

Toronto E.M.S. Infection Control Manual Version 2.0

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Emergency Medical Services  **TORONTO**

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Infection prevention and control is a priority
at Toronto Emergency Medical Services

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The Bug Stops Here

Introduction

Infection prevention and control is defined as “a program that limits the spread, or prevents the occurrence, of infections within the health care environment.” Patients who develop infections while receiving medical care have increased morbidity and mortality, longer hospital stays, an increased cost to the health care system and the ability to spread these infections to other patients or members of the health care team. Infection prevention and control procedures are a vital part of patient care.

The use of infection prevention and control routine practices for every patient will result in:

- Decrease in paramedic exposures and infections.
- Decrease in risk of patients becoming infected.
- Decrease in morbidity and mortality.
- Raising the standard of patient care.
- Increasing patient safety
- The same excellent standard of care for each patient.

Effective infection prevention and control practice helps paramedics protect themselves from contracting a communicable disease. Paramedics who practice effective infection prevention and control procedures for all patients will raise their standard of care while protecting their patient, themselves and their families from communicable disease. The infection control program at Toronto Emergency Medical Services (EMS) was developed to ensure that the appropriate infection control policies and procedures are followed for the protection of all patients and paramedics.

Infection, as defined in the Association for Professionals in Infection Control (APIC) text of Infection Control and Epidemiology, is **an invasion and multiplication of micro-organisms in or on body tissue causing cellular damage through the production of toxins, multiplication or competition with the host’s metabolism.** Most contact with an infectious agent will not result in active disease.

Infectious agents that cause disease are:

- Bacteria
- Viruses
- Fungi and Mould
- Parasites
- Prions

Paramedics and other emergency services workers should be familiar with:

- Modes of transmission.
- Signs and symptoms of communicable disease.
- Exposure risk factors.
- Personal Protective Equipment.
- Barrier precautions.
- Proper hand hygiene.
- Cleaning and sanitizing techniques.

Effective hand hygiene, use of personal protective equipment and protective barriers, and other infection control measures in health care are referred to as **routine practices**. Routine practices are what Health Canada calls a system of infection prevention recommended to prevent transmission of communicable diseases. It is a method used for every patient to ensure health care workers are protected from potential infection, including those whose disease status is unknown.

When using routine practices to prevent infection all patients should be regarded as potential reservoirs of disease. Routine practices involve recognition of the possibility that a patient has a communicable disease and subsequent good decision making.

Decisions are based upon:

- Signs and symptoms of patient.
- Mode of transmission.
- Degree of patient contact.
- Degree of contamination.
- Environmental conditions.
- Procedure likely to create blood or body-fluid splash.
- Difficulty of procedure.
- Patient co-operation.

Paramedics should be vigilant in their infection prevention and control practices. Decisions to use protective equipment should not be based on the diagnosis of the patient.

By the time the diagnosis is made it may be too late to prevent transmission.

This manual is designed to provide a framework to inform emergency services workers of the basics of infection prevention and control practice. After reading the material in this manual, paramedics should have the knowledge to make effective decisions to promote infection control.

Fact sheets for the communicable diseases most likely to be encountered in the pre-hospital environment are located in the appendices of this manual. Use them as a reference when you encounter a communicable disease in order to ensure that you know the facts and can take the appropriate action to determine your risk of exposure and appropriate follow up.

If communicable diseases are encountered that have not been included, information may be obtained directly from:

- TEMS Infection Control Practitioner. 416 338 2151
- Toronto Public Health. 416 338 7600. toronto.ca/health
- Health Canada. www.healthcanada.ca
- Ministry of Health and Long Term Care. www.health.gov.on.ca
- United States Centers for Disease Control and Prevention (CDC), Atlanta. www.cdc.gov

The Chain of Infection

The chain of infection describes all the components that are necessary for the transmission of a communicable disease. The six links in the chain of infection are:

1) **Infectious agents** - These are microorganisms that are capable of causing human disease.

They include:

- Viruses
- Bacteria
- Fungi and moulds
- Parasites
- Prions

2) **Reservoir** – a place where an infectious agent can survive but may or may not multiply. Patients, health care workers, health care equipment, and the environment are common reservoirs associated with nosocomial infections. A nosocomial infection is an infection acquired through contact with the health care system. Examples of reservoirs are: Humans, birds and swine for the influenza virus.

3) **Portal of Exit** – the path by which the infectious agent leaves the reservoir. An example of a portal of exit is when a person with human immunodeficiency virus (HIV) bleeds; the virus exits the body through the blood. Portals of exit include:

- Blood
- Respiratory tract
- Gastrointestinal tract
- Genitourinary tract
- Skin and mucous membranes
- Trans-placental

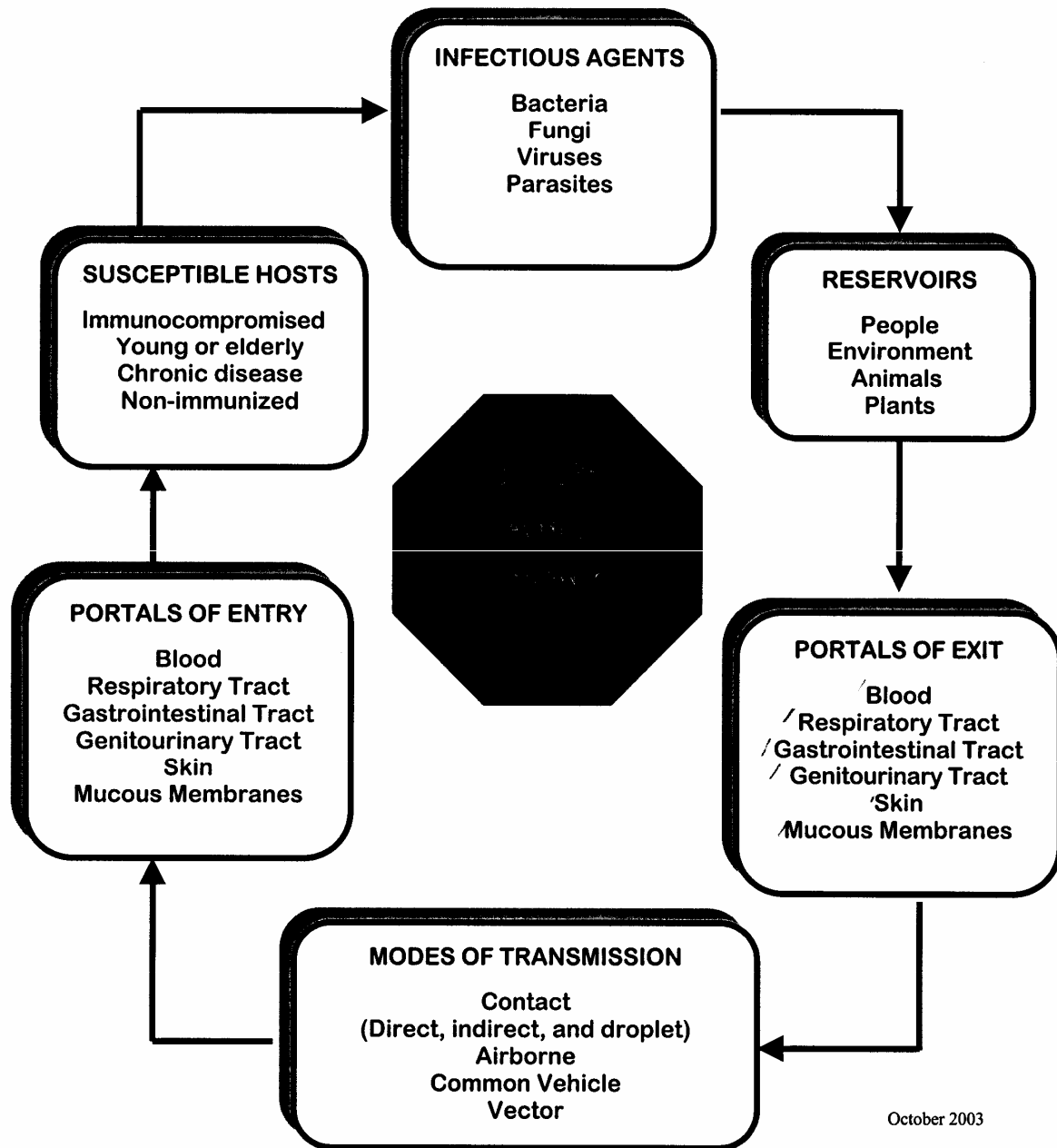
4) **Mode of Transmission** – the mechanism by which an infectious agent is transferred from its reservoir to a susceptible host. Modes of transmission include:

- Contact transmission: includes direct, indirect, and droplet
- Airborne.
- Common vehicle.
- Vector.

5) **Portal of Entry** – the path by which an infectious agent enters the susceptible host. An example is when a health care worker has droplet contact of respiratory secretions on their mucous membranes from a patient with a febrile respiratory illness. Portals of entry are the same as portals of exit.

6) **Susceptible Host** – a person who is lacking an effective resistance to a particular infectious agent. Patients in pre-hospital care often have chronic health problems that lead to compromised immune systems making them susceptible hosts. Other susceptible hosts include the very young, the elderly, non-immunized people, people on certain medications, and those under a lot of stress.

The Six Components of the Chain of Infection



Breaking the Chain of Infection

The goal of an infection prevention and control program is to break the chain of infection and prevent the spread of the infectious agents that cause communicable disease. This is accomplished by using routine practices and additional precautions.

How is the chain broken at each link?

- **Infectious agents** – The environment is full of infectious agents and therefore it is not reasonable to expect to be able to get rid of them all. Routine cleaning procedures, when done properly, will reduce the number of infectious agents in the pre-hospital environment, such as those on uniforms, in the patient care area of the ambulance and on equipment, to levels that are not harmful.
- **Reservoir** – Culling of chickens to control avian influenza or having a symptomatic paramedic stay home are examples of breaking the chain at this link. Routine practice of cleaning used equipment, etc. also breaks the chain by preventing environmental items from becoming reservoirs.
- **Portal of Exit** – Preventing the infectious agent from leaving the reservoir is how the chain of infection is broken at this link. Practicing hand hygiene after covering your mouth when sneezing, coughing into your elbow instead of into your hand, and avoiding procedures that will induce the patient to cough are examples of breaking the chain of infection at the portal of exit.
- **Mode of Transmission** – This is the most likely place to interrupt the chain of infection. The use of routine practices such as hand hygiene, cleaning, disinfection, and the use of personal protective equipment are highly effective in preventing transmission of communicable disease.
- **Portal of Entry** – Personal protective equipment (PPE) can be used to cover up portals of entry, such as the mucous membranes of the nose, mouth and eyes, and the respiratory tract. The use of moisturizer helps to keep skin intact and therefore effective as a barrier to infection. Non-intact skin also acts as a portal of entry.
- **Susceptible Host** – Most of the patients treated in pre-hospital care have compromised immune systems, making them susceptible hosts. Diligent use of routine practices will prevent transmission of infectious agents to these patients. Paramedics can ensure that they are not susceptible hosts by taking a number of measures to protect themselves. These measures include:
 - Immunization
 - Adequate nutrition
 - Preserve normal flora through careful antibiotic use
 - Protect intact skin from damage

- Regular exercise
- Adequate rest
- Decreased stress levels

Modes of Transmission

The modes of transmission are the mechanisms by which an infectious agent is transferred from a reservoir to a susceptible host. Interruption of the chain of infection at this link is the most likely way to prevent the transmission of disease. The most common mode of transmission in health care is contact transmission which can be easily and effectively prevented using routine practices. Airborne transmission and common vehicle transmission occur less frequently and can also be controlled with routine practices and additional precautions. Vector-borne transmission has not been reported in Canadian health care settings, largely due to a high level of cleanliness which removes insects and animals from the health care setting.

Contact Transmission

- **Direct contact** occurs when there is transmission of an infectious agent from an infected individual straight to a susceptible host, such as blood to blood contact, skin to skin and diseases which are sexually transmitted.
- **Indirect contact** involves the passive transfer of infectious agents to a susceptible host through a contaminated intermediate object. Indirect contact can occur when contaminated hands, equipment, or objects that are not cleaned and/or disinfected properly come into contact with a portal of entry on a susceptible host.
- **Droplet transmission** refers to large droplets (greater than 5 microns) that are generated from the respiratory tract of a patient when they cough or sneeze, or during procedures such as suction and intubation. These droplets travel up to one metre away and may deposit on the mucous membranes of a susceptible host. Some organisms expelled in droplets settle on objects in the immediate environment, making infection via indirect contact, such as a contaminated hand touching a mucous membrane, possible. The wearing of surgical masks, eye protection, medical gloves and performing diligent hand-hygiene are extremely effective ways of preventing droplet transmission from occurring.

Airborne Transmission

Airborne transmission refers to infectious agents that remain suspended in the air in droplet nuclei (smaller than 5 microns) or on dust particles. These agents can be dispersed widely by air currents for prolonged periods of time and may be inhaled by a susceptible host some distance from the reservoir. The nature of this mode of transmission makes it very difficult to control,

however the wearing of N95 respirators has been proven to prevent infection by preventing the microorganisms from reaching the respiratory tract.

Common Vehicle Transmission

Common vehicle transmission involves the spreading of infectious agents through a single contaminated source. Examples of possible sources are food, medication, equipment, and IV fluids. Routine practices, cleaning, disinfection, and regular checking of medicines and IV fluids for 'best-before' dates, discolouration or sediment, can prevent these items from transmitting disease.

Vector-Borne Transmission

Vector-borne transmission refers to those infectious agents that can only be transmitted by insects or animals. Examples are mosquitoes infected with the West Nile Virus, or a dog with rabies. While most health care workers are rarely exposed to vectors, paramedics are at risk for exposure to some vector-borne disease when outdoors, in unclean buildings or worksites or homes where animals are allowed to roam free.

Preventing the spread of organisms from
person-to-person is the goal of infection control.

Patient Assessment

Initial patient assessment can be a valuable tool in breaking the chain of infection at the source. However, for some diseases such as influenza, even a limited amount of contact time may result in the paramedic becoming infected. Health Canada and the Ontario Ministry of Health and Long Term Care recommend that health care providers **initially assess all patients capable of verbal response from a distance of at least one metre in order to rule out a febrile respiratory illness (FRI)**. Most FRIs are spread through the droplet route; because droplets are heavy, they travel less than one metre through the air. Therefore **assessing a patient's symptoms before approaching to determine the necessity of personal protective equipment can help minimize the risk of infection**.

Paramedics should ask the patient:

- If they have a new or worsening cough.
- If they have a fever.

If the patient answers 'yes' to either of these questions, the paramedic should consider wearing an N95 respirator, eye protection, and gloves **before** going to the patient to finish their assessment.

Certain patients will be unable to accurately report on their symptoms and may lead the paramedic to assume the patient does not have an FRI when this is not the case. **If you are in doubt, wear PPE before patient contact**. This ensures that the paramedic will be protected in the presence of a communicable disease. Appropriate PPE for patient contact is a fit-tested N95 respirator, eye protection, and medical gloves.

FRIs include some of the most readily communicable diseases in the pre-hospital setting. A patient who is coughing profusely may have spread infectious droplets throughout their environment. Paramedics should be aware of the signs and symptoms of FRI and use routine practices, especially respiratory precautions and excellent hand hygiene, to reduce the potential for disease transmission.

Signs and symptoms of FRI include:

- Fever
- New or worsening cough
- New or worsening shortness of breath
- Headache
- Muscle aches
- Hemoptysis
- Weight loss
- Exposure history

Paramedics are required to wear an N95 respirator, protective eyewear, and nitrile gloves when treating and transporting a patient that presents with these symptoms. **The symptoms alone are enough to make the decision to take precautions; do not wait for a diagnosis.** Delayed application of PPE can allow you to become infected. In addition to PPE, a paramedic should also use the ventilation system to reduce the infectious load in the vehicle and should limit patient contact to essential personnel only.

There are other patient symptoms that may reflect the presence of a communicable disease. **Paramedics are required to use routine practices when presented with these signs and symptoms:**

- **Acute diarrhea** is not always infectious, however it can be the result of many communicable diseases, such as clostridium difficile (C.Diff) and Norovirus. Diseases that cause diarrhea are generally spread by contact transmission so paramedics must wear gloves when treating and transporting these patients, and hand-hygiene must be performed at break of patient contact. Gowns should be worn if there is a risk of clothing contamination by body fluids.
- **Draining wounds** can be the result of bacterial infections such as Group A Streptococcus. When contacting any open wounds, the paramedic is required to wear gloves while covering the wound with a dressing to prevent contact with wound discharge. If dressing removal is required, the paramedic should use routine practices for droplet infection; slow and careful removal of the bandage will minimize aerosolization of any infectious agent.
- **Jaundice** can indicate that the patient has hepatitis. Paramedics are required to wear nitrile gloves to prevent contact with blood and body fluids. Eye protection and a gown are to be worn if fluid splash is possible.
- **Rash**, in the presence of fever, may be an indication of meningitis. Have the patient wear a surgical mask or a high-concentration low-flow mask fitted with the appropriate filter when oxygen is required. PPE for droplet contact transmission is required, and if the patient has respiratory secretions, a face-shield or N95 respirator and eye protection should be worn to protect the paramedic's mucous membranes from exposure.

A thorough patient history, including recent travel history and a proper physical examination, will help determine the possibility that the patient has an infectious disease. **Discovery of signs, symptoms, or patient history which suggests the possibility of communicable disease means the paramedic must put on PPE for that patient.** The absence of signs and symptoms, or patient history significant for communicable diseases means that the paramedic may safely decide not to wear some or all PPE during patient care.

Respiratory Precautions

Respiratory precautions are required when treating and transporting a patient with a diagnosis of a disease transmitted by the airborne or droplet route. Paramedics however, regularly care for patients before a diagnosis has been made. Therefore the decision to use respiratory precautions should be made based on the presenting symptoms of the patient.

Communicable diseases are an environmental danger and should be assessed in the same way that a paramedic would assess the scene for weapons, chemicals or other dangerous materials. There is often a family member or acquaintance that can provide information when you arrive on scene so that you can determine the patient's symptoms before approaching. Putting on an N95 respirator and eye protection or staying one metre away from the patient while establishing health status and medical history will also significantly reduce the risk of exposure to respiratory illnesses. Dispatch may also be able to provide you with important infection control information taken from the original 911 call.

