Infection Control

2.5 Contact Hours

Presented by:

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Infection Control

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Objectives:

At the completion of this course, the learner will be able to:
1. Identify the reasons for the current critical need for infection control.
2. Recognize the pathogenesis of infection.
3. Identify the principles of standard precautions.
4. Recognize three types of transmission precautions.

Overview

The discovery of antibiotics lured the healthcare professions into a sense of empowerment. We had grand visions of eradicating all infectious agents that had plagued mankind over the centuries. However, this dream has not been fulfilled. Life-threatening infections are currently a threat not only in health care facilities and offices, but in the community as well. This disastrous outcome makes the principles of infection control an even more critical priority as we head into the future. Since the advent of HIV and the rise of other opportunistic organisms the Centers for Disease Control (CDC), the Occupational Safety & Health Administration (OSHA), and the Joint Commission have developed and enforced standards for infection control. They all stress cooperation among the various healthcare disciplines using consistent methods of infection control. Since infection control is so critical to the health of not only patients, but healthcare workers as well, we must periodically review the principles. This course will review not only infection control techniques but the reason that we must use them every day with every patient.

Infection occurs when a bacteria, virus, fungus, parasite, or prion invades the body, multiplies, and causes symptoms of disease. Antimicrobial agents have been developed over the years to combat infections. In spite of them, infectious diseases remain a major cause of death. This is due to the ability of microorganisms to adapt in ways that make the resultant disease that they cause unpredictable. Many diseases that were once easily treatable are now complicated with variations in clinical manifestations. Tuberculosis, rheumatic fever, and cholera are examples. Some bacteria have become multidrug-resistant organisms (MDROs) and others are now resistant to all known antibiotics. It is frightening to see how fast these incredibly numerous and diverse organisms can adapt to medical therapies. That is why we see changing protocols in antibiotic therapy every few years. Medical science is hard pressed to stay ahead of the microbes.

Certain factors have increased not only the incidence but the diversity of the infectious diseases seen today. Changes in the surface of the earth caused by human habitation have caused new agents to appear such as the Ebola and Marburg viruses. Worldwide travel of

animals and humans provide transportation for microorganisms to new environments where there is less immunity. This caused the appearance of the West Nile Virus, H5N1 avian influenza, monkeypox and severe acute respiratory syndrome (SARS) in the United States. Biological warfare has introduced lethal infectious agents to various populations as well.

The human population has changed and this has also encouraged the increase in infectious diseases. There are many more people who are immunocompromised. Many must suppress their immunity to avoid rejecting a transplanted organ, or to treat inflammatory or neoplastic diseases. Others have compromised immune systems due to the human immunodeficiency virus (HIV). Organisms that were rarely seen in action have taken advantage of this population and are now much more commonplace.

Pathogenesis of Infection

For infection to occur, host and infectious agent must meet. Then the invading organism must overcome the various host barriers to infection in a series of steps. If the infectious agent is strong enough, infection readily manifests. If the agent is weak, it may remain silently within the host for years until it has gradually multiplied enough to cause disease. Once disease occurs, it spreads through a population as more and more people are exposed to a contaminated source, such as water, or to people who transmit the infectious agent in one of various ways. The modes of transmission vary among infectious agents and include direct or indirect contact with the patient or the patient's environment, respiratory or mucous membrane exposure to droplets, or via suspended organisms in the air.

There are several risk factors for infectious disease. Behaviors such as unprotected sex put one at risk. Exposure to contamination in the environment of the living situation or workplace raises risk of infections. Infected animals can also expose humans to harmful microbes. Receiving medical care exposes the patient to new infectious agents. Medical treatments that involve opening the skin, the introduction of instruments or tubes into the body, and treatment with immunosuppressive drugs or antibiotics can all lower the patient's resistance.

Host factors influence the probability of the host to succumb to infection. Age, present or prior illnesses, and nutritional status impact resistance. Pregnancy complicates infections. The person's emotional state and stress level affects the immune system. Defects in immune system functioning can greatly raise the risk of infection. These defects can include those in nonspecific immunity such as a decreased cough reflex or skin integrity interruption or in the inflammatory response such as the presence of neutropenia or absence of the spleen. They can also include defects in innate immunity such as complement system defects, or in adaptive immunity such as deficiencies in T lymphocytes or B cells.

Bloodborne Pathogens

Bloodborne pathogens are those that are present in the blood of the infected patient. Exposure to this blood via contaminated needlesticks or cuts in the skin with contaminated sharps exposes a healthcare worker to infection. Transmission in the healthcare setting also occurs via exposure of the mucous membranes of the eyes, nose, and mouth to the patient's infected blood. Pathogens included in this category include the hepatitis B virus (HBV), hepatitis C virus (HCV), HIV, Ebola, and Marburg viruses.

