train healthcare workers on correct donning and doffing in the modified procedures.

During Patient Care

- PPE must remain in place and be worn correctly for the duration of exposure to potentially contaminated areas. PPE should not be adjusted during patient care.
- Healthcare workers should perform frequent disinfection of gloved hands using an ABHR, particularly after handling body fluids.
- If during patient care a partial or total breach in PPE (e.g., gloves separate from sleeves leaving exposed skin, a tear develops in an outer glove, a needlestick) occurs, the healthcare worker must move immediately to the doffing area to assess the exposure. Implement the facility exposure plan, if indicated by assessment.

Doffing

- The removal of used PPE is a high-risk process that requires a structured procedure, a trained observer, and a designated area for removal to ensure protection.
- PPE must be removed slowly and deliberately in the correct sequence to reduce the possibility of self-contamination or other exposure to Ebola virus.
- A stepwise process should be developed and used during training and daily practice.

Training on Correct Use of PPE

Training ensures that healthcare workers are knowledgeable and proficient in the donning and doffing of PPE prior to engaging in management of an Ebola patient. Comfort and proficiency when donning and doffing are only achieved through repeated practice on the correct use of
PPE. Healthcare workers should be required to demonstrate competency in the use of PPE, including donning and doffing while being observed by a trained observer, before working with Ebola patients. In addition, during practice, healthcare workers and their trainers should assess their proficiency and comfort with performing required duties while wearing PPE. Training should be available in formats accessible to individuals with disabilities or limited English proficiency. Target training to the educational level of the intended audience.

Use of a Trained Observer

Because the sequence and actions involved in each donning and doffing step are critical to avoiding exposure, a trained observer will read aloud to the healthcare worker each step in the procedure checklist and visually confirm and document that the step has been completed correctly. The trained observer is a dedicated individual with the sole responsibility of ensuring adherence to the entire donning and doffing process. The trained observer will be knowledgeable about all PPE recommended in the facility’s protocol and the correct donning and doffing procedures, including disposal of used PPE, and will be qualified to provide guidance and technique recommendations to the healthcare worker. The trained observer will monitor and document successful donning and doffing procedures, providing immediate corrective instruction if the healthcare worker is not following the recommended steps. The trained observer should know the exposure management plan in the event of an unintentional break in procedure.

Methicillin Resistant Staph Aureus

What is antibiotic resistance?
Pathogens develop resistance by being exposed to an antibiotic. A few individual organisms may survive that exposure due to random mutations in their genes that confer resistance. Those survivors then pass on those genes to the next generation, and also transfer those genes to other individual organisms nearby. This process is well-known to biologists as natural selection, the motor of evolution, as random beneficial variations in individuals are passed on to successive generations who survive preferentially as a result of those inherited traits.

Causes of the spread of resistant pathogens
There is a general acceptance, and even dependence, on antibiotics that has created a culture of overuse in most of the world. Prescribers overprescribe antibiotics and especially broad-spectrum antibiotics, livestock are treated in order to improve growth and disease resistance, and common household cleaners and even toys now contain antibiotics.

Definition of MRSA
MRSA stands for Methicillin Resistant Staph Aureus. The term could be a bit misleading because these variants of S. aureus bacteria are resistant to an entire class of antibiotics that includes methicillin, but also includes other common antibiotics such as amoxicillin and penicillin. Vancomycin has been the treatment of choice for broadly resistant MRSAs, but vancomycin-resistant MRSAs have been in evidence since 2002.

Types of MRSAs
HA-MRSAs, that is hospital acquired MRSAs, are also resistant to nearly all available antibiotics. CA-MRSAs are usually susceptible to trimethoprim/sulfamethoxazole (Bactrim) and certain other drugs.

Scope, treatment, and prevention
MRSAs are the most common antibiotic resistant pathogen in US hospitals. MRSAs represent a serious problem in the healthcare environment and are a growing public health problem as
well. Manifestations include skin infections, pneumonias, bloodstream infections, septic arthritis, and endocarditis. Treat MRSAs according to culture and susceptibility. Prevent MRSAs by scrupulous attendance to infection control guidelines and practices and educate patients with MRSAs about hand hygiene.