Routine practices that are to be used for patients exhibiting signs and symptoms that indicate a respiratory illness include:

- Wear a properly fitted N95 respirator, nitrile gloves, and protective eyewear.
- Place a surgical mask on the patient. If oxygen therapy is indicated, a high-concentration low-flow mask with filter is to be used.
- Limit contact with the patient.
- Only allow essential personnel, as determined by the paramedic, in the ambulance.
- Turn on the exhaust fan during transport and close the window to the cab.
- Notify the hospital in advance of arrival that respiratory precautions are being taken.
- Follow routine cleaning procedures for vehicle and equipment following call.
- Leave exhaust fan on after transport with windows and doors closed to facilitate a complete air exchange in the vehicle.
- Perform hand hygiene at break of patient contact. **This includes when leaving the patient in the patient care compartment and going to the cab to drive.**

While it is an expectation of infection control, hospitals and long-term care facilities do not always inform paramedics when respiratory precautions are recommended. Paramedics must always be diligent and use precautions with all patients with signs and symptoms of FRI.

ROUTINE PRACTICES

Routine Practices

Routine practices have replaced “universal precautions and body substance isolation practices.” Routine practices and additional precautions are a system of health care practices that came into general use in 1999. The philosophy of routine practices relies on the recognition of signs and symptoms that can indicate communicable disease, and on knowledge of the modes of disease transmission rather than focussing on patient diagnosis. Paramedics should take steps to implement routine practices whenever they are unsure of the patient’s health status.

The components of routine practices include:

- Hand hygiene.
- Personal protective equipment (PPE).
- Sharps safety.
- Patient placement.
- Routine cleaning of equipment.
- Routine cleaning of the environment.
- Cough etiquette.

By following the components of routine practices for every patient, Toronto EMS can ensure a clean and disinfected environment for each patient and every paramedic. The same standard of care will be maintained for each patient while preventing pathogen transmission and improving patient and paramedic safety.

Additional Precautions

Additional precautions are further methods of infection control based on the mode of transmission of the infectious disease. Taking a thorough patient history will help uncover the possibility of infectious disease and this discovery should immediately result in the use of additional precautions while treating and transporting the patient.

Additional precautions include:

- Contact Precautions - gloves and gown required with attention to hand hygiene. Vehicle and equipment are to be cleaned following transport.
- - these are the type of precautions used to protect health care workers when caring for patients with respiratory infections. The precautions include a surgical mask (or N95 respirator) eye protection or face shield. Droplet precautions are also used to protect the mucous membranes during procedures and patient care activities likely to generate contact with body fluids such as airway suctioning or intubation. If a body fluid splash or

spray is a possibility, then a face shield must be worn. All equipment used on the patient and ambulance surfaces that contacted the patient or the patient's respiratory secretions are to be cleaned and disinfected following transport.

- If gross contamination of your uniform is possible, consider wearing a gown.
- Airborne precautions - require gloves, N95 respirator, and eye protection to be worn at all times. A gown should be worn when exposure to blood or body fluids is anticipated. All equipment used on the patient and all ambulance surfaces are to be cleaned and disinfected following transport. Use an N95 respirator on the patient if oxygen is not required. If oxygen is required then use high-concentration, low-flow mask fitted with an appropriate filter.

It is important to note that pre-hospital differentiation of airborne or droplet transmission is not generally possible as a diagnosis is usually not known. EMS personnel will use the same precautions when contacting any patient presenting with possible febrile respiratory illness in order to ensure the best possible protection regardless of the actual diagnosis.

Additional precautions are diagnosis based. As most patients in the pre-hospital environment do not have a diagnosis, routine practices should always be used with every patient, and when in doubt, wear an N95 respirator, eye protection and gloves before making patient contact.

Ask yourself: What precautions do I need to take in order to protect myself and safely treat this patient?

Hand Hygiene

Hand hygiene includes effective hand washing and skin care. Health care workers are frequent hand washers and time should be taken to use moisturizers to prevent the skin from becoming dry and cracked. Skin that is dry, cracked or suffering from rashes can be a portal of entry for disease. Healthy, intact skin is an effective barrier to infection. Care should also be taken to ensure non-intact skin is covered while at work. Polyurethane film (Opsite) or bandages should be used to protect non-intact skin from exposure. If non-intact skin is on the hands, two pairs of medical gloves should be worn as additional protection.

Health Canada states that hand washing is the single most important procedure for preventing infection. Contaminated hands are frequently implicated as a means of transmission of nosocomial outbreaks in acute care centres.

Routine hand washing can prevent potentially fatal infections from spreading from patient to patient and from patient to paramedic. Hand washing can also prevent hands from contaminating equipment and environmental surfaces. The consistent application of soap and water or alcohol-based waterless hand sanitizer is the best way for paramedics to protect their families, colleagues, patients, and themselves from dangerous diseases.

Hand Hygiene should be performed:

- Before and after patient contact.
- During and after PPE removal.
- Before and after invasive procedures.
- After vehicle check
- After cleaning equipment/vehicle.
- Just after leaving the emergency department.
- Before entering the cab of the ambulance.
- Before and after handling food.
- Before and after smoking.
- After using the bathroom or other personal body functions (sneezing, coughing if into hands)
- Any time hands are visibly contaminated
- Before and after your shift
- Any time you cannot remember when hands were last washed

Criteria for good hand hygiene:

- Remove all jewellery.
- Do not wear artificial nails as pathogens can accumulate underneath. Evidence suggests people who use artificial nails do not wash their hands as often due to concern of breaking down the glue.
- Use adequate amounts of soap, cleanser, or alcohol-based waterless hand sanitizer.
- If soap or cleanser is to be used, wet hands first before applying cleaning product.
- Bar soap is **not** considered appropriate for cleaning hands in the health care environment as the bars can accumulate bacteria. Liquid soap or cleanser, preferably from non-refillable cartridges, is the dispensing system of choice.
- Rub hands to create friction for at least 15 seconds.

- Rinse soap or cleanser from hands with clean running water and dry with disposable towel. Use disposable towel to turn off taps and to open bathroom door handle to prevent re-contamination.
- Rub alcohol-based waterless hand sanitizer until it is dry.
- Use moisturizer after hand washing, if possible, to prevent skin breakdown.
- Refrain from habits such as nail biting or tearing of skin of cuticles.
- Avoid touching mucous membranes and conjunctiva to help prevent self-infection.

Soap and Water

Washing with soap and water is an effective method to remove microorganisms from the hands.

Soap suspends removable organisms from the skin and allows them to be rinsed off.

Washing with soap and water should be used for the first and last hand-wash of the shift, when hands are visibly soiled and after every five applications of alcohol-based waterless hand sanitizer.

Alcohol-Based Waterless Hand Sanitizer

Unlike soap and water that removes microorganisms from the surface of the hands, **alcohol-based waterless hand sanitizers kill microorganisms by denaturing their proteins.**

According to the recommendations on hand hygiene from Health Canada, alcohol-based waterless hand sanitizers are extremely effective in preventing the transfer of health-care associated pathogens. Alcohol-based waterless hand sanitizer reduces bacterial counts on hands more effectively than washing hands with soaps or detergents containing other anti-microbial substances, due to the requirement of the product to be in contact with the hands for enough time for it to work properly. Most people do not wash their hands long enough for anti-microbial soap to be effective.

Alcohol sanitizer may cause the skin to dry out, however, and some manufacturers state that they can cause a build up on the hands, allowing microorganisms to hide from further sanitizer application and preventing hands from being cleansed. Washing with soap and water to remove this build up is required after every five to ten uses. **For this reason alcohol-based waterless hand sanitizer should only be used when there are no facilities available for washing hands with soap and water.** Alcohol-based waterless hand sanitizers should not be used when hands are visibly soiled as they will not penetrate the dirt, thereby allowing microorganisms to survive and preventing the hands from being effectively cleansed.

Moisturizing

Healthy skin provides a very effective barrier against infection. Frequent hand cleansing may result in increased dryness, chapping, cracking, or irritation of the skin. Hand moisturizers should be used following either of the above methods of hand hygiene to promote healthy, intact skin.

It is also important to remember when watches, rings, bracelets, or other jewellery are worn that they must be removed and cleaned with alcohol based waterless hand sanitizer or soap and water prior to hand hygiene so hands are not re-contaminated when these items are put back on.

Clean hands = safer patient care

Recommended Procedure for Handwashing
Ministry of Health and Long-Term Care Document

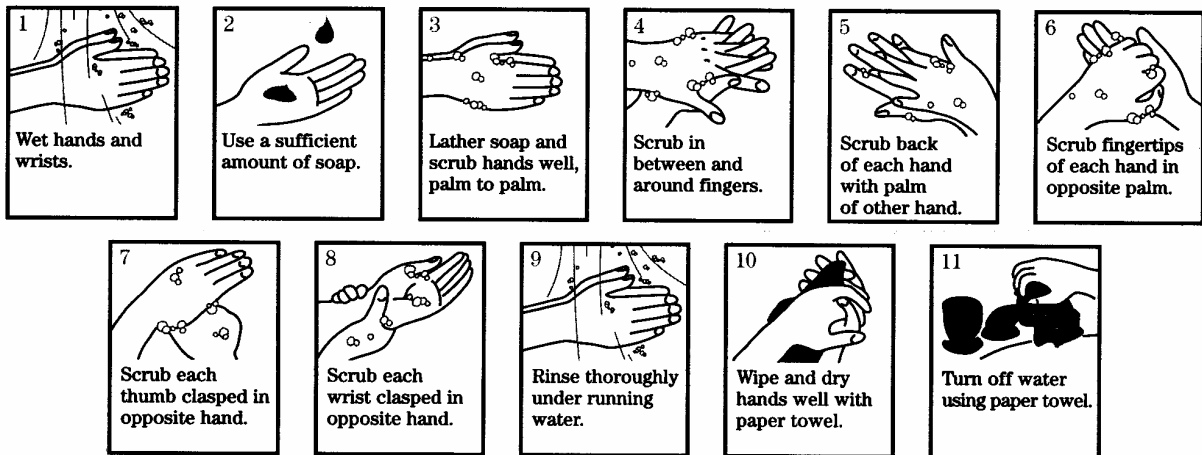
Handwashing

To wash hands properly, rub all parts of the hands and wrists with soap and water or an alcohol-based hand sanitizer. Wash hands for at least 15 seconds or more. Pay special attention to the areas of the hand most frequently missed.

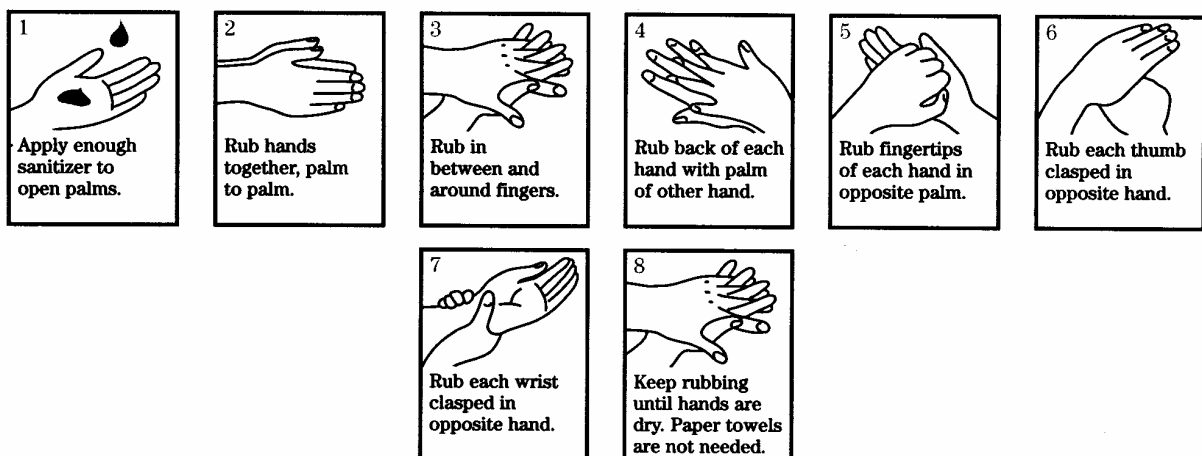
- Keep nails short.
- Avoid wearing rings.
- Avoid artificial nails or nail varnish.
- Remove watches and bracelets.
- Wash wrists and forearms if they are likely to have been contaminated.
- Make sure that sleeves are rolled up and do not get wet during washing.

If you have any questions regarding cuts, sores, allergies or pre-existing skin conditions, call Telehealth Ontario at 1-866-797-0000, TTY: 1-866-797-0007.

Handwashing with soap and water



Disinfecting with alcohol sanitizers



Personal Protective Equipment

Personal protective equipment (PPE) includes:

- Properly fit-tested N95 respirator
- Nitrile gloves
- Protective eyewear, including goggles or face shield
- Gown

N95 Respirator

N95 respirators are provided for your protection from diseases transmitted both through the airborne and droplet route. N95 respirators are designed to protect against infection by airborne disease by preventing the pathogens from being able to be breathed into the lungs. It protects against droplet transmitted diseases by preventing pathogens from entering the mucous membranes of the nose and mouth. The respirator was created to be used in a non-oil environment and will filter out **at least** 95% of particles that are 0.3 microns in size or greater. Since airborne particles always stick together, a filter for particles 0.3 in size or larger is therefore excellent protection against all known airborne diseases. All employees need to be fit-tested to guarantee that their N95 respirator provides the best possible protection. Fit-testing ensures that the N95 respirator fits snugly against the skin, which prevents air from being able to bypass the filtering effect of the respirator upon inspiration. Wearing an N95 respirator that has not been fit-tested, while better than no protection at all, will not be completely effective against airborne pathogens, as leaking will occur. It is mandated that you be fit tested on more than one N95 respirator to ensure respirator availability in the event your primary respirator is out of stock. Significant body changes can cause a respirator to fit improperly.

Staff should be fit tested again following

- Substantial (>15 lb) increase or decrease in weight.
- During the later stages of pregnancy.
- Major dental work (braces, dentures).
- Other facial changes due to illness or injury.

Facial hair may cause an improper seal, which can result in air leaking around the edges of the respirator. **The area where the N95 respirator seals to the face must be clean shaven.**

The new face of EMS wears a respirator

Indications for use of an N95 respirator:

- If a patient is febrile.
- If the patient has a new or worsening cough and the diagnosis is unknown.
- When treating and transporting a person with a known/suspected communicable disease that is transmitted by droplet or airborne routes.
- When treating and transporting a patient with symptoms of febrile respiratory illness.
- When blood or body fluid splash is likely or expected, and a face shield is not available, as it provides a covering for the mucous membranes of the nose and mouth.
- When performing invasive procedures such as intubation or suctioning.
- When required by a medical, provincial, or TEMS directive.
- When cleaning vehicle or equipment following transport of patient with a known or suspected communicable disease transmitted by airborne or droplet route.

The outer surface of the N95 respirator is contaminated, and care must be taken to prevent accidental self-innoculation with the pathogens on the outside of the respirator both during wear and while taking it off. The N95 respirator is designed for single patient use and is to be discarded following use. **Do not wear the respirator around the neck or on top of the head as this can result in self-inoculation.** When removing the N95 respirator, take it away from the face in a straight line, and place it directly in an appropriate refuse container. If an N95 respirator must be worn by the driver during transport, then the used N95 respirator should be removed at break of patient contact, hands should be cleansed, and a new, unused N95 respirator should be put on before going into the cab of the ambulance. **Used PPE must never be worn in the cab of the ambulance. Never drop used PPE in the cab of the ambulance.**

Protect against crushing of the N95 respirator because a crushed N95 respirator has a reduced capacity to seal properly which will minimize its effectiveness. Discard any N95 respirator that has been crushed. The N95 respirator must stay as dry as possible, as wet respirators are less effective. Change wet N95 respirator in a dry area as soon as possible.

Face-Plate Respirators

Face-plate respirators are provided for those staff members whose facial configurations prevent them from being able to be properly fitted for an N95. Face-plate respirators differ from N95 respirators in two key ways. Firstly, they are not disposable. This means that they require cleaning and disinfecting every time they are used during patient care with a patient with a known or suspected illness transmitted through the airborne or droplet route. Secondly, they differ from the N95 respirators because they require replacement of the disposable filters that are placed within the canisters of the respirator to filter air before it is inhaled. These filters are

specific to the type of face-plate respirator that has been issued. Please follow the donning, doffing and filter replacement instructions from the manufacturer included with the respirator. Because face-plate respirators are not disposable, there is a greater risk of accidental self-innoculation or cross-contamination when removing the respirator and when it is cleaned and decontaminated.

As per Directive #2006-07, please follow the procedure listed below for after-use care and cleaning of the face-plate respirator.

- Remove contaminated medical gloves and wash hands.
- Obtain a 'zip-lock' single-use only plastic bag for the face-plate respirator from your District Supervisor. Prop it open.
- Get a container of 0.5% Hydrogen Peroxide wipes and place them where readily accessible and open the container.
- Don clean gloves.
- Carefully remove respirator by inserting thumbs under the end tab of each of the harness head straps and fully extending them. Then, grasping the respirator by speaking diaphragm or bottom head harness strap attachments, lift the straps up and over the back of your head and bring the respirator straight away from your face.
- Do **not** grasp face-plate respirator by exhalation valve or filter cartridge as these may be damaged by rough handling.
- Remove used filter element and dispose it in an appropriate biohazard container.
- Use supplied 0.5% Hydrogen Peroxide wipes to wipe down outside of the respirator, and dispose of wipes in biohazard bag.
- Place respirator carefully in 'zip-lock' bag, being sure to note where outside of plastic bag has been touched. Seal bag.
- Remove gloves and wash hands.
- Put on a new pair of gloves and wipe down outside of 'zip-lock' bag with 0.5% Hydrogen Peroxide wipes where outside of bag was touched and let dry as per manufacturers' instructions.
- If respirator was placed on table at any point, wipe down table with 0.5% Hydrogen Peroxide wipes and let dry as per manufacturers instructions.
- Remove gloves and wash hands.
- Arrange for supervisor pick-up of face-plate respirator with the Duty Officer. The respirator will then be cleaned and disinfected again at the service district.

Note: Alcohol-based and abrasive cleaners will denature the material the respirator is made from and will scratch the lenses. They should not be used for cleaning.