Standard Precautions

Standard Precautions combine Universal precautions and the system of Body Substance Isolation (BSI) and are based on the principle that every person's blood, body fluids, secretions, and excretions may be infected with infectious agents and should be treated as contaminated. Transmission of these agents is prevented by certain practices that protect both the patient and healthcare personnel including:

- Proper hand hygiene
- Use of personal protective equipment (PPE) such as gloves, gown, mask, and goggles or face shields when appropriate
- Safe injection practices
- Proper handling of contaminated equipment and supplies
- Proper cleansing of equipment, environment, and supplies
- Respiratory hygiene/cough etiquette
- Proper placement of patients

Handwashing is still one of the major ways to avoid the spread of infectious organisms. The incidence of infections with MDROs has been increasing, usually due to transmission via the hands of a healthcare worker. Proper hand hygiene includes more than just proper handwashing. It starts with avoiding bare hand contact with surfaces near the patient. This prevents contamination of the hands by surfaces and of surfaces by dirty hands. Hands that are contaminated with visible blood, body fluids, or other potentially contaminated materials should be washed for at least 15 seconds with soap, either antimicrobial or nonantimicrobial. An alcohol-based hand rub may be used if the hands are not visibly soiled or may be used in addition to hand washing. Hand cleansing should be performed:

- Before and after direct contact with any patient
- After contact with potentially contaminated fluids, materials, equipment, or furniture
- After touching the patient's skin, taking vital signs, or lifting the patient
- After contact with contaminated areas of the patient's body and prior to touching clean areas of the patient's body
- After removing gloves

Antimicrobial hand soap should be used when infection with spores is suspected. Healthcare workers who work with patients who are at high risk for infections should not wear artificial fingernails or hand jewelry. They can carry infectious agents to both the patient and to the healthcare worker's home.

The use of personal protective equipment depends on the expected risk of contamination and the type of organism involved. PPE should be used when there is a risk of contamination of the healthcare worker's clothes or body with the patient's blood or other body fluids. Care should be taken to properly remove PPE without contaminating oneself during the removal. PPE should be removed and disposed of before leaving the patient's room. Gloves are worn more often than gown, mask, goggles, or face shield. Gloves should be worn whenever contact with any patient's blood, body fluids, open skin, or contaminated intact skin is anticipated. Gloves should be applied over clean hands and should fit properly. Vinyl gloves should be worn if a latex allergy is present in the patient or healthcare worker. Gloves should be changed when soiled and removed with care so that the hands are not contaminated. Disposable gloves should be discarded. Reusable gloves used to clean equipment should be properly cleaned. Gowns are worn whenever contamination of clothing is a risk. The mouth, nose, and eyes should be covered when there is a risk of splashes with contaminated fluids or during procedures in which aerosols are generated such as suctioning, bronchoscopy, or endotracheal intubations of patients with respiratory-transmitted infectious agents. Masks should be worn to protect the caregiver from inhaling organisms or exposing the mucous membranes to infection. They should also be worn to protect the patient during lumbar punctures, placement of spinal catheters, and for injections into spinal catheters during tests or epidural anesthesia.

Safe injection practices include the use of safe sharps containers and disposal, awareness of sharps during procedures and surgeries or tests, and the use of needleless intravenous (IV) systems. Needles should not be recapped, bent, or removed after use. All needles and sharps should be disposed of as soon as possible in an approved container that should be nearby. Sharps containers are disposed of in accordance with hazardous waste regulations. Aseptic technique must be used when accessing medication from vials, ensuring that the vial is not contaminated or used for multiple patients. Syringes, needles and cannulae are to be considered single-use equipment and discarded after use. The same goes for IV administration sets.

Proper handling of contaminated equipment and supplies includes using PPE as needed to avoid contamination from visibly soiled equipment or linen during transportation for cleaning. Linens should be handled as little as possible and held away from the body as they are bagged for cleaning. Special bags that dissolve can be used to transport and launder contaminated linens.

Contaminated equipment should be cleaned following established facility policies and procedures. Gross organic material is removed using cleaning agents prior to disinfection and sterilization. Agents used for cleaning and disinfection must be EPA-registered anti-microbial products and Material Safety Data Sheets (MSDS) must be available for employees to read, and for guidance in the case of accidental exposure to these products. All products should be used according to the manufacturer's recommendations. Products should be changed as needed to be sure that they are affective against infectious agents encountered at the facility where they are used. PPE should be worn as needed during

cleaning. Cleaning should be done in a way that does not cause organisms to be shaken or swept up into the air. The patient environment must be cleaned on a routine basis according to the level of patient contact and amount of soiling present. Surfaces that are close to the patient or frequently touched by the patient such as bed rails, over-bed tables, door knobs, sinks, and toilet handles must be cleaned daily and when they are grossly soiled in between. Devices used with multiple patients should be cleaned after each use or daily according to manufacturer's instructions. Eating utensils are appropriately cleansed using detergent and machine washing with hot water, even if the patient is in isolation.