Hospital-Acquired Pneumonia

**What is hospital-acquired pneumonia (HAP)**

HAP is a nosocomial infection that develops at least 48 hours after admission, and is associated with poor patient outcomes and increased costs and length of stay. Subcategories of HAP include postoperative pneumonia, ventilator-associated pneumonia (VAP), and healthcare-associated pneumonia (HCAP) which is associated with chronic care and outpatient facilities.

**Risk Factors**

More than 85% of HAPs are VAP, and as many as 23% of all ventilated patients develop VAP. Risk factors for non-ventilated patients include previous antibiotic treatment, presence of stress ulcers, and various common comorbidities such as cardiac, hepatic, renal, and pulmonary problems. The most important risk factors for postoperative pneumonia are advanced age and abdominal or thoracic surgery.

**Prevention**

If possible, maintain ventilated patients in a semi-upright or upright position in order to reduce the risk of aspiration. Ventilation with continuous positive airway pressure (CPAP) has a lower risk for HAP than with an ET tube. Incentive spirometry will help prevent postoperative pneumonia.

Tuberculosis

**Facts about tuberculosis**

Tuberculosis (TB) is a disease that affects the lungs and/or other parts of the body. It is the largest single cause of death among people diagnosed with AIDS. Tuberculosis is curable, but it involves taking medication for a very long time.

TB is caused by airborne bacteria, which remain in the air for a long time and travel considerable distances. Tuberculosis spreads through coughing, sneezing, talking, laughing, and breathing.

- In the U.S., over 25,000 people are diagnosed with tuberculosis every year.
- Worldwide, over 8 million people are infected with TB every year, and 3 million people worldwide die of the disease.

About 90% of people infected with TB may not show signs of the disease even though the germ is present in their bodies. This condition is referred to as LATENT TB. These people are most at risk of developing ACTIVE TB within 2 years of the exposure. TB may also develop if they have (or develop) another disease that affects the immune system, such as AIDS.

**Symptoms of TB include:**

- Chest pain
- Prolonged productive cough
- Coughing up of blood
• Fever and chills
• Night sweats
• Weight loss
• Feeling run down or easily tired

Risks, detection, and protection
People are more prone to contracting TB when they:

• Live in close quarters, such as homeless shelters, prisons, migrant camps, nursing homes or other crowded home situations
• Are affected by a disease that affects the immune system, such as AIDS
• Take medication that affects the immune system
• Live in geographic areas where TB is common, such as Asia, Africa and Latin America
• Are exposed to people who have TB.

Healthcare professionals and persons exposed to TB need to have a Purified Protein Derivative (PPD) skin test or a chest X-ray. Positive test results indicate the person is infected with TB but may not have TB disease. He or she may be given preventive therapy to kill germs that are not doing any damage now, but could break out later.

Facts:

• If a PPD test shows positive, all PPD tests taken after it will show positive as well, and each reaction will be more severe.
• If a person has had a positive PPD test in the past (even if the TB was treated), a skin test should NOT be administered (it will indicate positive). A chest X-ray MUST be taken instead to determine if the person has ACTIVE TB.
• People who have received the Bacillus Calmette-Guerin (or "BCG") vaccine will have a positive skin test.

Your facility may require you to have a routine PPD test or chest X-ray at specified intervals or on exposure to TB. Most hospitals require that every employee be tested at least once a year. However, testing may be more or less frequent depending on the risk of exposure to patients with tuberculosis.

Treatment
Tuberculosis can be cured with medication.

Latent TB
If a doctor decides a person with Latent TB should have treatment to prevent it from becoming Active TB, the usual prescription is a daily dose of isoniazid (INH). The person takes INH for six months (up to a year for some patients), and should have periodic medical checkups.

Active TB
People with Active TB show symptoms of the disease. They may have to spend a short time in the hospital and can then continue taking medication at home. Sometimes the patient will not have to stay in the hospital at all. As long as they are taking the medication correctly, most patients can return to normal activities after a few weeks, and not have to worry about infecting others. However, it is VERY important that patients take the medicine correctly for the full length of treatment - usually, six to nine months or longer.

Multi-Drug Resistant TB
Tuberculosis, a disease that was once considered to be almost eradicated, has become more widespread in recent years. One reason is that, in some instances, TB is resistant to the drugs
normally used to treat the disease. Resistance may occur when people who are being treated start feeling better and stop taking their medication too soon. The TB germs are not completely destroyed and the person will start showing signs of the disease again. Drugs previously used will no longer be effective. This condition, referred to as Multi-Drug Resistant TB, is extremely difficult to cure.