Nitrile Gloves

Toronto EMS provides personal-issue nitrile gloves to all paramedics. Wearing the correct size glove will provide the best protection and the best tactile feel. As gloves are susceptible to tearing and are not considered 100% effective, wearing gloves does not eliminate the need for proper hand hygiene. Clean gloves are applied at the point of patient contact for every patient and should be removed and hands cleaned when patient contact is terminated. This includes when the paramedic who is driving the ambulance leaves the patient in the patient care compartment with his/her partner. **Used gloves must never be worn in the cab of an ambulance. Never drop used PPE in cab of ambulance**

Good hand hygiene is required regardless of glove use

Indications for the use of nitrile gloves:

- When treating and transporting a person with a known/suspected communicable disease that is transmitted by direct or indirect contact, droplet or airborne routes.
- When treating and transporting a patient with symptoms of febrile respiratory illness.
- When there is the possibility of blood/body fluid contact.
- When the patient's skin is soiled or not intact.
- When the skin on the paramedics hands is not intact. The paramedic may wear two pairs of gloves, and discard and replace the dirty first pair over the clean second pair in order to avoid further damage of the skin due to hand washing.
- When performing procedures requiring aseptic technique such as an intravenous line or intubation; these procedures also have the potential for body fluid exposure
- When performing invasive procedures.
- When cleaning vehicle and equipment following patient transport.

Guidelines

- Do not clean your hands with gloves on, since soap and water or alcohol-based hand sanitizers break down the material of the gloves.
- Discard gloves in appropriate receptacles at the point of patient care immediately after removal and perform hand hygiene.
- Change gloves and cleanse hands after invasive procedures.
- Cleanse hands and change gloves at break of patient contact. This includes the driver of the ambulance when leaving the patient in the patient care compartment.
- Be aware of what you touch with your gloved hands and be sure to clean those surfaces, including pens, stethoscopes, pagers, etc.
- Refrain from writing or transcribing notes on gloves as this damages the material of the gloves and limits their effectiveness.
- Avoid touching your face or hair with gloved hands.
- Gloves are contaminated and should be discarded immediately following use.
- Do not wear gloves in the cab of the ambulance.

Protective Eyewear

Protective eyewear can be worn over prescription glasses and is designed to protect the conjunctiva from exposure to blood, body fluids, and secretions propelled into the air by coughing or sneezing. Reusable protective eyewear should be cleaned and disinfected following use. Full face shields are provided and are to be discarded after use. Prescription eyewear is not considered protective as it allows contaminants to travel between the lens and the face.

Indications for the use of protective eyewear:

- If a patient is febrile
- If a patient has a new or worsening cough where diagnosis is unknown.
- When treating and transporting a person with a known/suspected communicable disease that is transmitted by indirect or direct contact, droplet or airborne routes.
- When treating and transporting a patient with symptoms of febrile respiratory illness.
- When blood or body fluid splash is likely or expected.
- When performing invasive procedures such as intubation or suction.
- When required by medical, provincial, or TEMS directive.
- When cleaning large amounts of effluvia, blood or body fluid.

Gowns

Long sleeved gowns are used while providing patient care and are designed primarily to prevent the forearms and uniform from being contaminated with blood and/or body fluids. Gowns have been found to be of little benefit in preventing the transmission of disease.

Indications for the use of gowns:

- When blood or body fluid splash is likely or expected.
- When required by a medical, provincial, or TEMS directive.

Gowns should be removed and discarded immediately following patient care and transport. Care must be taken to prevent self-contamination during gown removal. With the exception of a clean N95 respirator, no PPE in will be worn in the cab of the ambulance. PPE must never be disposed of or dropped in the cab of the ambulance.

When in doubt: gloves, eye protection, and N95 respirator;
BEFORE patient contact

Donning and Removal of Personal Protective Equipment (PPE)

It is important to pay close attention to the donning and removal of personal protective equipment (PPE). Proper donning of PPE is essential to avoid the possibility of transmission of disease, and proper removal of PPE is vital to ensure that you do not accidentally infect yourself through contact with potentially contaminated PPE as you take it off.

Applying PPE

- 1) Wash your hands.
- 2) Put on the gown so that the opening is at the back. Tie the waist and neck bands securely.
- 3) To apply the N95 respirator
 - a) If you are using a respirator that is stored flat, gently fan the folds out into proper shape.
 - b) Hold on to the straps of the respirator with the opening towards your mouth and the nosepiece the right way up.
 - c) Position the respirator under the chin with the nosepiece up.
 - d) Hook the bottom of the respirator with your chin and pull the straps over your head so that the respirator ends up covering your mouth and nose.
 - e) Adjust the top strap so that it rests high on the back of the head.

- f) Adjust the bottom strap so that it lies on the back of your neck. **Straps should not be crossed as this may pull the respirator out of position and prevent it from sealing properly to your face.**
 - g) Untwist the straps if necessary, and position the respirator so it fits low on your nose.
 - h) Shape the nosepiece to your nose by pushing inwards down both sides of the nosepiece using both hands. Always be sure to use both hands since using one hand may result in an improper fit.
 - i) Take hands away from respirator and breathe in deeply; the respirator should pull gently towards the face. If it does not, readjust the straps and nose piece. Then, with both hands away from the respirator, exhale sharply. Air that leaks out should be felt across the eyes, and indicates that the respirator requires readjustment of the nosepiece and/or the straps. Repeat this process until there are no leaks. If readjustment does not eliminate the leak, do not use that respirator.
 - j) **Never** wear the used respirator on your head or around your neck as there is a potential for self-inoculation when you touch that area at a later time.
- 4) Put on protective eyewear.
 - 5) Apply gloves, and pull glove over cuff of gown if possible.

Note: PPE should always be put on using the same procedure to create a proper protective barrier. PPE should always be worn when treating and/or transporting a patient with a known or suspected communicable disease and when cleaning the vehicle and equipment following treatment and transport of a patient with a known or suspected communicable disease.

Removing PPE

The order in which PPE is removed is critical to avoid the possibility of self-contamination. Following proper removal technique of PPE will prevent transfer of pathogens from the PPE to the skin.

- 1) Untie or break the waistband of the gown while still wearing gloves
- 2) Remove the gloves in the following manner:
 - a) Using your left-hand pinch the right glove near the top of the palm without allowing the glove's outer surface to contact your skin.
 - b) Pull downward, allowing the glove to turn inside out as it comes off. Keep the right glove bunched in the left hand so no part of the glove touches any exposed skin.
 - c) Insert two fingers of the un-gloved hand under the edge of the left glove. Avoid touching the glove's outer surface.

- d) Pull downward from the wrist so that the glove turns inside out as it comes off. Continue pulling so that the right glove is enclosed in the left glove.
 - e) Discard the gloves carefully in the appropriate receptacle.
 - f) Hands are now contaminated from touching gloves. Cleanse your hands using proper hand hygiene techniques.
- 3) Remove the gown
- a) Untie or break the neck strap.
 - b) Grasp the outside of the gown at the shoulders and pull the gown down over your arms turning it inside out as it comes off.
 - c) Holding the gown away from your uniform and roll it inside out, handle as little as possible and discard into the appropriate disposal container.
 - d) Hands are now contaminated from contact with the outside of the gown. Cleanse your hands using proper hand hygiene techniques in order to prevent self-inoculation and/or contaminating hair and uniform while removing eye protection and N95 respirator.
- 4) Remove eye protection and/or face shield.
- a) Remove the face shield by holding the bottom of the shield with one hand and with the other hand pull the strap over the head. **Pull the shield straight away from the face and discard in the appropriate disposal container.** Do not lift face shield up and over the head to remove as this can result in contamination of the hair and lead to accidental self-inoculation when you touch your hair at a later time.
 - b) Remove glasses using two hands. Each hand is placed on the corner of the glasses and then glasses are pulled straight away from the face to prevent contaminants from dripping off the glasses and onto your face. Protective glasses are reusable and need to be cleaned while cleaning the other equipment. Refer to the equipment cleaning section for instruction.
 - c) If goggles are worn, lift elastic strap up and over the head with one hand while stabilizing goggles on face with the other. Remove goggles by taking them straight away from your face. Goggles are reusable and need to be cleaned with other contaminated equipment. Refer to the equipment cleaning section for instruction.
 - d) Hands are now contaminated from contact with the eye protection/face shield. Wash your hands again using proper hand hygiene techniques.
- 5) Remove the N95 respirator.
- a) Cup the respirator in your hand. Pull the bottom strap over your head.
 - b) While still holding the respirator, pull the top strap over your head.

- c) Remove the respirator straight away from your face and discard in the appropriate disposal container.
- d) **Never** wear the used respirator on your head or around your neck as there is a potential for self-inoculation when you touch that area at a later time.
- e) Hands are now contaminated from contact with the N95 respirator. Wash your hands using proper hand hygiene techniques.

Note: PPE should always be removed in the same manner. PPE is to be removed following treatment and transport of a patient with a known or suspected communicable disease and/or at break of patient contact. This includes when the driver of the ambulance leaves the patient in the patient care compartment. PPE should also be removed as above following cleaning and disinfection of the vehicle and equipment.

N95 respirators are not to be worn in the cab of the ambulance, unless the patient has a known or suspected respiratory illness, an FRI or haemorrhagic fever. If a paramedic requires respiratory protection while driving, he/she should wear a new, unused N95 respirator.

Used PPE must never be worn in the cab of the ambulance.

A Note on Long Hair

If your hair impairs your vision during patient care, there is the potential that you will brush it away from your face while you are wearing contaminated medical gloves. After you have removed your PPE and washed your hands, you may accidentally re-contaminate your hands by touching your hair. **Although not a part of PPE, long hair that has the potential of falling into your eyes and compromising vision should be tied back to prevent accidental self-inoculation.**

Patient Transport

The hospital has private rooms, isolation rooms and negative pressure rooms that can be used when treating a patient with a communicable disease. Toronto EMS does not have the same capability. Consequently the back of the ambulance becomes the 'isolation area' when transporting a patient with a communicable disease. Every effort should be taken to limit the contact of the infectious patient with others.

When transporting a patient with a known or suspected disease transported by the airborne or droplet route:

- Use the exhaust fan to circulate air out of the ambulance.
- Minimize the number of people who have contact with the patient.
- Only essential personnel, as determined by the paramedic, are permitted in the ambulance.
- Notify the hospital while en route so an isolation or negative pressure room can be prepared prior to EMS arrival.

Vehicle and Equipment - Cleaning and Disinfection

Health Canada states that cleaning is essential prior to disinfection or sterilization. An item that has not been cleaned cannot be effectively disinfected or sterilized.

Visible contamination and soiling can shield microorganisms from the action of disinfectants. Some disinfectants may fix organic material to equipment making it very difficult to remove materials and renders disinfection useless.

It is important to understand that cleaning and disinfection are two distinct processes with different applications and different results.

Cleaning

Cleaning is a process of physically removing all visible and non-visible contamination from a surface using soap and water, detergent and water, or enzymes. Cleaning includes the removal of blood, body fluids, and other biological material from a surface. The act of cleaning is more important than the cleaning product used; it is the friction created by the physical action of cleaning that actually removes infectious agents from surfaces.

Cleaning should always be performed from the "cleanest" (least contaminated) area to the "dirtiest" (most contaminated) area to prevent the spread of contaminants.

Cleaning must always be completed before disinfection.

Disinfection

Disinfection is a process which kills pathogenic microorganisms (with the exception of bacterial spores) on a surface. Three levels of disinfection are recognized; high, medium, and low.

The level of disinfection required for re-usable equipment is determined by the degree of contact with the patient and the contamination risk to the patient. In 1968, E. Spaulding developed a classification system for medical devices. He identified the following three groups of medical devices.

- *Critical devices.*
These devices enter a patient's sterile body cavity or vascular system and therefore carry a high risk of infection for the patient if the device is contaminated. This category includes surgical instruments, catheters, needles, and implants. Critical medical devices always require sterilization before use. All critical devices used by Toronto EMS are single use and are sterilized by the manufacturer, and must be disposed of appropriately after use.
- *Semi-Critical Devices.*
These devices contact a patient's mucous membranes or non-intact skin. This category includes respiratory therapy equipment, anaesthesia equipment, and endoscopes. Semi-critical devices require high level disinfection, which is a process which destroys all microorganisms with the exception of bacterial spores. The only items on the ambulance that currently require high level disinfection are MacGill Forceps; these are to be sent to headquarters for disinfection once used. The remaining semi-critical devices such as laryngoscope blades, lighted stylets, and bag-valve-masks (BVM) are single-use only and meant for disposal after use.
- *Non-Critical Devices.*
These devices come into contact with a patient's intact skin. Skin is an effective barrier against microorganisms and as such these devices will only require low level disinfection, which kills most bacteria, some viruses, and fungi. Non-critical devices include blood pressure cuffs, stethoscopes, laryngoscope handles, cardiac monitors, stretchers, and compartment surfaces.

Low Level Disinfection

With the exception of MacGill forceps and non-disposable metal laryngoscope blades, which require high-level disinfection, all reusable emergency medical equipment and ambulance unit surfaces require only low level disinfection. The product currently used for low level disinfection

is an accelerated 0.5% hydrogen peroxide product. Disinfection requires surface cleaning to remove soiling, followed by application of the disinfectant. Allow the accelerated 0.5% hydrogen peroxide to remain on the surface for at least five minutes.

NOTE: It is extremely important to follow the manufacturer's instructions when using cleaning and disinfection products. The products currently used by Toronto EMS require sufficient surface contact time to achieve the required level of disinfection. **If the disinfectant is not used for the recommended length of time you will not achieve the required level of disinfection and the item will remain contaminated.** By allowing the correct contact time you are ensuring that your equipment is ready and safe for use.

Routine Vehicle Cleaning and Disinfection

The ambulance units and all patient care equipment should be cleaned and disinfected on a daily basis and also following each call. Emphasis should be placed on the patient care area of the ambulance and the areas that come in contact with patients and paramedics. New medical gloves must be worn when performing general cleaning and disinfection procedures. Hands must be cleansed following cleaning and disinfection procedures. An N95 respirator and eye protection should be worn when cleaning the ambulance following a call when the patient may have had a respiratory illness. Gowns, face shields and/or eye protection should be worn while cleaning if there is the possibility of a splash of blood or body fluids.

Disinfection is only as good as the cleaning that precedes it.

At Beginning of a Shift

- Cleaning must be done prior to application of the disinfectant.
- To ensure that you are starting the shift with a disinfected vehicle, apply disinfectant to all exposed surfaces of the patient compartment and allow contact time recommended by the manufacturer. After the appropriate contact time, wipe the surfaces dry with a clean, disposable cloth.
- Put fresh linen on the stretcher and pillow.
- Replace full sharps containers when 2/3 full with empty containers, ensuring the sharps container is well sealed and appropriately discarded.
- Dispose of garbage.

- Wipe down the surfaces in the cab (steering wheel, seat belts, door handles, radios, etc) with disinfectant; allow the recommended contact time as per manufacturer's instructions and wipe dry with a clean, disposable cloth.
- Wipe down personal equipment, such as pens, pagers, stethoscopes, pen-lights, scissors, Kelly clamps etc. with disinfectant; allow the recommended contact time as per manufacturer's instructions and wipe dry with a clean, disposable cloth.
- Sweep and mop the ambulance floor with cleaning equipment designated for this purpose.
- Discard gloves and other PPE if worn, and wash or cleanse your hands.

During a Call

- Minimize opportunities for contamination –have the patient wash hands with alcohol-based waterless hand sanitizer prior to entering ambulance and wrap the patient in a clean sheet to prevent the patient from touching ambulance surfaces.
- If gloves become contaminated during patient care, remove them, cleanse your hands, and don a new pair before touching the patient again.
- Take mental note of any equipment and surfaces contacted by the patient or paramedic in the ambulance. These items will need to be cleaned and disinfected after the call.
- Place all reusable equipment which are contaminated (i.e. stethoscope, shears, and blood pressure cuff) in one place after use to minimize contamination of ambulance surfaces.
- All sharps should be disposed of in an appropriate sharps container by the user immediately after use.

Following a Call

- Remove and dispose of PPE used during patient care and perform hand hygiene. Clean and disinfect reusable eye protection worn during call.
- Put on new gloves, N95 respirator and disinfected eye protection if necessary, before beginning cleaning.
- Change dirty linen.
- Clean and disinfect reusable equipment used to treat the patient with supplied cleaner followed by supplied disinfectant.
- Discard all disposable equipment in the appropriate container (i.e. biohazard, garbage).

- Clean and then disinfect all compartment surfaces in contact with the patient with supplied cleaner followed by supplied disinfectant, allowing sufficient contact time recommended by the manufacturer.
- If patient had signs and symptoms of a FRI, clean and then disinfect all compartment surfaces that may have been contaminated by respiratory droplets, keeping in mind that respiratory droplets cannot travel for more than one metre's distance.
- Dispose of all garbage appropriately. Biological waste is to be disposed of in the biohazard waste disposal.
- Remove and dispose of PPE and perform hand hygiene.
- Place new linen on the stretcher.

Following a Blood or Body Fluid Spill

- Eye protection with an N95 respirator or a face shield, gown and gloves are to be worn while cleaning spills of blood or body fluid.
- Clean the surface with rags and/or linen to remove all visible blood and body fluid.
- Clean the surface again with available cleaner and dry as per manufacturer's directions.
- Apply the supplied disinfectant to the cleaned surface and allow contact time recommended by the manufacturer.
- Rinse mops, brushes, and other tools used for cleaning as well as possible. If soiled, place the item in a red, plastic bag and contact supervisor for cleaning or disposal and replacement.
- Discard dirty rags in biohazard containers provided; soiled linen is to be placed in laundry bags.

Routine Equipment Cleaning and Disinfection

There are many pieces of equipment used throughout an ambulance call. The following is a partial list of equipment that may need cleaning after a call:

Cardiac monitor	Oxygen tank	Stair chair
Airway roll	Oxygen regulator	Portable radio
Portable suction unit	Unit suction	Scoop stretcher/spinal board
Stethoscope	Pen	MobiCAD and eMedic
Pulse oximeter	Pen-light	35P – mattress, control surfaces, straps
Laryngoscope handle	End tidal CO2	Vehicle surfaces – handles, switches, steering wheel
Glucometer	Protective eyewear	
Scissors	Blood pressure cuff	

Follow this procedure when cleaning and disinfecting the items listed above and any other equipment not otherwise mentioned:

- Clean the equipment with the supplied cleaner.
- Once cleaning is complete, apply the supplied disinfectant.
- Allow contact time recommended by the manufacturer.
- Dry equipment with clean disposable cloth.