Respiratory hygiene and cough etiquette help to control respiratory transmission of infectious diseases. Patients who present to the facility for care and any visitors suspected of having respiratory infections are offered masks and encouraged to use tissues to cover the mouth when coughing. Handwashing facilities, alcohol hand rubs, and instructions on their use are given to these patients and instructional signs are posted in the facility to encourage all to adhere to respiratory hygiene procedures. Tissues and covered waste receptacles are provided. These patients are also encouraged to separate themselves from others by at least 3 feet, or placed in a less populated waiting room if possible especially during seasonal outbreaks of respiratory infections in the community.

Patient placement is another important component of standard precautions. Patients who have open wounds or lesions with drainage or copious secretions are separated from other patients upon presentation to the facility. This applies also to infants with suspected respiratory or gastrointestinal infection as well. The placement of the infected patient depends on the suspected infectious organism involved, the mode of transmission of the organism, and risk of the infection spreading to other patients. Single rooms or rooming with a patient who has the same disease is ideal.

Transmission-based Precautions

When a patient is infected with a virulent organism standard precautions by themselves are not enough. Depending on the mode of transmission the patient will be placed in isolation with contact, droplet, or airborne precautions in place as well as standard precautions. More than one type of precaution may be necessary for a given organism. Equipment should be dedicated to the patient and cleaned according to standard precautions. Multiple use equipment must be cleaned and disinfected before use with another patient. If equipment is cleaned in another location it should be transported in a labeled bag. The patient room should be cleaned daily. Visitors must be taught to observe transmission precautions and should limit items brought into the room. Care must be taken to counteract the anxiety, depression, stigma, and other mood disturbances that the patient may feel as a result of isolation. Reduced contact with the staff can result in an increase in adverse events that would otherwise be more easily preventable.

Contact precautions serve to prevent transmission by direct or indirect contact with the patient and surrounding environment. The patient with copious drainage or incontinence of feces fits this category. The patient is in a single room or may have a roommate with the same organism if appropriate. If so there should be three feet between the beds, the curtain must be drawn, and both patients should be taught contact precautions and that they must not share any items. Gown and gloves are worn when direct contact with the patient or areas of the environment that may be contaminated will occur. If two patients are in the same room, PPE must be changed and hand hygiene performed before caring for the other patient. If the patient must leave the room for a test or procedure, alert the receiving department to have PPE available for use. Any infected areas of the body should be contained by dressings or bags if possible and covered during transport. PPE worn to do this should be removed before leaving the room and transporting the patient through the corridors. Don a fresh gown and gloves when arriving at the destination to transfer the patient to a cart, bed, or exam table.

Droplet precautions are used when there is a risk of transmission of the organism via respiratory secretions to the mucous membranes or respiratory system of the caregiver or visitor. The organism is infectious only for a short distance around the patient so a negative-pressure room and special air handling is not needed. Again, the patient may be in a single room or with another patient with the same infectious disease. A mask is donned upon entry to the room and changed between patients in the room. If transportation to another department is necessary, the patient wears a mask the entire time away from the room and is taught to observe respiratory hygiene/cough etiquette at all times.

Airborne precautions should be used for organisms that are infectious for long distances via suspension in the air. The patient is alone in a negative-pressure room with special air handling and ventilation. The air in the room is exchanged 6 to12 times per hour and routed to the outside or through HEPA filters to reenter the hospital circulation. The door to the room must be closed at all times. Caregivers must wear a mask or a fit-tested NIOSH-approved N95 or higher respirator may be needed depending on the organism. If possible, caregivers immunized against the organism should care for the patient. If transportation to another department is necessary, the patient wears a mask the entire time away from the room and is taught to observe respiratory hygiene/cough etiquette at all times. Any room in which the patient resides for even a short period should be left empty for at least one hour afterwards to permit time for a total room air exchange to occur.

Infection control has become critical for any healthcare giver to help prevent the spread of infectious organisms which, through their incredible diversity and adaptability, have risen to a level of threat known only before the advent of antimicrobials. The incidences of infection will continue to rise and the healthcare giver must frequently review infection control measures as they change to meet the threat.

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