If a person with Multi-Drug Resistant TB infects another person, that other person will also have Multi-Drug Resistant TB.

**Special Precautions used for tuberculosis**  
Tuberculosis is caused by airborne bacteria. To protect yourself and others from contracting tuberculosis, follow your facility’s recommended Special Precautions in addition to Standard Precautions.

Special Precautions for the treatment of TB patients:

- Place TB patients in private rooms.
- Ventilate rooms directly to the outside if possible, to prevent the circulation of TB germs to other areas of the facility.
- Wear a special "fit-tested" mask (and receive training in how to wear it correctly) when entering the room and while in the room.
- Explain to patients and visitors how to use special masks.
- Keep patients in their rooms as much as possible.
- Encourage patients to cough or sneeze directly into tissues and to dispose of them.
- Have patients wear masks when being transported to other areas of the hospital (for X-rays, etc.).

**HIV/AIDS**

**What are HIV and AIDS?**

HIV  
HIV (Human Immunodeficiency Virus) is the virus that causes AIDS. Once this virus enters
and infects the body, the person is said to be "HIV Positive." However, the person may be infected with the virus for up to 10 years or more before developing AIDS.

**HIV in the US**

- Between 800,000 and 900,000 people are infected with HIV.
- Approximately 40 thousand new HIV infections occur each year.
- 70% of new infections are in men and 30% are in women.
- Half of all newly infected people are under the age of 25.
- One-third of people infected with HIV do not know they are infected.

**HIV worldwide**

- At the end of 2000, it was estimated that 36.1 million people worldwide were infected with HIV.
- 70% of all HIV-infected people are in the sub-Saharan region of Africa.
- Approximately equal numbers of men and women are infected with HIV.
- 1.4 million of those infected with HIV are children under the age of 15.

**AIDS**

AIDS stands for **Acquired Immune Deficiency Syndrome**. Most people who are HIV positive will eventually develop AIDS.

**AIDS worldwide in 2000**

- Children under the age of 15 made up approximately 500,000 of those deaths.
- By the end of 2000, it was estimated that 21.8 million people worldwide have died from AIDS or AIDS-related causes.

**From HIV to AIDS**

A person is "HIV positive" when the virus is present in the body.

Once someone is infected, the virus begins to attack the body's "immune system" (the body's defense against infection). HIV seeks out special immune cells known as "CD4 cells" and uses them to manufacture copies of the virus, which then go on to attack other CD4 cells and other types of immune cells. The normal role of CD4 cells is to direct other immune cells to fight germs that could cause an infection or disease.

An HIV positive person may not feel sick or even know they have the virus for ten or more years. During that time, the virus (a blood borne pathogen) can infect other people. A person may only know they are HIV positive by having specific blood tests.

A positive HIV test does not mean that a person has AIDS. A diagnosis of AIDS is made under either of two conditions:

1. If the CD4 cell count (normally 800-1000/microliter of blood) falls below 200/microliter, whether or not symptoms of the disease are present
2. If a person shows signs of having infections that healthy people are usually able to fight off such as tuberculosis, Kaposi's Sarcoma, Pneumocystis Carinii Pneumonia.
Can I get AIDS?
Yes, you can get AIDS. The HIV virus is passed from one person to another through contact with infected blood or body fluids.

Methods of spreading HIV include:

- Sexual contact with an infected person
- Sharing needles (as in IV drug injection, tattooing, ear piercing, etc.) with someone who is infected
- Transfusions of infected blood or blood clotting factors (very rare in countries where blood is screened)
- From HIV-infected mothers to infants during childbirth or through breast-feeding
- Through contact with infected blood or other body fluids in the healthcare setting.

A healthcare worker can be infected with HIV if he or she is stuck with a needle containing HIV-infected blood, or if infected blood gets into a worker's cut or onto a mucous membrane (for example, in the eyes or nasal cavity).

There is no evidence of HIV being transmitted in other ways such as through the air, water, or by insects.