Cleaning and disinfection of equipment between calls protects paramedics and their patients.

Stretcher and Mattress

Follow these procedures when cleaning and disinfecting the stretcher and mattress:

- Remove linen from the mattress and clean blood, body fluids, and other organic material from the stretcher and mattress using a rag/paper towel and supplied cleaner.
- When cleaning is completed, apply the supplied disinfectant to the stretcher and mattress as per manufacturer's instructions and allow appropriate contact time.

- Clean mattress in a controlled environment to allow appropriate wet contact time
- Replace visibly soiled stretcher straps with clean straps. Send dirty straps to headquarters for washing. Otherwise, straps may be disinfected with the supplied disinfectant as per SOP.
- After cleaning and disinfection of the stretcher and mattress, place new linen on the mattress.
- Damaged stretcher mattresses must be reported to your supervisor as soon as possible.

Linen Handling

According to the CDC, **soiled linen may harbour large numbers of pathogens but the actual risk of disease transmission is negligible**. Soiled linen should be handled as little as possible in order to minimize agitation when removing it from the stretcher. Wear gloves when handling used linen, especially when it is soiled with blood or body fluids. After every transport where the patient was placed on the stretcher, remove used linen from the stretcher and immediately place it in a laundry bag. If stretcher is visibly soiled, clean stretcher with supplied cleaner. Once clean, disinfect the stretcher and mattress and allow to dry. Remove PPE, and perform hand hygiene. Place new linen on the stretcher as the final step when preparing the vehicle for the next call.

Follow these procedures when handling linen:

- Used linen should be left in appropriate receptacles at hospital.
- When laundry bag is not available place in red plastic bag, tie, and place in laundry bag as soon as one is available.
- Linen soiled with blood and/or body fluids is placed in a red plastic bag and then in the orange linen bag. Double bag linen with red plastic if there is the possibility of leaking.
- Wash hands following the handling of used linen.
- Used linen will be picked up by material management staff to be delivered to laundry.
- All clean linen should be stored and handled carefully to maintain its cleanliness.

Genesis Automatic Transport Ventilator

To clean and disinfect the automatic transport ventilator and tubing simply follow the procedure for equipment cleaning and disinfection listed on the previous page. In addition:

- Do not immerse.
- Do not autoclave.
- Do not oil or grease.

Backboards and Straps,

Backboards and straps without visible soiling can be disinfected using the above procedure before reuse. All soiled backboards and straps are to be left at the hospital or ambulance station for pick up by materials management staff for cleaning at HQ.

Cervical Support

‘Pool noodles’ without visible soiling can be disinfected and reused. **Since ‘pool noodles’ are cut before use, their impermeability is compromised and fluid can seep into the foam interior.** They cannot be properly cleaned before disinfecting, thereby rendering the disinfection useless. Therefore they must be thrown away once visibly soiled. Linen should not be wrapped around noodles.

Equipment Bags

Equipment bags that are visibly soiled after a call should be placed in a red plastic bag and exchanged for a clean bag. The dirty bag will be taken to headquarters for washing. Bags that are not visibly soiled can be disinfected with the supplied disinfectant. Once the bag dries it is ready for use.

Single Use Items

All single-use items (ex BVM, aerochambers, laryngoscopes, cervical collars) should be discarded in the appropriate receptacle after use.

Mops

Cleaning of the ambulance floor requires a clean mop designated for that purpose. Heavily soiled mop heads should be replaced with a clean mop head. Dirty mop heads should be disposed of and replaced.

Uniforms

While uniforms may harbour large numbers of pathogens after patient care, the CDC states the actual risk of transmission is negligible due to the fact that the pathogens become lodged in the fabric. Attention to safe handling of contaminated uniforms and good hygiene practice will help prevent disease transmission. Toronto EMS’ standard operating procedures require paramedics to have an extra uniform available in the event that a uniform becomes visibly soiled.

If a uniform becomes visibly soiled:

- Return to the station and remove the visibly soiled uniform. Place it in a plastic bag.
- Wash soiled areas of skin with soap and water.

- Put on a clean uniform.
- Launder the dirty uniform. According to the CDC, home laundering on normal washing and drying cycles or dry cleaning will render the uniform free of risk of disease transmission. If dry cleaning is used the cleaner should be informed that the uniform is soiled.
- **Extensive skin soiling requires immediate assessment of the skin for areas that are non-intact. If non-intact skin is found to have been in contact with blood or body fluids, the paramedic should be immediately assessed at the hospital ED where the patient was taken to determine the risk of exposure and if prophylaxis is necessary.**
- Paramedics exposed to an excessive amount of blood or body fluid will require a shower.

Sharps Safety

According to the Association for Professionals in Infection Control (APIC) the most frequent cause of blood-borne infection in healthcare settings is through needlestick injuries. Any healthcare worker that is handling sharp devices is at risk of occupational exposure to blood-borne pathogens. There are an estimated 600,000 needlestick injuries to health care workers each year in the United States; but the exact number is not known as injuries often go unreported. The consequences of these injuries include a potential infection, psychological distress, and the difficulty in getting health status information about the patient. In order to help prevent needlestick injuries it is imperative to have an effective sharps safety system in place.

Safe and immediate disposal of the sharp is the user's responsibility.

Safe handling of sharps includes:

- Immediate disposal of sharps into a sharps container **by the user**.
- **Never** re-cap a contaminated needle.
- **Never** pass an exposed needle.
- **Never** accept a used sharp, such as a lancet or epi-pen from a patient.
- **Never** accept a used sharp from another health care provider.
- Minimize proximity of other persons before exposing a sharp.
- No bending of needles.
- Proper disposal of sharps containers when they are 2/3 full.
- Use needle-less systems whenever possible.

If a needlestick injury occurs:

- Express blood from the wound and wash site with soap and water, alcohol based waterless hand sanitizer and/or an antiseptic swab as soon as possible.
- Notify your supervisor as soon as possible after injury. He/she will provide immediate assistance with post-exposure follow-up and care.
- **See the ER physician in the hospital where the patient was received for assessment within two hours of injury in order to start HIV post-exposure prophylaxis medication (if necessary) in the recommended time period of one to two hours after exposure.**

Needlestick injuries should be reported to a supervisor immediately. It is critical to be assessed at the hospital emergency department to determine the risk of infection and the need for prophylaxis.

Sharps Disposal

Sharps must be placed in a sharps container by the user immediately after use. Each sharps container has a 'full line,' which is at approximately 2/3rds full, and locking instructions written on the container. When the container is 'full' it must be immediately locked, following the instructions, and placed in a biohazard disposal bin at a station. Some ambulance stations may not have a biohazard disposal bin and therefore paramedics may need to drop off 'full' sharps containers at another station that does have a bin. If a biohazard bin is not available the paramedic should contact a supervisor for instruction.

Replace the 'full' container with a new, unused, unlocked sharps container. If a new container is not available, contact a supervisor.

Biohazard Waste Disposal

Biohazard waste disposal bins lined with yellow bags are available at all ambulance stations. Every hospital and emergency department has a biohazard waste disposal as well. All contaminated, disposable articles are to be placed in the biohazard receptacles when cleaning up after a call. If a bin is full at the station **do not force additional waste into the receptacle** by trying to compact material as this can result in injury or infection from contaminated objects. Contact a supervisor or materials management staff to have the receptacle emptied. **Used sharps should never be placed in a biohazard waste disposal bin. Used sharps should be placed in a sharps container only.**

Gloves must be worn for all cleaning and disinfection procedures. Additional PPE is to be worn when there is risk of droplet contamination or from blood or body fluid splash.

When cleaning or disinfection is finished, remove all PPE and cleanse hands.

High Risk Procedures

There are some procedures performed in pre-hospital care that are associated with a higher risk of aerosolization of respiratory secretions and exposure to blood and body fluids. Extra care must be taken when performing these procedures to prevent accidental exposures to potentially infectious materials.

High risk procedures include:

- Oxygen delivery to patients with a suspected or confirmed febrile respiratory illness.
- Contact with mucous membranes or non-intact skin.
- Manual control of bleeding.
- Nebulizing of medication.
- Ventilation support with a BVM.
- Suctioning.
- Intubating.
- Surgical airway insertion.
- Needle thoracostomy.
- Assisting with childbirth.

An N95 respirator, a face shield, and gloves must be worn when performing the above procedures. Proper adherence to use of personal protective equipment is essential to protect the patient and the paramedic from transmission of microorganisms. Some procedures may be contraindicated during a declared outbreak or under specific circumstances. Refer to Provincial, Base Hospital, or TEMS directives for instructions when those events occur.

Oxygen Therapy

Recent research has shown oxygen delivery devices such as non-rebreather masks and nebulizers can result in aerosolization of particles a greater distance than normal respiration, coughing, and sneezing. This can increase the risk of inhaling infectious particles. Any patient requiring oxygen therapy that has a known or suspected respiratory infection and/or fever requires a high-concentration, low - flow mask fitted with a submicron hydrophobic filter (HEPA filter).

Ventilation with a BVM also has an increased risk for generating aerosolization of respiratory secretions. Wear the appropriate PPE and use a submicron hydrophobic (HEPA) filter between the BVM and the mask or tube when ventilating all patients.

Appropriate PPE for delivery of oxygen therapy consists of: gloves, eye protection and a fit-tested N95 respirator.

Transport of a Patient with a Known or Suspected Communicable Disease

When a crew transports a patient with a known or suspected communicable disease, the following steps must be taken:

- The crew must use routine practices to protect themselves from exposure. These precautions include the wearing of PPE.
 - Gloves must be worn if contact with blood, body fluid, non-intact skin and/or mucous membranes are likely, or the patient has a suspected illness that may be spread through direct or indirect contact.
 - Gloves, N95 respirators and protective eyewear are required if the patient has signs and symptoms of FRI.
 - Gloves, N95 respirators and protective eyewear or a face shield must be worn if blood or body fluid splash might occur.
 - Gowns may be required during a declared outbreak or through a MOH(LTC) directive, or if a blood/body fluid splash may occur.
- Turn on the vehicle exhaust fan during transport and close the window between the cab and the patient care area.
- Where appropriate have the patient wear a surgical mask. If oxygen therapy is required use a high-concentration, low-flow mask on the patient.
- If appropriate, have the patient perform hand hygiene (or perform hand hygiene on the patient with alcohol-based waterless hand sanitizer) before transport.
- When transporting a patient with known or suspected respiratory disease, limit the number of people in the vehicle. Ensure that passengers are provided with respiratory protection, such as a surgical mask or N95. If passengers are wearing N95 respirators, they must be informed that they are not fit-tested.
- Ensure the receiving hospital is notified in advance of arrival.
- Leave the doors and windows closed and leave the exhaust fan running for a minimum of four minutes following transport as per the manufacturer's guidelines. This step will completely exchange the air inside the unit and remove all infectious airborne particles
- Use appropriate PPE while cleaning.
- Follow the recommended procedures for bagging of contaminated linen and cleaning of contaminated equipment and the vehicle.
- Perform hand hygiene after completion of patient care and after cleaning.
- If an exposure occurs the crew will then follow the procedures summarized below.

High Risk Exposures to Infectious Diseases

High risk exposures are those exposures that may result in the paramedic becoming infected with a life-threatening illness, or infected with an illness that can be prevented or controlled through immediate administration of prophylactic medication.

The Designated Officer (DO) Manual is the recommended reference for paramedics and supervisors to use in the event of both high and low-risk exposures to infectious diseases. The DO Manual explains in detail the steps that should be followed for all types of exposure occurrences. The following is a brief description of the appropriate follow-up for high-risk exposures to infectious diseases

High risk exposures include:

- A sharps injury, stab, scrape, cut or abrasion by an object contaminated with blood or body fluid.
- A bite wound breaking the skin.
- A blood and/or body fluid splash that contacts mucous membranes or non-intact skin.
- A copious amount of blood and/or body fluid that contacts intact skin, as the likelihood of a large amount of skin having minute or previously unnoticed injuries is very high.
- Unprotected exposure to respiratory secretions from a patient with known or suspected meningitis.
- A bite, lick or scratch from an animal with known or suspected rabies.
- Exposure to a viral hemorrhagic fever
- **Sputum that contacts mucous membranes or non-intact skin should be considered high-risk if the paramedic's Hepatitis B Vaccine titres are not known.**

Follow-up procedure for high risk exposures:

- Express blood from wound, cleanse site with antiseptic swab, or alcohol-based waterless hand cleanser and then, if not done first, soap and water as soon as possible.
- Notify your supervisor as soon as possible after the incident. Your supervisor will provide you with immediate assistance with post-exposure follow-up and care.
- See a physician at the emergency department where the patient was transported as soon as possible for assessment.
- Contact the Toronto EMS Infection Control Practitioner (ICP) at: 416-338-2151 or the Duty Officer at: 416-392-1836. They will obtain information on the patient's medical condition as it pertains to the paramedic's risk of infection, and get recommendations for follow-up, if any, from Toronto Public Health and/or the appropriate department of the

receiving hospital, usually their departments of Occupational Health or Infection Control. Pertinent information will be giving to you right away.

- Have your supervisor fill in the exposure report form and the WSIB form as soon as possible after the incident and fax them to Toronto EMS Human Resources department.

All exposures should be reported to your supervisor, and exposure report forms completed for each occurrence. The Toronto EMS ICP reviews all exposure reports upon receipt. High risk exposures are investigated through Toronto Public Health and the suitable departments of the receiving hospital, with the purpose of gaining enough information in order to make appropriate recommendations to the exposed paramedic for his/her follow-up. Please call the ICP at: 416-338-2151 with any questions or concerns.

ASEPTIC TECHNIQUE

Aseptic Technique

The Association for Professionals in Infection Control and Epidemiology textbook defines the following terms:

Asepsis - the absence of pathogenic microorganisms.

Aseptic technique - the method used to ensure pathogenic organisms are not introduced into the process of providing care or performing a procedure.

There are two types of aseptic technique:

- Clean technique - the practice that will reduce the number of microorganisms and/or prevent or reduce the transmission of microorganisms from one person/place to another.
- Sterile technique - the practice that renders areas and objects maximally free of microorganisms

Clean Technique

It is virtually impossible to achieve a sterile technique while performing procedures in pre-hospital care. The sterile field attainable in the controlled atmosphere of the operating room cannot be achieved in the imperfect environment of emergency response. However, a clean technique is possible for paramedics to achieve with all procedures, and paramedics should ensure they are meeting or exceeding this standard.

Clean technique is achieved by:

- Performing hand hygiene with soap and water or an alcohol-based waterless hand sanitizer. This reduces the number of microorganisms on your skin.
- Using antiseptics for patient skin preparation before invasive procedures reduces the number of microorganisms that could be introduced into the patient's body.
- Routine cleaning and disinfection of the environment and equipment reduces microorganisms that could then be transferred from the equipment to a future patient or paramedic.
- Wear clean gloves when performing a procedure, and change gloves after invasive procedures, or after touching the patient's non-intact skin or mucous membranes, or when gloves are visibly soiled. This protects your patients and yourselves from cross contamination.
- Gloves, face shield and gowns should be worn when there is a possibility of blood/body-fluid splash.

- The ‘No Touch’ method of wound dressing maintains the sterility of the dressing. This method involves manipulating the dressing by touching the outside only, so the side that contacts the patient’s wound remains sterile.
- Avoid contamination of sterile devices such as IV catheters, surgical airways, obstetrical kits, burn dressings, and chest needles. If a sterile device is contaminated before use, discard and use a new sterile device. **Do not pre-open packages of equipment that are used for invasive procedures such as intubation.** This contaminates the equipment and could introduce pathogenic material into the patient.

Sterile Supplies

There are a variety of sterile supplies that are used in pre-hospital care. The following is a list of these supplies:

Pressure dressing	Gauze bandage	Abdominal pads
Nasal airways	Oral airways	Suction catheters
Suction tips	Endotracheal tubes	Bulb suction
Solution sets	Chest seals	Surgical airway kit
All intravenous supplies	Syringes	Obstetrical kits
Meconium aspirators	Intraosseous needles	Burn kits

The manufacturer sterilizes these products and they are guaranteed sterile unless the packages are damaged or open prior to use. **If the packaging is damaged or opened prior to use, the contents are not considered sterile and must be discarded.** These products must be stored in a manner that protects the integrity of the packaging.

Proper storage includes:

- Closed cupboard doors.
- Protection from moisture.
- Protection from extremes of temperature.
- Protection from dirt.
- Protection from exhaust fumes.

Some sterile supplies have expiry dates. **Expired products are not to be used and must be discarded.** Some manufacturers will re-sterilize unused equipment that is returned in its original packaging. Check with your supervisor as to which items may be returned for re-sterilization. Use those products that are closest to expiring first in order to avoid product wastage. Check all sterile equipment before and after opening packages to ensure the products are not damaged due to wear and tear and that the packaging has remained intact.

Surgical Airway Insertion and Needle Thoracostomy

These procedures are considered surgical procedures and are only performed in the pre-hospital environment as a life-saving measure. Surgical procedures carry a much higher risk of patient infection as medical devices are introduced into sterile areas of the body, which can result in accidental transmission of microorganisms into these sterile areas. Surgical site infections account for as many as 16% of nosocomial infections and result in a higher cost of care, prolonged hospital stays, and increased patient mortality. **Aseptic technique is vital in preventing the development of a surgical site infection.** While it is impossible to achieve surgical asepsis in the pre-hospital environment, it is possible to maintain clean technique which reduces the risk of infection.

Follow these steps to maintain aseptic technique during surgical procedures:

- Perform excellent hand hygiene before procedures.
- Wear proper PPE.
- Put on a clean pair of gloves when beginning the procedure. If gloves are already on, change them prior to procedure.
- Prepare the skin at the incision/insertion site with the supplied antiseptic, allowing for appropriate contact time as per manufacturer's instructions.
- Apply antiseptic, moving from incision/insertion site to the periphery.
- Avoid contamination of the incision/insertion site with hands or objects during and after skin preparation. This may involve using a barrier to prevent falling debris or dust from getting on the site.
- Ensure that the sterile packaging of devices from the manufacturer has been maintained. Discard devices when packaging is open prior to use or if the packaging has been compromised with dirt or moisture.
- Do not use devices past their expiry date.
- Discard any sterile device that has had its sterility compromised. This includes inadvertent contact with the patient at an area other than the prepared site.
- After procedure, cover the site with sterile dressings to prevent contamination.

Intravenous & Intraosseous Access

Intravenous (IV) access is commonly used in pre-hospital care as a means of administering medication or fluid volume and can be a source of nosocomial infection. Health Canada and the CDC indicate that emergency IV placement results in higher rates of infection than non-emergency placement due to the difficulty in maintaining a clean environment in pre-hospital care. **Careful attention to aseptic technique when inserting peripheral IV catheters is an absolute necessity.**

Follow these procedures to maintain aseptic technique while starting IV or Intraosseous (IO) lines:

- Ensure hand hygiene and wear proper PPE.
- Put on a clean pair of gloves when beginning the procedure. If gloves are already on, change them prior to procedure.
- Prepare the skin at the insertion site with the supplied antiseptic. Allow appropriate contact time as per manufacturer's instructions.
- Apply antiseptic, moving from insertion site to the periphery.
- According to Health Canada, only catheters made of Teflon, silicone or polyurethane should be used.
- Avoid contamination of the insertion site with hands or objects before, during, and after skin preparation.
- Catheters that have contacted objects or patient before insertion, have expired, damaged packaging, dirt, or have moisture on or in the packaging are not to be used.
- After insertion cover the site with sterile dressings to prevent contamination.
- Remove gloves, cleanse hands and put on a new pair if the previously worn pair has been contaminated with blood.

Solution Sets

- Ensure the integrity of the packaging. Discard a set when integrity is compromised.
- Discard sets with leaks.
- Discard sets past their expiry date.
- A solution set is sterile and each end is capped to maintain sterility. Do not compromise the sterility by allowing the uncapped ends to contact other things prior to insertion into the catheter hub or IV solution bag. Discard if sterility is compromised.
- Health Canada Guideline's state that IV bags should be set up at the time of use and not prepared and primed before needed. If IV bags are prepared and primed before use

however, they must be labelled with the time and date of preparation, and discarded after 24 hours if unused.

- Wipe the administration port with antiseptic solution and allow appropriate contact time as per manufacturers instructions prior to administering all drugs.

Intravenous Fluid

IV fluid is sterile and care should be taken prior to administration to maintain sterility.

- Do not use expired fluids.
- Discard fluid bags that have leaks, precipitate, or are cloudy.
- Avoid contamination of the IV bag when spiking with a solution set.

Intubation and Suction

Procedures such as intubation and suction are associated with an increased risk of nosocomial (health-care acquired) pneumonia. Patients who have been intubated or suctioned have a greater risk of acquiring bacterial pneumonia and this may result in longer hospital stays, increased cost of care, increased mortality, and increased morbidity.

Cross colonization from the hands of health care personnel and contamination of devices used for suctioning and intubation have been implicated in the transmission of microorganisms that cause patient infection. The endotracheal tube acts as a conduit to the patient's lower respiratory tract making it easier for pathogens to enter. Paramedics must pay careful attention to hand hygiene, equipment cleaning and disinfection, and the maintenance of the sterility of sterile devices.

Follow these procedures to maintain aseptic technique while intubating or suctioning:

- Ensure proper hand hygiene.
- Wear proper PPE, which consists of gloves, protective eyewear, and an N95 respirator, while performing these procedures.
- Wear a gown if there is risk of contamination from blood or body fluids.
- Wear a clean pair of gloves when performing intubation or suctioning. Change gloves that have become visibly soiled, and before initiating other care for the same patient in a different area of their body after intubation is complete.
- Dispose of single-use items. **Do not re-use.**
- Ensure that sterile packaging of devices is maintained. Discard devices when packaging is open prior to use or has been compromised with dirt or moisture.
- Do not use devices past the expiry date.

- **Prepare endotracheal tubes only at the time of use to maintain sterility.** Do not open packaging prior to patient contact; do not cut tubes; and do not insert the stylet prior to patient contact as per SOP#3-5-28 and Operations Directive 2005-03.
- **Intubation and suctioning are aerosol-generating procedures and have a higher risk of disease transmission. Paramedics are to wear gloves, protective eyewear, and an N95 respirator while performing these procedures.**

Cleaning and Disinfection Products

Percept™ (Also available as Virox 5)

Ingredient	Accelerated Hydrogen Peroxide 0.5%
Supplied	4 litre bottle (pre-diluted by materials management) or Percept™ wipes.
Application	Percept™ is to be used on all equipment and vehicle surfaces that require cleaning and disinfection with the exception of the equipment requiring high level disinfection (MacGill forceps, and non-disposable metal laryngoscope blades).
Method	Use directly from container in the supplied form. Either spray on or wipe on. Do not dilute. Percept™ can be used for cleaning and/or disinfection. Remember that these are two distinct processes. Cleaning - remove excess blood/body fluids from surface, apply to surface, soak for thirty seconds, and wipe dry with disposable towel. Disinfection – apply to the surface so the area will remain wet for five minutes. Wipe surface dry after five minutes. Can be used on many surfaces. Can also be used on textiles such as uniform material, stretcher straps, backboard straps, and equipment bags, however, MSDS recommends hard surfaces only.
Precautions	See MSDS for full information regarding this product. Percept™ is non-irritating to the eyes and skin under normal circumstances. However prolonged exposure can cause skin irritation. Wear gloves and eye protection while using this product. Do not mix with other chemicals. May be incompatible with some soft metals. Ingestion of Percept in large quantities may cause stomach irritation.
First Aid	Eye contact - flush with water for 15 minutes and seek medical attention. Skin contact - flush with water for 15 minutes and wash with soap and water. Seek medical attention if irritation persists. Inhalation - not a normal route of exposure. Ingestion - do not induce vomiting. Rinse mouth with water and drink one glass of water. Seek medical attention.
Storage	Avoid storage at elevated temperatures.
Disposal	Liquid can be disposed of in the drain, flushing with water. Wipes can be disposed of in regular garbage unless heavily soiled with organic material. If heavily soiled, place in biohazard disposal.

Alcohol-Based Hand Sanitizers

Ingredient	Cida Rinse® 70%
	Microsan® 70%
	Kimberly Clark® 62%
Supplied	Cida Rinse® in 118 ml bottle
	Kimberly Clark® in 59 ml bottle
	Microsan® in 115 ml bottle and 300 ml dispenser
Application	To be used to perform hand hygiene when there is not a sink with soap and water available to wash hands. It is not to be used when the hands are visibly soiled as it must contact the skin of the hands to kill transient microorganisms.
Method	Apply at least 5 ml of liquid or foam to hands and rub over all hand surfaces as per the hand washing guidelines in this manual.
Precautions	See MSDS for full information on this product.
	Contact with the eyes can cause irritation and possibly burning. It is not usually absorbed through the skin but in some individuals prolonged contact may cause mild irritation. Ingestion of large amounts may cause stomach cramps, nausea, vomiting, and diarrhea. Inhalation can cause respiratory inflammation, coughing and shortness of breath. It is alcohol based and is flammable. Do not use in close proximity to an ignition source.
	-Do not use anywhere except on skin
First Aid	Hands must be washed with soap and water after every five applications of alcohol-based waterless hand sanitizers to remove build-up.
	Eye contact - flush with water for 15 minutes. Seek medical attention if irritation or visual disturbances persist.
	Skin Contact - wash off excess with water and seek medical attention if irritation persists.
	Inhalation - remove to fresh air and seek medical attention if cough, shortness of breath, or other respiratory problems occur.
	Ingestion - if large volumes are swallowed, contact poison control and seek medical attention right away. Drink several glasses of water.
Storage	Store in a cool dry place between 5 and 37 degrees Celsius. Do not store near sparks, flames, other ignition sources, or excessive heat.
Disposal	These products are completely soluble in water and can be disposed of down the drain, flushing with water.

Appendix A

Immunizations & Vaccines

Immunization

As a condition of employment, the 2000 Ambulance Act states:

All paramedics must hold a valid certificate, signed by a physician or nurse, that shows that he/she is immunized against Tetanus, Diphtheria, Poliomyelitis, Measles, Mumps Rubella, Chickenpox and Hepatitis B or that they have a letter stating that these vaccinations are medically contraindicated

The aim of vaccination is to induce a specific immune response against a particular pathogen without causing the host to experience the actual disease. Most vaccines induce this effect by stimulating the production of antibodies. This antibody production acts as a pre-alert for the immune system to attack the pathogen that matches those antibodies when it first enters the host. Vaccines are an extremely safe and reliable way of protecting the body from dangerous communicable diseases. The human immune system cannot be overwhelmed by multiple vaccinations as there does not seem to be any 'upper limit' of the number of antibodies the immune system can create.

It is recommended that all health care workers receive the influenza vaccine at the beginning of the influenza season in October each year. The chickenpox vaccine is not required if the paramedic has evidence of positive serology and/or definitive medical history of the disease. Paramedics are not generally considered a high-risk group for pneumonia and meningitis; pneumococcal and meningitis vaccines are not required for health care workers. Paramedics may choose to discuss the benefits of the pneumococcal and meningitis vaccine with their family doctor.

Hepatitis Vaccine and Positive Serology

Vaccination against hepatitis B virus (HBV) is an extremely effective way to eliminate the risk of infection from HBV after exposure to blood and/or body fluids. Due to the high efficacy of the vaccine, the Ministry of Health and Long-Term care requires proof of immunization of all potential health-care workers pre-hire in order to ensure they are protected from HBV.

The vaccine's seroconversion rate is 90% or more in healthy adults. In some people however, seroconversion will not occur after one course of vaccination, and a second course will be necessary to ensure adequate immunity. Without post-immunization testing, it is impossible to know which individuals will require re-vaccination and who will not.

Paramedics who do not know their seroconversion status may still be at risk of HBV infection after being exposed to blood or body-fluid from infected patients.

According to the 2002 Canadian Immunization Guide, post-immunization testing for anti-HBs should be conducted on all health care workers to establish antibody response and the need for re-immunization should the first course of vaccine have failed. This testing should be done no more than 6 months after the last dose of vaccine. If a paramedic has completed their

immunization against HBV more than 6 months previously however, testing for anti-HBs should still be undertaken, and if the paramedic is found not to have protective antibodies, they should be re-immunized with a second course of vaccine as soon as possible.

Pneumococcal Vaccine

This single-dose vaccine can prevent pneumonia, meningitis, and bacteremia caused by 23 types of the streptococcus pneumonia bacteria. These 23 types account for approximately nine out of 10 cases of pneumococcal disease. This vaccine is particularly important for people with underlying medical conditions such as diabetes, splenectomy, chronic heart, kidney, or lung disease. The vaccine protects about 50 to 80 per cent of people against pneumococcal infection and makes the disease milder for those who may catch it. This pneumococcal vaccine has been used in Canada since 1983. According to Health Canada: “People for whom re-immunization should be considered include those with functional or anatomic asplenia or sickle cell disease; hepatic cirrhosis; chronic renal failure or nephrotic syndrome; HIV infection; and immunosuppression related to disease or therapy.” Reimmunization should occur between three to five years after the original dose.

Meningitis Vaccine

Meningococcal group C conjugate vaccine is a vaccine that helps to protect people from serious meningococcal group C disease. The vaccine has been shown to give protection in 90% of persons vaccinated and provides prolonged immunity. This vaccine is especially recommended for infants, children one to four years of age, adolescents, and young adults due to their increased risk.

A significant exposure to meningitis is defined as a close contact with respiratory secretions while performing invasive procedures such as intubation where saliva-to-saliva contact is possible and protective personal equipment is not worn. Paramedics wearing N95 respirators who also perform excellent hand hygiene after patient contact should never have a significant occupational exposure to meningitis.

Influenza vaccine

Influenza vaccines have been around since the 1940s. The vaccine is made from fragments of inactivated influenza viruses grown in fertilized hens' eggs and then purified. The virus in the vaccine is inactivated and split into smaller pieces. The vaccine cannot cause a person to become sick with influenza.

As influenza viruses change from year to year, the composition of the vaccine has to be updated annually, necessitating annual vaccination. It is recommended that paramedics receive an annual influenza vaccination for two reasons; they are more likely to get exposed to people with influenza due to the nature of their jobs, and influenza can be spread to others 24 hours before a person develops symptoms themselves.

While healthy paramedics may only suffer minor illness from influenza, the risk of spreading the virus to vulnerable patients is very high. Patients, such as the elderly, very young, and those with underlying health issues could easily become infected with influenza from contact with a paramedic, and experience severe complications or even death.

All paramedics should have yearly influenza immunization in order to prevent themselves from acting as a vehicle of disease for vulnerable patient populations.

For more information on influenza and the vaccine refer to the fact sheets in the appendices of this manual.

By protecting yourself, you
are protecting your
patients, your co-workers
and your family

Appendix B

Disease Fact Sheets

Extended Spectrum Beta-Lactamase Producing Bacteria (ESBL)

Extended spectrum beta-lactamase producing bacteria (ESBL) refers to certain types of bacteria that produce enzymes which break down antibiotics, therefore rendering them useless. ESBL bacteria normally live inside the gastrointestinal tract of humans and rarely cause infection in healthy people. The most common forms of ESBL bacteria is E. coli and Klebsiella.

How is it spread

ESBL is passed from person to person directly or indirectly, via the fecal-oral route. A common source of infection is from infected individuals who have poor personal hygiene, poor hand washing technique, or from contact with objects contaminated with tiny amounts of infected feces, such as door handles, bedrails and bathroom fixtures.

Who is at risk

ESBL producing bacteria do not usually cause infection in healthy individuals. People who are identified as carriers of ESBL bacteria, but have no symptoms are not treated as this can increase the risk of antibiotic resistance. People with weakened immune systems are generally more at risk for infection. Factors that increase the risk of infection with ESBL bacteria included: Prolonged hospital stay, previous in-hospital antibiotic use, catheterization and admission to Intensive Care.

The risk of ESBL bacteria to members of the general public is extremely low.

Signs and Symptoms

The signs and symptoms of ESBL bacterial infection are typical of any bacterial infection, including malaise, fever, pain at the site of infection and purulent wound drainage. People may also develop pneumonia, septicaemia, and urinary tract infections from ESBL bacteria.

Prevention

Excellent and diligent hand hygiene is the most effective method of preventing the acquisition or spread of the bacteria. When caring for a patient with a known or suspected ESBL bacterial infection, Hands should be cleaned:

- After entering or using patient's washroom
- Before and after all patient contact.

- Before entering and leaving a patient's room in hospital or Long-Term Care Home.
- Before and after donning and doffing medical gloves for patient care.
- If possible, have the patient perform hand hygiene and have them wash their hands with soap and water for thirty seconds, or cleanse patient's hands with alcohol-based waterless hand sanitizer if tolerated, before leaving the patient's room.
- Wash your hands for thirty seconds when you leave the patient's room. Hand washing using soap and warm water is required; alcohol-based waterless hand sanitizer is sufficient until access to facilities is available. Put on a new pair of gloves.

Gowns do not need to be worn to prevent the spread of ESBL bacteria unless gross contamination of your uniform is suspected or likely. Wrapping the patient in a sheet before transport to minimize contact with the stretcher and careful cleaning and disinfection of all equipment used with the patient is the best way to prevent accidental spread of ESBL bacteria from one patient to another.

Sources

Halton Region Health Department

<http://www.halton.ca/health/programs/infectionctrl/ESBL.htm>

Region of Durham Public Health Department

http://www.durhambusiness.ca/health.asp?nr=/departments/health/facts_about/esbl_e_coli.htm&nav=b&setFooter=/includes/health/healthFooter.txt

Methicillin-Resistant Staphylococcus Aureus (MRSA)

MRSA is a bacterium that is resistant to treatment with methicillin and a large number of other commonly used antibiotics. Staphylococcus aureus (staph-aureus) is a bacterium ubiquitous in the community and hospital environments. Staph-aureus causes infections such as abscesses and skin infections; it is commonly responsible for wound infections and their complications in the hospital setting.

Why is MRSA a problem?

Health care workers may become colonized with MRSA bacteria; capable of transmitting the disease but remaining asymptomatic themselves. The colonized health care worker may then transmit the bacteria to susceptible patients with serious illness or injuries. MRSA infection can cause difficulty in wound healing, and septicemia and pneumonia in at-risk individuals. Due to the bacteria's antibiotic resistance the infections are very hard to treat.

Of particular concern is the possibility that MRSA may come into contact with other bacteria, such as vancomycin resistant enterococci (VRE) and develop further resistance to one of the only antibiotics that can actually treat it. This makes identification and control of MRSA infection critical in the health care setting. VRE represents a different, but parallel, challenge for the health care community.

Prevention

MRSA already exists in the community. Hospitals continue to aggressively prevent colonization of their patients and the number of identified cases has remained small. Toronto EMS' primary role is to assist in preventing the spread of this bacterium, particularly when transferring infected patients between institutions.

Infection Prevention and Control Procedures

Hospitals having cases of MRSA require infection control staff to be notified prior to any infected patient being transported by ambulance. Specific policies are being proposed requiring hospital personnel to inform EMS whenever a patient with MRSA is to be transported. If implemented, a reduction in the risk of paramedic exposure and the possibility of MRSA being inadvertently from institution to institution.

MRSA Precautions

- Additional precautions apply to patients and/or environments where MRSA is present. These precautions are in addition to routine practices.
- Put on gloves prior to entering the patient's room. Gowns, eye protection and/or face shields are only required if there is a risk of soiling clothing or skin with blood or body fluid. MRSA pneumonia is not known to spread to healthy adults.
- Respirators should be considered to prevent inadvertently touching your face with contaminated gloves; MRSA can colonize nasal passages from such contact.
- Spread a sheet over the stretcher to prevent contamination.
- Avoid contact with other objects and surfaces in the patient's room.
- Remove gloves and gown (if worn) when you leave the patient's room.
- If possible, have the patient perform hand hygiene and have them wash their hands with soap and water for thirty seconds, or cleanse patient's hands with alcohol-based waterless hand sanitizer if tolerated, before leaving the patient's room.
- Wash your hands for thirty seconds when you leave the patient's room. Hand washing using soap and warm water is required; alcohol-based waterless hand sanitizer is sufficient until access to facilities is available. Put on a new pair of gloves.
- The attendant must wear gloves while with the patient in the back of the vehicle. The driver must remove gloves, if worn, after assisting with loading the stretcher into the ambulance and then must, at minimum, wash with alcohol-based waterless hand sanitizers prior to touching any surface in the cab of the ambulance.
- Prior to unloading the patient from the vehicle, the attendant must remove the gloves and then wash with an alcohol-based waterless hand sanitizer, carefully avoiding contact with the patient, equipment or surfaces of the ambulance. A new pair of gloves should then be put on.
- Hospital staff should immediately be informed of the patient's MRSA status upon arrival. Transfer care of the patient as usual. Gowns and gloves should be removed prior to leaving the patient's room and you should again wash your hands.
- If any equipment used or carried is considered contaminated, both personnel should put on a pair of gloves before cleaning and decontamination with disinfectant provided. Upon completion, remove and dispose of the gloves and again wash your hands.