Protecting yourself and others against AIDS
Following Standard Precautions, such as using recommended procedures and wearing personal protective equipment can help prevent the spread of HIV to healthcare workers. To further protect yourself and others:

- Abstain from sex or sex-related activities when the HIV status of your partner is doubtful or not known. The use of latex condoms can reduce the risk of contracting the virus and is referred to as "safer sex." However, there is no such thing as "safe sex" when the HIV status of your partner is unknown.
- If you are HIV infected and pregnant, take appropriate medication to reduce the chances of passing the virus to your unborn child.
- If you are HIV infected, DO NOT breastfeed.
- NEVER share needles, including needles used for tattoos, body piercing, or injecting steroids.
- If you have ever engaged in high-risk activities (IV drug injection, sex with multiple partners), have an HIV test.

There is no vaccine that will prevent AIDS and no drug that will cure AIDS. However, medications have been developed that both slow the progression of HIV Positive to AIDS and lengthen the survival of people with AIDS. There is some evidence that the recently developed "cocktail" drug treatments have had an impact on survival rates.

Hepatitis

What is hepatitis?
Hepatitis is a serious disease of the liver, an organ necessary for life. Hepatitis B and C, the two most serious kinds of hepatitis, are similar kinds of liver infection that are caused by different viruses. Although there are fewer new Hepatitis C infections each year compared with Hepatitis B, there are more deaths in the long term due to Hepatitis C which is a more serious chronic disease.

About 50% of Hepatitis B infections and 75% of Hepatitis C infections cause NO initial symptoms. When symptoms are present, they include:
• Jaundice
• Nausea
• Loss of appetite
• Abdominal pain
• Fatigue.

Chronic hepatitis
When left untreated, 6-10% of Hepatitis B infections and more than 85% of Hepatitis C infections lead to chronic disease. Cirrhosis (degeneration) and cancer of the liver are often the result of chronic hepatitis.

Some facts about hepatitis:
• An estimated 3.7 - 4.0 million Americans presently have chronic hepatitis.
• 85% of individuals who contract Hepatitis C will develop chronic liver disease, including many who are initially asymptomatic.
• There are more deaths annually from the effects of chronic Hepatitis B than from initial symptoms.

How hepatitis is transmitted
Hepatitis B and Hepatitis C viruses are transmitted through blood and body fluids. Infected blood can be transmitted from one person to another through openings in the skin or through contact by both individuals with a sharp tool.

Methods of blood-borne transmission of both Hepatitis B and C include:
• Blood splashes from minor cuts and nosebleeds
• Procedures that involve blood (especially in health care)
• Hemodialysis (using kidney machines)
• Sharing personal items like nail clippers, razors, and toothbrushes
• Sharing needles for intravenous drug use
• Body piercing and tattoos.

Hepatitis B and, to a lesser extent, Hepatitis C can also be transmitted as a result of:
• Close household contact with an infected person
• Unprotected sex with multiple partners
• Childbirth (from mother to baby).

About one third of Hepatitis C patients never find out how they contracted the virus.

Accurate detection techniques were developed for Hepatitis B in 1972, and for Hepatitis C in 1992. Before these dates, the virus could not be detected reliably, so some people received infected blood in blood transfusions. If you had a blood transfusion or organ transplant before these dates, ask a doctor to test you for the appropriate virus or viruses.

Who is at high risk for hepatitis?
Any time the skin is broken, there is the opportunity to contact another person's blood or body fluids and the risk of hepatitis infection increases. People who routinely come into contact with other people's blood are at high risk. These include:
• Healthcare workers
• Tattoo artists, people doing body piercing

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People with multiple sex partners.
Drug users

Healthcare workers
People who are exposed to blood and body fluids are at high risk for hepatitis. This includes people who:
- Work in the lab and handle specimens
- Work directly with patients and come in contact with body fluids
- Change the diapers of infected babies
- Work in housekeeping and come in direct contact with garbage or laundry.

All healthcare workers are at a greater risk because of their job.

Tattoo artists and people doing body piercing
Equipment that has not been properly sterilized and shared ink may contain the hepatitis virus. The following people are at risk:
- The person receiving the tattoo or piercing
- The tattoo artist or the person doing the piercing.

People with multiple sex partners
The risk of getting hepatitis is high for people having unprotected sex with multiple partners.