Sources

United States Centers for Disease Control and Prevention

http://www.cdc.gov/ncidod/dhqp/ar_mrsa_healthcareFS.html

Vancomycin Resistant Enterococcus (VRE)

VRE is a bacterium which is resistant to commonly used antibiotics and specifically to Vancomycin. Enterococci are typically found in the human bowel as part of the normal flora and normally do not cause disease. VRE is not harmful to healthy individuals but can cause problems for patients who are seriously ill and whose immune systems are compromised. A person who acquires VRE does not necessarily become ill as the bacteria will eventually be cleared from the bowel.

Why is VRE a problem?

Over the past decade, there has been an increase in the number of hospital acquired (nosocomial) infections from normal bacteria found in the bowel. The most common of these bacteria are *Enterococcus faecalis* and *enterococcus faecium* (*E. faecalis* and *E. faecium*). These bacteria have adapted and changed to become resistant to the antibiotics which have effectively controlled them in the past. Resistant strains of enterococci have become endemic in many hospitals in the United States and elsewhere. Some hospitals in Toronto have recently identified VRE within their hospitals as well.

Most enterococcal infections have been attributed to the patient as enterococci can be found in the normal gastrointestinal tract or female genital tract. Recent reports of outbreaks and endemic infections due to enterococci, including VRE, have shown that patient-to-patient transmission of the microorganism can occur either through direct contact or indirectly through the hands of personnel or contaminated environmental surfaces.

The presence of VRE in institutions represents a hazard to those at greatest risk of infection as VRE can be multi-drug resistant and is difficult to treat. The vancomycin-resistant genes in VRE may also be transferred to other bacteria, such as staphylococci (i.e. MRSA), which could represent a serious public health concern.

What is our role in managing this problem?

Toronto EMS staff and their families are at little, if any, personal risk from VRE. There is a risk of transferring this infection to seriously ill patients. The possibility that this resistance could be transferred to other common bacteria is also a concern and heightens the importance diligent infection control.

Infection Control Procedures

The Community and Hospital Infection Control Association of Canada – Toronto Practitioners of Infection Control has recommended that hospitals and other health care facilities need to notify paramedics that are transporting any patients with a communicable disease that could put paramedics or hospital staff/patients at risk. Advanced knowledge of a patient having a VRE infection allows the paramedics to prevent the accidental transmission of this infection from one institution to another. .

Standard hand washing with regular hand soap may not eliminate VRE. A thirty-second hand wash with appropriate antibiotic soap is recommended. In the absence of immediate ability to wash your hands properly you can utilize an alcohol-base waterless hand sanitizer.

Double gloving, to prevent VRE contamination of ambulance equipment and surfaces, is recommended when handling patients colonized with VRE. Recommendations are included in the attached procedures. To protect your forearms and clothing from contamination, gowns are recommended as VRE can be present on environmental surfaces.

While the precautions listed may seem cumbersome and to some may appear to be excessive, we are dealing with more than the patient in these circumstances. The vehicle, stretcher, equipment and your clothing can potentially harbour VRE and provide the opportunity for this bacterium to spread to other vulnerable patients.

VRE Precautions

Precautions apply to patients and/or environments which are infected or contaminated with VRE. These precautions are to be viewed as additional precautions with routine practices.

- Prior to entering the patient's room, put on double nitrile gloves and a single, disposable, infection control gown.
- While respirators and/or face shields are not specifically required for VRE contact, they may help prevent accidental self-inoculation through touching your face.
- Spread a sheet over the stretcher ensuring that all surfaces are covered. This will prevent the stretcher, straps, etc. from becoming contaminated.
- When assessing and moving the patient, avoid contact with objects or surfaces in the patient's room.
- If possible, have patient wash their hands with antibacterial soap and water, or cleanse their hands with alcohol-based waterless hand sanitizer before leaving the room.
- Remove the outer layer of gloves following patient contact.
- Remove the gown and inner pair of gloves prior to leaving the patient's room.

- Wash your hands for thirty seconds with an antibacterial soap when you leave the room. If facilities are not immediately available, use alcohol-based waterless hand sanitizer and then proceed to the nearest available facility to wash your hands.
- If the above procedures are followed, the stretcher should not be contaminated. Should you suspect the stretcher has become contaminated; a single pair of gloves is to be worn while moving the stretcher to your vehicle. Gowns should not be required but may be used at your discretion.
- The attendant should wear gloves while with the patient in the back of the vehicle. If gloves were worn to move the stretcher, remove them and put on a new pair of gloves. The driver should remove gloves after assisting with loading the stretcher into the ambulance and then should wash with alcohol-based waterless hand sanitizer or antibacterial soap prior to touching any other surface or entering the cab of the vehicle.
- Once patient care has been transferred, wipe down stretcher and all equipment used with the accelerated hydrogen peroxide wipes provided and allow drying before placing stretcher and equipment in your vehicle. A single pair of gloves should be worn while cleaning. Once the stretcher has been decontaminated, gloves may be removed. Hands should then be wiped down with alcohol-based waterless hand sanitizer or washed with an antibacterial soap. Gowns are not required for equipment cleaning, but may be used at your discretion.

Sources

Public Health Agency of Canada

<http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/97vol23/23s8/vreindx.html>

United States Centers for Disease Control and Prevention

http://www.cdc.gov/ncidod/dhqp/ar_vre.html

Clostridium Difficile (C. Difficile)

Clostridium difficile (*C. difficile*) is a spore forming bacteria which can cause diarrhea and other gastrointestinal illness. *C. difficile* can be a normal part of the flora of the large intestine, causing no illness in the patient. When symptoms do occur it is referred to as *Clostridium difficile* associated disease (CDAD). Recent studies have suggested *C. difficile* may be a substantial problem in Canadian healthcare settings.

Mode of Transmission

C. difficile is spread through feces, usually diarrhea, of an infected person. Any surface, device, or material (e.g. commodes, bathing tubs, and electronic rectal thermometers) that becomes contaminated with feces may serve as a reservoir for the *C. difficile* spores. *C. difficile* spores are transferred to patients mainly via hands of healthcare personnel, patients, and visitors who have touched a contaminated surface or item.

Signs & Symptoms

- Watery diarrhea.
- Fever.
- Loss of appetite.
- Nausea.
- Abdominal pain/tenderness.
- Indications of dehydration.

Persons at Risk

- Antibiotic use.
- Recent gastrointestinal surgery/manipulation.
- Long stay in healthcare settings.
- Elderly.
- Serious underlying illness.
- Immunocompromising conditions.

C. difficile Colonization vs. CDAD

C. difficile colonization

- Patient asymptomatic.
- Patient tests positive for *C. difficile* and/or its toxin.
- More common than CDAD.
- Generally not treated.

CDAD

- Patient exhibits clinical symptoms.
- Patient tests positive for the *Clostridium difficile* and/or its toxin.

CDAD Prevention

- Use antibiotics judiciously.
- Use routine practices for patients with known or suspected CDAD.
- If possible, isolate patient and implement isolation precautions.
- Report as required to appropriate Health Care Agency.
- Post signage for Personal Protection Equipment (PPE), and hand washing protocol at entrance to room.
- Institute strict hand washing protocols for staff, patients and visitors.
- Use disposable gloves when entering patients' rooms and during patient care.
- Use gowns if soiling of clothes is likely.
- Dedicate equipment whenever possible.

Continue these precautions until diarrhea ceases.

- Ensure adequate cleaning and disinfection of environmental surfaces and reusable devices, especially items likely to be contaminated with feces and surfaces that are touched frequently.
- Use the approved disinfectant provided according to label directions.

If the source of the gastrointestinal illness is confirmed to be *C. difficile* it must be remembered that this organism is very difficult to kill. *C. difficile* cannot be effectively disinfected with quaternary ammonium disinfectants or chlorine bleach. Currently known sporicidal products such as glutaraldehyde that can kill *C. difficile* require multi-hour wet contact time for complete disinfection. Therefore it is unrealistic to attempt to completely kill *C. difficile* on environmental surfaces.

While *C. difficile* cannot be killed by our disinfectants, it can be **physically removed** from environmental surfaces by the action of cleaning with any of our disinfectant cleaners. Therefore, cleaning of all items used in patient care when the patient is known or suspected to have *C. difficile* is a must.

Resources

Public Health Agency of Canada

<http://www.phac-aspc.gc.ca/c-difficile/index.html>

United States Centers for Disease Control and Prevention

http://www.cdc.gov/ncidod/dhqp/id_CdiffFAQ_general.html

Anthrax

Anthrax is an acute infectious disease that is caused by bacillus anthracis. This is an encapsulated, aerobic, gram positive, rod shaped, spore-forming bacteria. Anthrax infection is most common in hooved mammals such as cattle, sheep, and goats; but can occur in humans.

There are four types of anthrax:

- Cutaneous - most common
- Inhalation - rare
- Gastrointestinal tract - rare
- Oropharyngeal - least common

Mode of Transmission

Anthrax is not contagious and cannot be transmitted from person to person. Infection occurs when there is exposure to anthrax spores on the skin, in the air, or through ingestion. Humans can become infected with anthrax if they handle products from infected animals or eating undercooked meat from infected animals.

Cutaneous anthrax infection occurs when there is contact with spores in the tissues of infected animals. Anthrax spores enter through cuts and open sores in the skin. Environmental factors such as contaminated soil are also considered potential sources of infection.

Inhalation of anthrax spores is possible in industrial settings commonly associated with livestock processing. Hide tanning, bone processing, and wool collection involving infected animals are sites associated with inhalation exposure.

Oropharyngeal and gastrointestinal tract anthrax, while quite rare, are usually caused by the consumption of contaminated and undercooked animal meat.

The use of anthrax spores as a weapon has also been a source of infection. In 2001, anthrax spores were sent through the U.S. Postal Service, killing 5 of the 22 people who became infected. While no cases of anthrax-based terrorism have been reported in Canada, similar attacks are possible here in the future.

Incubation Period

- Cutaneous - immediate, up to one day.
- Inhalation - usually less than one week - may take up to two months.
- Gastrointestinal tract - one to seven days.
- Oropharyngeal - one to seven days.

Period of Communicability

Anthrax cannot be transmitted from human to human.

People at Risk

Workers handling animal products such as hide, wool or bone products are the most at risk. It is endemic in underdeveloped agricultural regions of the world such as South and Central America, Asia, Africa and Eastern Europe. Human anthrax infection is infrequent in industrialised countries such as Canada.

Signs and Symptoms

- Cutaneous Anthrax - Initially resembling an insect bite, cutaneous anthrax usually develops into a 1-3 cm painless ulcer with a characteristic black centre. If pain is present it is usually due to secondary infection or the surrounding edema.
- Inhalation Anthrax - Initial symptoms may resemble a common cold with non-specific symptoms that may include fever, cough, malaise, myalgia, profound sweats, and chest discomfort. This will be followed in three to five days by an abrupt onset of high fever and acute respiratory distress with x-ray evidence of mediastinal widening.
- Gastrointestinal Anthrax - This is characterized by an acute inflammation of the intestinal tract. Initial signs include fever, nausea, anorexia, vomiting, hematemesis, bloody diarrhea, and acute abdominal pain. Ascites (excess peritoneal fluid) develops two to four days later, followed by signs of septicaemia.
- Oropharyngeal Anthrax - Swollen lymph nodes cause the neck to appear larger or distorted. A fever is common and there will be severe throat pain with dysphagia. White or black ulcers may appear in the mouth and at the base of the tongue. The swelling can be severe enough to compromise the airway.

Treatment & Expected Outcome

Anthrax is treated with a regimen of antibiotics that include penicillin, ciprofloxacin and doxycycline. The antibiotic regimen can last for up to 60 days. Corticosteroids can be used for extensive swelling in the head and neck region. Early treatment is important for all forms of anthrax infection.

Cutaneous anthrax treated with antibiotics is fatal in 1% of cases. The fatality rate for untreated persons approaches 20%. Gastrointestinal anthrax results in a fatality rate of 25%-60%. The effect of early antibiotic treatment is unknown. Inhalation anthrax has a fatality rate of 75% even with antibiotic treatment.

How Can You be Protected?

While there is a vaccine for anthrax, it is not recommended as it requires multiple doses and has many adverse side effects. The vaccine is only available to United States military personnel and those people working in high risk occupations for exposure; animal product handlers, those working in laboratories that handle anthrax, and veterinarians who work in countries where the incidence of anthrax is high.

Care must be taken when handling substances containing anthrax spores. You should not handle suspicious substance unless trained to do so. When treating patients with anthrax, routine practices are to be used. Quarantine is not required.

If anthrax is known or suspected, contact One Desk to dispatch the CBRN team.

Exposure Procedure

Vacate the infected area and advise others of the risk. Immediately rinse and wash any skin contacts with soap and water. Remove contaminated clothing or other articles and place them in a sealed bag. Showering using soap and water is effective and washing off anthrax spores – bleach or other products can be harmful to skin and may cause injury or illness.

The exposure circumstance should be immediately reported to a supervisor, evaluated by public health officials, and assessed by a physician to determine the risk of the exposure. A nasal swab should be taken to determine the patient's exposure. Rapid assessment of the contaminant should be done as it is useful in assessing the risk of exposure. A person with an exposure should begin a regimen of post-exposure prophylaxis antibiotics immediately. Treatment started as soon as possible after exposure, not waiting for lab results, may prevent infection in the patient.

If a person develops symptoms of anthrax after an exposure they should seek immediate medical attention and begin the appropriate antibiotic treatment.

Sources

Public Health Agency of Canada – Emergency Preparedness
http://www.phac-aspc.gc.ca/ep-mu/anthrax_e.html

City of Toronto – Toronto Public Health
<http://www.toronto.ca/health/anthraxfactsheet.htm>

United States Centers for Disease Control and Prevention
<http://www.bt.cdc.gov/agent/anthrax/faq/signs.asp>

Group A Streptococci

Group A Streptococcal (GAS) infections are caused by a group of 120 different streptococcal bacteria. They are often found in the throat and on the skin. This bacterium causes a variety of illnesses that range from mild to severe and life threatening. The vast majority of GAS infections cause mild illness such as acute streptococcal laryngitis (strep throat), impetigo, scarlet fever, cellulites, and erysipelas. If these mild cases are left untreated they may develop into more severe conditions such as rheumatic fever or glomerulonephritis.

On rare occasions (3.1 cases per 100 000 people in the U.S.) severe GAS infections can occur. These are referred to as invasive group A streptococcal (IGAS) disease which include necrotizing fasciitis (flesh eating disease), and streptococcal toxic shock syndrome (STSS). Necrotizing fasciitis is an infection of muscle and fat tissue, while STSS is a rapidly progressing infection causing decreased blood pressure and resulting organ injury. IGAS is believed to enter the blood, muscles, fat, or other tissue via open sores or other breaks in the skin. This 'bypassing' of normal defense mechanisms may contribute to the increased severity of IGAS.

Mode of Transmission

Transmission of GAS diseases is by large respiratory droplets landing on your mucous membranes, or from your hand contacting respiratory secretions, infected wounds or sores on the skin of an infected host, and then touching your own mucous membranes or non-intact skin. Casual contact such as at work, school and with household items, (plates, cups, toys etc.) rarely plays a role in spreading the disease. Asymptomatic carriers of GAS bacteria are far less contagious.

Incubation Period

The incubation period usually lasts one to three days.

Period of Communicability

Untreated, uncomplicated cases are usually communicable for 10-21 days. Untreated cases with purulent discharge can be infectious for weeks or months. Patients with untreated strep throat may carry the bacteria for weeks or months with the communicability decreasing sharply after two to three weeks. Patients receiving antibiotic therapy are not contagious after 24 hours of treatment.

Persons at Risk

Experts estimate that there are 10 million cases of mild GAS infections in the United States every year. Susceptibility to strep throat and scarlet fever is common after age 3 and peaks at age 12. Impetigo occurs in the late summer and early fall in hot climates in young children. People can develop antibacterial immunity to specific strains of the bacteria, which may last for years. Antibiotic treatment may interfere with this immunity.

Factors which increase the risk of a person contracting the more serious IGAS disease include:

- People with suppressed immune systems.
- Chronic health problems such as cancer, diabetes, heart and lung problems.
- Patients on kidney dialysis.
- Patients on steroid or chemotherapy treatment.
- IV drug users and alcoholics.
- People with breaks in the skin such as burns, cuts, surgical wounds and chicken pox.

Patients that have had rheumatic fever have a significant risk of reoccurrence and the resulting cardiac damage following a GAS infection. Individuals who have had a case of erysipelas also appear to have a greater risk for reoccurrence.

Signs and Symptoms

Strep Throat (Acute Streptococcal Pharyngitis)

- Fever.
- Red and painful sore throat.
- Tender, enlarged lymph nodes.
- Abdominal pain, vomiting and diarrhea may be present.
- Headache.
- White patches on the tonsils.
- Rheumatic fever and glomerulonephritis can develop if untreated

Impetigo

- Pimple-like lesions surrounded by reddened skin; primarily on face, arms, and legs.
- Pus filled lesions; breaking and crusting after a few days.
- Itching is common.
- Untreated it can progress to glomerulonephritis.

Scarlet Fever

- Symptoms of strep throat.
- Red rash on the sides of the chest and abdomen - may spread to the entire body.
- Rash; tiny red pinpoints with a rough sandpaper-like texture; blanches with pressure.
- Bright, strawberry coloured tongue.
- Flushed cheeks.
- High fever, nausea, and vomiting.

Cellulitis and Erysipelas

Cellulitis is an inflammation of the skin and the underlying tissue. Erysipelas is a type of cellulitis that affects the upper layers of skin. Symptoms are similar but erysipelas has more defined swelling. These conditions can occur after a wound to the site resulting in:

- Red rash with raised borders; usually on face, arms, or legs.
- Rash spreads as infection spreads.
- Pain, tenderness, and warmth in the area.
- Sudden onset and rapid growth in first 24 hours.
- Influenza-like symptoms.
- Nausea and vomiting.

Necrotizing Fasciitis

Early symptoms include

- Pain and swelling at site; severe relative to injury.
- Redness and warmth at the site.
- Influenza-like symptoms.
- Intense thirst.

Advanced Symptoms include

- Purple rash develops.
- Large black blisters which fill with black fluid.
- Strong odour.
- Appears necrotic, flaky, and mottled; bluish, white, or dark.

Critical Symptoms

- Severe hypotension; toxic shock.
- Unconsciousness and death.

Streptococcal Toxic Shock Syndrome (STSS)

- Fever.
- Dizziness and confusion.
- Flat, red, rash over large areas.
- Hypotension.
- Disseminated intravascular coagulation (DIC).
- Organ Failure.
- Acute Respiratory Distress Syndrome (ARDS).

Treatment & Expected Outcome

Doctors will take a swab of the discharge for cultures to determine the presence of GAS bacteria. The mild infections are then treated a 10 day course of common antibiotics, while more severe cases will likely require hospitalization. The more severe cases may require supportive care in the intensive care unit and sometimes surgery to remove damaged or dead tissue.

The mild forms of GAS are effectively treated with antibiotics. Patients are not contagious after 24 hours of antibiotics and usually feel better after four days. IGAS diseases are associated with high mortality rates even with appropriate treatment; 20 to 30% for necrotizing fasciitis and over 50% for STSS.

How Can You Be Protected?

The most effective way of protecting your self from infection is with good hand washing techniques. This is essential following coughs and sneezing, patient care, before and after preparing, and before eating food. Cover your mouth while coughing and sneezing with your elbow not your hand in order to prevent contact transmission. All wounds should be kept clean and watched for possible signs of infection. If a person becomes symptomatic they should seek appropriate medical care. Mild cases should stay away from work or school until the first 24 hours of antibiotics is completed. Use of routine practices during patient care (including nitrile gloves and N95 respirator) will significantly reduce the chance of infection.

Exposure Procedure

Healthy people who are exposed to GAS should monitor themselves for the onset of any symptoms. If you have any of the predisposing factors and are exposed consult your doctor; antibiotics may be prescribed. **It is important to note that while transmission of GAS bacteria is possible, contracting the specific disease is not guaranteed.** Your body will react differently to the bacteria and you may or may not become ill with the same type of illness. If symptoms develop, seek appropriate medical attention in order to start antibiotics as soon as possible. Quarantine is not required but you should stay home until 24 hours of antibiotics are completed and you are no longer contagious.

Sources

Ottawa Public Health

http://ottawa.ca/city_services/yourhealth/communicable_diseases/strepa_en.shtml

United States Centers for Disease Control and Prevention

http://www.cdc.gov/ncidod/dbmd/diseaseinfo/groupastreptococcal_g.htm

Hepatitis A (HAV)

Hepatitis A is an infectious liver disease caused by the hepatitis A virus (HAV). The disease varies in clinical severity from a mild illness lasting 1-2 weeks, to a severely disabling disease lasting several months.

Mode of Transmission

HAV is found in the feces of infected persons and is usually spread from person to person by the contact of contaminated material with the mouth. The virus is more easily spread under poor sanitary conditions and when good personal hygiene is not practiced. The virus can also be transmitted through both oral and anal sexual activity. People can get HAV by eating raw or undercooked shellfish, or drinking contaminated water. Fruits and vegetables or other foods can become contaminated during handling or washing with unclean water.

Incubation Period

The incubation period for HAV ranges from 15 to 50 days. The length of the incubation period depends on the amount of virus to which a person is exposed. Exposure to a large dose of virus results in a short incubation period.

Signs & Symptoms

Three of every four persons infected with HAV have symptoms. When symptoms develop they include:

- fever
- tiredness
- loss of appetite
- nausea
- abdominal pain
- dark urine
- jaundice

Period of Communicability

Asymptomatic individuals can transmit the virus from 2 weeks before the symptoms begin to 2 weeks after symptoms end.

Persons at Risk

There is an HAV vaccine available for free from Toronto Public Health for the following groups:

- men who have sex with men
- drug users
- people with chronic liver disease such as hepatitis B or C
- household and sexual contacts of a person with hepatitis A
- People travelling to areas of the world where hepatitis A is endemic

Occupational Prevention

There continues to be little evidence of risk for HAV infection in the workplace. Health care workers are not considered to be at increased risk when they follow routine precautions procedures.

The prevention of hepatitis A in the workplace is based on good hygiene and sanitation. Careful hand washing is extremely important in the prevention of HAV transmission, especially washing or cleansing hands before activities such as eating, drinking or smoking. As well, careful removal of PPE, including hand cleansing during and after removal will prevent accidental self-inoculation with HAV.

Contact your family physician, Toronto Public Health, or **The Works – Needle Exchange Program** in Toronto for information on receiving the vaccine. 416-338-7600.

Sources

City of Toronto – Public Health – Hepatitis A
http://www.toronto.ca/health/hepatitis_index.htm

Public Health Agency of Canada
Blood Safety Surveillance and Health Care Acquired Infections Division
http://www.phac-aspc.gc.ca/hcai-iamss/bbp-pts/hepatitis/hep_a_e.html

Hepatitis B (HBV)

Hepatitis B is a viral infection that attacks the liver. However only 30% to 50% of infected adults will ever manifest symptoms of disease. Infections of hepatitis B can occur if the virus is able to enter the blood stream and reach the liver. Once in the liver the virus reproduces and releases large numbers of new viruses into the bloodstream, allowing the person to become contagious through their blood and body fluid, including saliva. In recent years about 3000 cases of hepatitis B have been reported annually in Canada, but many more cases are likely unreported. 0.5% of the population of North America has chronic HBV infection.

Mode of Transmission

Blood is the major source of the hepatitis B virus in the workplace. It is also found in other tissues and body fluids in much lower concentrations. The risk of transmission varies according to the specific source.

Transmission through blood occurs through direct contact, such as:

- punctures of the skin with blood-contaminated needles, lancets, scalpels, or other sharps
- splashes to skin bearing minute scratches, abrasions, burns, or even minor rashes
- splashes to mucous membranes in the mouth, nose, or eyes

Indirect contact with blood-contaminated surfaces can also transmit the hepatitis B virus. The virus may be stable in dried blood for up to 7 days at 25°C. Hand contact with blood-contaminated surfaces such as laboratory benches, test tubes, or laboratory instruments may transfer the virus to non-intact skin or mucous membranes.

Saliva

Saliva of people with hepatitis B can contain the hepatitis B virus in concentrations much lower than those found in blood. Contact with infected saliva, as with bite injuries, can potentially transmit the virus, but this occurrence has never been documented. There are no reports of people getting hepatitis B from mouth contact with infected CPR manikins or mouthpieces of musical instruments.

Other Body Fluids and Tissues

HBV is found in semen, vaginal secretions, and breast milk. The virus can be transmitted during unprotected sexual intercourse, from mother to infant during birth, and through breast feeding. Synovial fluid (joint lubricant), amniotic fluid, cerebrospinal fluid, and peritoneal fluid can contain the hepatitis B virus but the risk of transmission to workers is unknown.

Feces, nasal secretions, sputum, sweat, tears, urine, and vomit have not been implicated in the spread of hepatitis B unless they are visibly contaminated with blood. The risk of contracting hepatitis B from these fluids in the workplace is practically nonexistent unless there is visible blood in the fluid.

HBV is not transmitted by casual contact, although the virus can spread through intimate contact with carriers in a household setting. The virus can find its way into the bloodstream of fellow family members possibly because of frequent physical contact with small cuts or skin rashes. The virus can also spread through the sharing of toothbrushes or razors or other personal grooming items.

Incubation Period

The incubation period ranges from 45 to 180 days with an average of 60 to 90 days. The length of the incubation period depends on the amount of virus to which a person is exposed. Exposure to a large dose of virus may result in a shorter incubation period.

Occupational Risk

The risk of acquiring HBV from the workplace depends on the amount of exposure to human blood or blood products, or other body fluids and tissues known to transmit HBV, sustaining a needlestick injury or other injuries from sharp instruments contaminated with blood, or close contact with HBV carriers in family or institutional residence settings.

Blood tests show that certain occupational groups have different risks of getting HBV.

In general, occupational groups with increased risk include:

- Health-care workers repeatedly exposed to blood or blood products or those who are at risk of needlestick injury.
- Dentists, dental assistants, and dental hygienists.
- Certain staff members of institutions for the developmentally handicapped.
- Staff of institutions where workers may be exposed to residents who bite aggressively.
- Embalmers.

Treatment & Prevention

Post-exposure prophylaxis involves HBIG (Hepatitis B Immunoglobulin) inoculation and HBV vaccine. HBIG must be given as soon as possible after exposure. Treatment for HBV infection is based on medications which can suppress the virus or stimulate the body to respond. Interferon and lamivudine are the two treatments commonly used in Canada. Other treatments may be prescribed by your doctor.

The risk of hepatitis B can be significantly reduced by:

- Following routine practices with all patients, all the time.
- Immunizing workers at risk.

Two recombinant DNA vaccines are licensed for HBV immunization in Canada. Both provide safe, reliable protection from HBV when used either before or immediately after exposure to the virus. Tests show 90 to 95 percent of healthy people vaccinated against hepatitis B result in the development of immunity to hepatitis B. Vaccination is the best way to avoid acquiring hepatitis B as an occupational disease.

Before Contact

The National Advisory Committee on Immunization (NACI) recommends the vaccination of people who are at increased risk of contracting HBV because of exposure to the virus in their work, such as health-care workers. They also recommend vaccination for people who are sexual or household contacts of carriers of HBV.

After Contact

Workers who experience needlestick injuries, splash exposures to blood from carriers, or bite injuries should immediately notify a supervisor and seek medical attention. If the blood is known to contain HBV and the exposed worker has not been vaccinated or does not know if they have developed antibodies to their course of HBV vaccine, post-exposure immunization is strongly recommended to prevent the development of HBV.

National immunization guidelines recommend post-exposure vaccination when the source of blood is unknown. Vaccination against HBV is usually recommended within seven days of exposure. Depending on the specific circumstance, HBV immunoglobulin is sometimes also recommended. Immunoglobulin is a preparation containing antibodies which attack the hepatitis B virus. It is usually given as quickly as possible; preferably within 24 hours of the incident.

If the worker's blood has antibodies against HBV or the contaminated blood is free of the virus, further treatment may be unnecessary.

Expected Outcome

For reasons that are not completely understood, 10 percent of people who develop hepatitis B become carriers of the disease. Their blood remains infected for months, years, and sometimes for life. Seventy percent of carriers develop chronic persistent HBV, although most do not appear to be ill. The remaining 30 percent of carriers experience continuous liver disease. This condition often progresses to cirrhosis and the patient may develop cancer many years later.

At present there is no way cure for HBV carriers or those with active liver disease due to HBV.

Sources

Toronto Public Health

http://www.toronto.ca/health/hep_b_factsheet.htm

Public Health Agency of Canada – Blood Safety Surveillance & Health Care Acquired Infections

http://www.phac-aspc.gc.ca/hcai-iamss/bbp-pts/hepatitis/hep_b_e.html

Hepatitis C (HCV)

The hepatitis C virus (HCV) was first identified in 1989 as a form of viral hepatitis other than HAV or HBV. The pathology of HCV is not well understood – many infected persons will have few, if any, signs or symptoms and may not feel ill at all. Approximately 40% to 80% of infected persons will develop chronic liver disease; HCV is responsible for approximately 1/3 of cirrhosis cases in Canada.

Mode of Transmission

HCV is a blood-borne virus primarily transmitted through direct contact with infected blood. Sexual transmission is possible if blood is involved, as is the possibility of a mother infecting her child during childbirth. Infection by blood transfusion is possible but rare; donated blood and tissues are currently screened for HCV.

HCV is not spread by casual contact, sneezing, coughing, food, or water.

Incubation Period

The incubation period for hepatitis C ranges from 2 weeks to 6 months, most commonly 6 to 9 weeks.

Persons at Risk

- Health care workers in contact with blood and blood products.
- Injection and IV drug users.
- Blood product or tissue recipients before 1992.
- Children of infected mothers.

Signs and Symptoms

- Many infected persons will be asymptomatic carriers.
- Loss of appetite.
- Stomach pain.
- Fever.
- Extreme fatigue.
- Nausea and vomiting.
- Jaundice.

Occupational Risk

The risk of acquiring hepatitis C from the workplace depends on the amount of exposure to human blood or blood products and needlestick injuries. In general, occupational groups with increased risk include those repeatedly exposed to human blood and who are at risk of needlestick injuries. The occupational risk from developing a HCV infection after a needlestick injury is only 0.3% .

Treatment

Infected persons should take immediate action to reduce stress on their liver. Alcohol consumption and exposure to toxic substances (drugs, nicotine, fumes, etc.) must be avoided. People ill or with advanced HCV can be treated with a combination of anti-viral medications given to suppress, and potentially remove, the virus. Consideration for a liver transplant is usually given to those suffering from cirrhosis and chronic liver failure.

Prevention

There is currently no vaccine for hepatitis C. The risk of hepatitis C can be significantly reduced by implementing infection control guidelines suitable for the specific workplace. Nitrile gloves should be worn whenever blood or other body fluids may be contacted. Protective eyewear and an N95 respirator will prevent blood from contacting the mucous membranes of the face.

Sources

Public Health Agency of Canada

http://www.phac-aspc.gc.ca/hepc/hepatitis_c/index.html

Hepatitis C Society of Canada

<http://www.hepatitiscsociety.com/english/HepCBasics.htm>

United States Centers for Disease Control and Prevention

<http://www.cdc.gov/ncidod/diseases/hepatitis/c/>

Influenza

Influenza is a highly contagious disease of the respiratory tract caused by the influenza virus. There are three groups of influenza virus that are recognized; influenza A, B and C. Each group is identified by the surface proteins on the virus and each group contains several different subtypes. Influenza A and B are very common while influenza C is rare. Influenza A is responsible for pandemics.

The term ‘the flu’ has been inaccurately used to describe any illness that makes us feel unwell. Less serious viruses or bacteria that cause the common cold or gastrointestinal symptoms have been incorrectly grouped together with influenza. Grouping minor illnesses in with influenza has led to the misconception that the flu is not a serious disease.

Mode of Transmission

Influenza is easily spread from person to person. It is spread through respiratory secretions that become airborne when a person coughs or sneezes. On a hard surface the virus can survive for up to 48 hours. Touching an object or surface that is contaminated with the influenza virus and then touching the mouth or nose can also result in virus transmission.

Incubation Period

The typical incubation period is usually two days, with a range of one to four days.

Period of Communicability

Adults can be infectious 24 hours prior to the onset of symptoms and for three to five days after symptoms begin. Children are infectious for up to seven days after the onset of symptoms. Infection transmission while asymptomatic makes identification and prevention difficult.

Persons at Risk

Everyone is susceptible to the influenza virus. While a person previously infected with one type of influenza will have immunity to that specific virus and may have an increased resistance to a similar subtype of that virus, the duration of this immunity is uncertain. Healthy individuals who have been vaccinated will have immunity to the strains of the virus in the vaccine. While this immunity may prevent serious illness or death during the flu season, re-vaccination will be necessary as the influenza strains undergo genetic changes from year-to-year that render the previous year’s vaccine ineffective.

Susceptibility to the influenza virus is greater during the 'flu season'. In Canada this season runs from November through April. This may be because the cold air causes drying of the respiratory tissue creating more susceptibility to the virus. The virus may also survive longer in the drier indoor air and people therefore can become more exposed as they group indoors to escape the cold.

There are certain individuals that are more susceptible to getting more serious cases of influenza, and suffering more severe complications. They include:

- Anyone 65 years or older.
- Staff and residents of long term care facilities.
- Anyone suffering from chronic heart, lung or kidney problems
- Anyone with diabetes, cancer, immune system problems or red blood cell problems
- Anyone aged 6 months to 18 years who has been treated with ASA for long periods.

Signs and Symptoms

A person with influenza will experience moderate to severe symptoms for approximately one to two weeks, and in some cases the cough and weakness can persist for up to six weeks. The symptoms include:

- Abrupt onset of fever that can last three to eight days.
- Chills/sweats.
- Myalgia.
- Headache.
- Sore throat.
- Dry cough.
- Nausea, vomiting, and diarrhea; common in children.
- Extreme fatigue.
- Weakness.
- Decreased appetite.
- Nasal congestion.

People over the age of 65 years, very young children, those with chronic medical conditions, and those with depressed immune systems may experience the following complications from the influenza virus:

- Dehydration.
- Sinus and ear infections.
- Exacerbation of asthma, COPD, or CHF.
- Bronchitis.
- Pneumonia.

Treatment

Otherwise healthy individuals are usually able to treat themselves at home. Increasing fluid intake, getting plenty of rest, and avoiding the use of alcohol or tobacco can alleviate some of the symptoms while promoting recovery. While acetaminophen for fever control is recommended, people under 18 years of age should not be given ASA as it has been linked to an increased occurrence of Reye's Syndrome. If symptoms worsen consult a physician and seek assessment at the hospital if required.

For those at higher risk of severe illness due to influenza, antiviral medications may be prescribed. These drugs work best when taken within 48 hours of symptoms onset, and have been shown to reduce the severity and duration of illness. Persons developing bacterial infections secondary to the influenza are often prescribed antibiotics.

How Can You Be Protected?

Frequent handwashing, a healthy lifestyle, and annual anti-influenza immunization are the best methods to prevent illness due to influenza. When hands are not visibly soiled, alcohol-based sanitizers are very effective at killing infectious organisms such as the influenza virus. Regular household cleaners are also very good at removing the virus from household surfaces.

Influenza immunization is available at no charge to residents of Ontario. It is recognized as a safe and effective method of protecting yourself against influenza.

Following the routine practices for infection control during patient care is instrumental in protecting against virus transmission. Ensuring equipment is cleaned and disinfected between patients, hands are washed, and appropriate PPE is worn to protect mucous membranes, is the best way (after immunization) to reduce the risk of contracting influenza from sick patients, or from allowing influenza to spread from patient to patient.

Expected Outcome

An average of 25% of Canadians will become ill with influenza each year. This results in approximately 7.5 million Canadians becoming ill due to a preventable illness.