Drugs Users
People who share needles when injecting drugs are at a high risk for hepatitis. People without medical training, who inject themselves or others, are at high risk for getting or giving the disease. Re-use of needles is one of the most common causes of the spread of hepatitis.

Prevention is the best treatment
Healthcare workers are at high risk for hepatitis. The best treatment is prevention.

There is a vaccine available for Hepatitis B. It is now a routine vaccination for children. The employer must provide all healthcare workers with the Hepatitis B vaccine at no cost if they are not immune to the virus. The vaccine does not contain any live virus. It is given in a series of 3 injections, and the most common side effects from hepatitis B vaccination are pain at the injection site and mild to moderate fever.

Rules in your facility
- All staff must follow Standard Precautions.
- All blood transfusions must be screened for Hepatitis B and C.
- All staff must be offered the Hepatitis B vaccine at no cost, if they are not immune to the virus.
- Children must be routinely vaccinated for Hepatitis B.

Your personal role
- Improve sanitation when possible.
- Maintain good personal hygiene habits.
- Encourage prevention through vaccination.
- Have yourself vaccinated if you are not immune to Hepatitis B.

Biohazardous Waste
What is biohazardous waste?
Biohazardous waste or biomedical waste is waste material from the hospital or medical office that involves blood or body fluids that present a risk of death, injury, or illness to individuals who handle it.

Materials defined as biohazardous waste include:

- Human blood and blood products
- Cultures and samples taken to determine the causes of disease
- Laboratory waste such as culture dishes, blood specimen tubes, and devices used to transfer, inoculate, or mix cultures
- Personal protective equipment, clothing, and materials that have come in contact with biohazards
- Sharps such as syringes, needles, suture needles, and fingersticks
- Body parts that have been surgically removed
- Human waste that is infected/diseased.

Packaging and labeling biohazardous waste for disposal
There are special procedures for disposing of any materials that may contain blood or other sources of germs so that these germs are not spread to others.

Treat all hospital laundry as if it contains germs.

- Handle it as little as possible.
- Always hold it away from your clothing.
- If laundry is visibly soiled, use gloves when removing it so that you do not touch any blood or other material.
- Always put soiled laundry into laundry bags with lids.
- Wash your hands frequently.
Any trash that has been in contact with blood or other body fluids must be placed in "biohazard" bags. These bags are usually red, are marked "Biohazard" and labeled with the facility’s mailing address, and are specially designed to be leak proof. They are referred to as **Red Bags**. Red Bags should NOT be used for regular trash and should NEVER be discarded with regular trash; for example, a defective Red Bag should be disposed of as biohazardous waste even if it has not been used.

All sharp instruments such as needles, scalpels, suture needles, and fingersticks that have come in contact with blood or other body fluids must be put into special sharps containers. The containers are made of leak proof, rigid, puncture-resistant plastic and must be labeled with the international biohazard symbol and the word "Biohazard."

Four rules to remember when packaging sharps:

1. ALWAYS use the safety devices required by your facility.
2. ALWAYS be sure that the sharp has dropped completely into the container.
3. NEVER recap needles while holding them in your hands.
4. NEVER over-fill a sharps container. Remove the container when it is 3/4 full or sooner depending on the policy of your facility.

Some canisters and containers for blood and/or body fluids are designed for disposal with the waste material in them. If they are made of glass or another breakable material, they are treated as large sharps and disposed of in large, rigid, biohazard containers.

Finally, specimens sent to the lab. for analysis must be in a specimen container or bag with a "Biohazard" label.

Under normal circumstances, eating utensils such as silverware and dishes do not need special handling. The very hot water used in dishwashing will kill any germs.

Blood spills and dried blood should be cleaned using disinfectants designed for that purpose. The Hepatitis virus can live as long as one week in dried blood.

Medical equipment can be decontaminated by:

- Autoclaving or steam sterilization
- Chemical disinfection.

**Autoclaving**

Autoclaving or steam sterilization uses saturated steam at temperatures high enough to kill infectious agents, and is used for equipment that is re-used and must be sterile. Time and temperature requirements vary depending on the type of waste. Waste that has been autoclaved is marked with autoclave tape.

**Chemical disinfection**

Equipment that has been contaminated with blood or other body fluids and does NOT need to be kept sterile may be decontaminated by chemical disinfection.

End of Infection Control Lesson