Most healthy individuals will recover completely from influenza after 7 to 10 days, although coughs and fatigue can last several weeks. Influenza may have a more serious impact on persons over 65 years of age; secondary infections resulting in pneumonia, susceptibility to dehydration, and exacerbations of underlying illnesses are common complications.

Exposure Procedure

The best way to protect against influenza is by getting vaccinated. If you are not vaccinated and have been exposed to influenza you can consult your physician about the possibility of using antiviral medications. This must be done before symptoms begin in order to prevent illness and within two days of symptom onset in order to decrease the severity of the illness.

If you become symptomatic after an exposure it is important to remain at home until symptoms subside. Avoid contact with others, especially those who are at the greatest risk from complications of the disease. Make sure you drink plenty of fluids, treat your symptoms, and get plenty of rest.

Sources

Toronto Public Health

http://www.toronto.ca/health/flu_facts.htm

Public Health Agency of Canada

http://www.hc-sc.gc.ca/dc-ma/influenza/index_e.html

Norwalk (Noro) Virus

Norwalk virus is a very common and very contagious virus that causes gastroenteritis. It was first identified in 1972 after an outbreak of gastrointestinal illness in Norwalk Ohio. Since then, other similar viruses have been described and referred to as Norwalk like virus and/or Norovirus. Norwalk virus has been linked to outbreaks of gastrointestinal illness in institutions such as schools and nursing homes as well as at camps and on cruise ships.

Norwalk virus has also been referred to as ‘winter vomiting disease’ and the ‘stomach flu’. Using the term ‘stomach flu’ is misleading as Norwalk virus has nothing to do with Influenza. Influenza is a severe respiratory illness that rarely causes gastrointestinal problems. Norwalk virus is a relatively mild, self-limiting gastrointestinal illness.

Mode of Transmission

Norwalk virus can be easily spread from person to person, as it is very contagious and even small amounts of the virus will result in infection. Fecal-oral transmission is common. It can be spread through contact with fecally contaminated hands of an infected person, or by consuming food or water that has been contaminated by an infected person. It can also be transmitted by contact with a fecally contaminated surface, such as a doorknob or counter top, and then touching the mouth. The virus is also present in vomit. Airborne transmission has also been suggested to explain the rapid spread of Norwalk seen in institutions.

Incubation Period

The typical incubation period is one to two days, but may be a matter of hours in certain people.

Period of Communicability

A person ill with Norwalk virus will be infectious during the acute stage of the illness and up to 48 hours after the diarrhea has stopped.

Persons at Risk

Everyone is at risk of contracting Norwalk virus. The organism is very contagious and even small amounts of the virus can result in illness. Those who live or work in institutions are more at risk particularly if there is an outbreak at their facility. The elderly, the very young and those with underlying medical conditions may experience more severe infection and are more likely to become dehydrated due to vomiting and diarrhea. Immunity to Norwalk virus is possible but

studies have demonstrated that a person who has been infected with Norwalk virus may have immunity for only a short period of time.

Signs and Symptoms

A person with Norwalk virus will experience mild to moderate symptoms that are self-limiting and last for 24 to 72 hours. The signs and symptoms include:

- Nausea.
- Vomiting.
- Diarrhea.
- Abdominal pain/cramps.
- Dehydration is a complication that may be experienced by the young, elderly and those with chronic health conditions.
- Myalgia.
- Malaise.
- Headache.
- Low grade fever.

When the following symptoms present, seek medical attention as they are not consistent with Norwalk and suggest a more serious cause of illness:

- High fever.
- Symptoms longer than 72 hours.
- Bloody stool or vomit.

Treatment & Expected Outcome

There is no pharmaceutical treatment for Norwalk Virus. A person should get plenty of rest and drink plenty of fluids. The vast majority of people who get Norwalk virus recover completely at home within three days. Those that become severely dehydrated due to excessive vomiting and diarrhea should seek medical treatment for intravenous rehydration and electrolyte replacement therapy.

How Can You Be Protected?

There is no vaccine available for Norwalk virus. The best way to prevent contracting the illness is through routine precautions, excellent hand hygiene practices and careful cleaning of equipment and surfaces. Wear gloves and your N95 respirator as there is uncertainty regarding airborne transmission of the virus. Immediately change and clean any clothing that has been contaminated with feces or vomit. After patient care is complete, ensure that all linen is changed

and any equipment and surfaces that were possibly contaminated are cleaned and then disinfected with the supplied disinfectant. Even surfaces that do not appear to be contaminated should be disinfected as it only takes a very small amount of the virus to cause infection. Include cleaning of the cab of the vehicle as well as the patient compartment and remember to wear gloves and a mask while cleaning. Do not store or eat any food in the vehicle due to the possibility of contamination. Make sure that hands are washed thoroughly with soap and warm water after patient care, after using the washroom and after cleaning the vehicle and equipment.

Additional measures include avoiding food that has been handled by a person suspected of having Norwalk virus. Raw shellfish has been implicated in the transmission of the virus so ensure that all shellfish is cooked.

Exposure Procedure

Once you have had an unprotected exposure to Norwalk virus there is no preventative medicine that you can take to prevent becoming symptomatic. You may become symptomatic in a few days. If you do become symptomatic it is important that you stay at home and rest for at least 48 hours after vomiting and diarrhea have ended. Drink plenty of fluid and do not handle food that will be eaten by others. Be sure to disinfect surfaces that could hold the virus such as bathrooms, doorknobs, and railings.

Sources

Toronto Public Health

<http://www.toronto.ca/health/norwalk.htm>

United States Centers for Disease Control and Prevention

<http://www.cdc.gov/ncidod/dvrd/revb/gastro/norovirus-factsheet.htm>

Meningitis

Meningitis is a viral or bacterial infection of the cerebral spinal fluid that causes inflammation of the lining of the brain known as the meninges. Viral meningitis is usually caused by a common intestinal virus, but can be caused by a number of viruses. Less frequently it can be associated with mumps, herpes, or other viral diseases. Bacterial meningitis can be caused by a number of bacteria including haemophilus influenza type B (haemophilus meningitis), streptococcus pneumonia (pneumococcal meningitis) and neisseria meningitis (meningococcal meningitis). Viral meningitis is much more common but bacterial meningitis causes much more severe illness. It is important to distinguish between the two types as bacterial meningitis requires rapid diagnosis and treatment.

Mode of Transmission

The transmission of viral meningitis varies. The virus is commonly spread through direct close contact with fecal matter or respiratory secretions of an infected person. Less common is the spread of a virus that can cause meningitis through an insect bite; such as West Nile Virus. Most people will be exposed to these viruses at some point in their life, but fewer than one in one thousand infected persons will actually develop viral meningitis.

Bacterial meningitis is spread through respiratory droplets or direct and prolonged contact with the secretions from the throat or nose of an infected person. Sharing items such as food, utensils, water bottles, cigarettes, lipstick, or kissing can put a person at risk of contracting meningitis. Certain medical procedures, such as intubation, increase the risk of transmission of the bacteria that cause meningitis.

The good news is that meningitis is not as contagious as the common cold or influenza. It cannot be spread through casual contact or by breathing the air where someone who has meningitis has been as it requires direct contact with respiratory secretions.

Incubation Period

The viruses that cause viral meningitis typically incubate for three to seven days. The incubation for bacterial meningitis can take two to ten days but is typically three to four.

Period of Communicability

The period of communicability of viral meningitis is three days after exposure to ten days following the onset of symptoms. Patients with bacterial meningitis are contagious as long there is bacteria present in the secretions from the nose and throat. They are no longer contagious following 24 to 48 hours of proper antibiotic treatment.

Persons at Risk

Anyone can get viral meningitis and it is found throughout the world; it is more common in children and young adults. Bacterial meningitis is also found worldwide and the groups with the highest risk are those under the age of five and teenagers aged 15-19 years. In adults it is more common in males than females.

Risk groups include

- Those with chronic illness such as ear and nose infections.
- Immunocompromised or immunosuppressed.
- Household contacts of infected persons.
- Children
- Staff in day care centres.
- Students living in close quarters.
- Soldiers living in close quarters.

Signs and Symptoms

The signs and symptoms for both viral and bacterial meningitis are the same and include:

- | | |
|--------------------------------|-----------------------------|
| • High fever | • Nausea and vomiting |
| • Severe headache | • Fatigue |
| • Stiff neck (nuchal rigidity) | • Sore throat |
| • Photosensitivity | • Petechiae (advanced sign) |
| • Drowsiness | • Seizures (advanced sign) |
| • Confusion | |

In newborns and small infants, fever, headache, and neck stiffness may be absent or difficult to detect. The infant may exhibit irritability, excessive crying, drowsiness, difficulty rousing, may refuse to eat, and be lethargic.

It is important to remember that the symptoms can progress quite rapidly with bacterial meningitis; symptoms can develop over the course of a few hours making early recognition very important.

Treatment

There is no specific treatment for viral meningitis, although the doctor may recommend fluids, rest, and medicine to relieve symptoms. Bacterial meningitis can be treated with a number of antibiotics including penicillin, ampicillin, chloramphenicol, and ceftriaxone. It is important to start treatment as soon as meningitis is suspected; early treatment with antibiotics can lower the death rate to below fifteen percent.

Expected Outcome

Viral meningitis is serious but rarely fatal in persons with normal immune systems. Usually a person will experience symptoms for seven to ten days and recover completely.

Bacterial meningitis is much more serious with some case progressing to death in 24 to 48 hours. Early identification and treatment is important but even with the correct treatment there is a 5 to 10% fatality rate. Of the survivors, 10 to 15 % will have permanent side effects such as hearing loss, learning disabilities, or brain damage. Bacterial meningitis can also advance to a more serious condition called meningococcal invasive disease. This results in an infection of the blood that will affect other areas of the body and can be fatal in 20 to 30% of cases.

How Can You Be Protected?

When treating a patient with known or suspected meningitis (viral or bacterial) it is important to wear protective equipment, especially gloves, N95 respirator and eye protection. It is impossible to identify patients suffering from viral meningitis *versus* those with bacterial meningitis without testing blood or cerebrospinal fluid. In addition, practice excellent hand hygiene and make sure that you wash your hands thoroughly, change stretcher linen and clean all equipment following the transport of a patient with known or suspected meningitis. It is also important to avoid sharing cigarettes, food, cups, utensil or water bottles with others as this can facilitate the exchange of bacteria in oral/nasal secretions.

There are also a number of vaccines that are available against some of the bacteria that cause bacterial meningitis. These include vaccines for haemophilus influenza (Hib), neisseria meningitis and streptococcus pneumonia. These vaccines have been shown to be as much as 90% effective in protecting against meningitis and the introduction of the Hib vaccine as a routine childhood vaccine in 1986 has virtually eliminated this form of meningitis. The Hib vaccine is not recommended for those over five years of age. Consult with your doctor to determine if vaccination would help protect you from bacterial meningitis.

Exposure Procedure

If you are exposed to viral meningitis it is not likely that you will develop any illness. Only one in one thousand of those infected with viral meningitis will develop the disease. Fill out an exposure report with your supervisor and monitor yourself for symptoms during the incubation

period. If any symptoms develop see a doctor right away while taking steps to avoid spreading the virus.

If you are exposed to bacterial meningitis you should be immediately assessed by a physician to determine if the nature of your exposure requires post-exposure medication. Medications such as rifampicin, minocycline, spiramycin, ciprofloxacin, and ceftriaxone are used to prevent the onset of meningitis. If symptoms of meningitis develop you should immediately go to a hospital emergency department for assessment and treatment.

Sources

Toronto Public Health

http://www.toronto.ca/health/meningitis_factsheet.htm

Health Canada

http://www.hc-sc.gc.ca/iyh-vsv/med/mening_e.html

Rabies

Rabies is a viral illness which attacks the central nervous system of any mammal. Rabies is fatal if post-exposure treatment is not started immediately after infection. The most commonly infected animals are bats, skunks, foxes, and raccoons but household pets such as cats and dogs can also be infected. All bite wounds should be assumed to be from a rabies-infected animal until proven otherwise. Abnormal behaviour may not be readily apparent with animals unfamiliar to the person who was bitten.

Mode of Transmission

Rabies is spread from infected animals to people or other animals by saliva. One can also get rabies after being bitten or by infected saliva contacting mucous membranes or non-intact skin, such as being licked on the eyes, nose or mouth, or cuts or scrapes, by an infected animal.

Incubation Period

The time between exposure to the virus and the onset of symptoms can range from 10 days to 2 years; typical human incubation is 2 to 8 weeks.

Persons at Risk

Anyone can become infected with rabies if bitten by an infected animal. Wildlife control officers, veterinarians, farm workers, and other people who work closely with animals are at greater risk. Laboratory professionals working with rabies are also at risk if workplace injuries such as aerosolization or needlestick injuries were to occur.

Signs and Symptoms

It is extremely important to begin treatment before signs or symptoms of rabies infection begin.

Early symptoms in humans include:

- Abnormal itching at bite site.
- Headache, cough, and fever.
- Fatigue.
- Nausea and abdominal pain.
- Sore throat.
- Lack of appetite.

Later signs and symptoms include:

- Dramatic mood swings.
- Stiff muscles.
- Dilation of pupils.
- Increased saliva production.
- Severe and painful throat spasms.
- Convulsions.
- Sensitivity to sound, light, and temperature.
- Fear of water.

Dumb and Furious

Later stages of rabies typically develop into “dumb” or “furious” rabies. In “Dumb” rabies some animals may become depressed and retreat to isolated places. Skunks and other wild animals may lose their fear of humans. Some animals may show signs of partial paralysis such as abnormal facial expressions, drooping head, sagging jaw, or paralyzed hind limbs. Night roamers like raccoons and skunks may wander about in daylight. Household pets may lose their appetites or become unusually depressed or lethargic.

In “furious” rabies animals may show extreme excitement and aggression. Some animals may gnaw and bite their own limbs or attack stationary objects or other animals. The bouts of furious rabies usually alternate with periods of depression.

Treatment

If a person is bitten, scratched, or licked on non-intact skin or a mucous membrane, by an animal suspected of having rabies, the area should be thoroughly washed and rinsed with soap and water or disinfectant. **Seek medical attention immediately.** Rabies vaccine should be given as soon as possible, preferably within 24-48 hours of exposure to anyone who has been in contact with the animal.

The first treatment, sometimes called passive immunization, provides immediate but temporary protection by injecting antibodies into the patient. Currently CDC recommends treating a patient with one dose of human rabies immunoglobulin (HRIG). After the first treatment, CDC recommends that the patient be given a rabies vaccination which causes the creation of permanent antibodies.

Rabies vaccine immunization consists of a series of five vaccines given in the upper arm over a four week period, starting as soon as possible after being exposed to a rabid animal. People with continuing risk should receive a booster about every two years.

Programs

Regional public health departments:

- Ensure proper confinement of all dogs and cats involved in human biting incidents.
- Enforce and promote rabies vaccination of cats and dogs.
- Provide education to the public.

The Ministry of Natural Resources conducts raccoon aerial baiting in areas where raccoon rabies has been identified. Ministry staff also provide live-trap operation for raccoons, foxes, and skunks where they inject the rabies vaccine and then release the animal at point of capture.

If you suspect you have been scratched, licked or bitten by a rabid animal, seek medical attention immediately and notify your local public health agency: Toronto Public Health, Health Environments Animal Control: 416-392-7685.

Sources

Public Health Agency of Canada

<http://www.phac-aspc.gc.ca/id-mi/index.html#rabies>

United States Centers for Disease Control and Prevention

<http://www.cdc.gov/ncidod/dvrd/rabies/>

Toronto Public Health - Animal Control

416 392 7685

0800 – 1630

Toronto Public Health – Main Number

416 338 7600

After hours

416 690 2142

Severe Acute Respiratory Syndrome (SARS)

SARS is a viral, respiratory illness caused by the SARS-associated corona virus (SARS CoV). SARS was first reported in China in February 2003 before quickly spreading to several other countries. The global outbreak of SARS hit Toronto very hard and was not contained until June 2003. Normally the corona virus causes only mild to moderate upper respiratory illness such as the common cold; the SARS CoV can cause severe pneumonia, respiratory distress syndrome, and death. As of July 2003, there have been no reported cases of SARS anywhere in the world.

Mode of Transmission

SARS seems to be difficult to catch and appears to require close and prolonged person-to-person contact. It is spread through respiratory droplets that are produced when an infected person coughs or sneezes. Coughing or sneezing propels the droplets a short distance (one metre) and infection occurs when a susceptible person inhales these droplets into the lungs or when they make contact with mucous membranes of the mouth, nose, or eyes. Close contact means having cared for or lived with someone who is symptomatic with SARS. It does not include walking by a person or briefly sitting across from a symptomatic person or any other form of brief contact.

Incubation Period

The typical incubation period is two to seven days but there have been cases of ten to fourteen days of incubation.

Period of Communicability

It appears that a person is only contagious when they are symptomatic, with patients being the most contagious during the second week of the illness. There have been no cases of transmission documented prior to the onset of symptoms. The duration of symptoms is variable from patient to patient. This has led to the recommendation that patients remain quarantined for 10 days following the end of fever and improvement of their respiratory symptoms.

Persons at Risk

Currently the only risk factors for SARS known are recent travel to areas where SARS is spreading or recent close contact with a person who is symptomatic with SARS. There is no evidence of community spread of SARS and infections were confined to health care workers and household members of those sick with SARS, or to those performing laboratory work on SARS infected samples.

It appears that the effects of SARS are more severe for those patients that are elderly or who have underlying health conditions such as diabetes, Crohn's disease or heart disease. This group is more likely to have severe pneumonia, respiratory failure, and death as a result of SARS.

Signs and Symptoms

The initial symptoms of SARS are similar to other viral illnesses and include:

- High fever (greater than 38 degrees Celsius)
- Muscle aches
- Headache
- Diarrhea (10-20% of patients)
- Fatigue

After two to seven days a patient may develop a dry, non-productive cough, SOB, and hypoxia. Most patients develop pneumonia with some progressing to RDS and respiratory failure.

Suspect Case

A person with all of the following:

- Fever > 38° Celsius.
- Coughing.
- Shortness of breath.
- An exposure in the past 10 days where there was close contact with a SARS patient or living/travelling in an area where there is known local transmission of SARS.

Probable Case

A suspect case with any one of the following:

- Radiographic evidence of infiltrates consistent with pneumonia or respiratory distress syndrome.
- Tests positive for the SARS coronavirus by one or more tests.
- Autopsy findings consistent with the pathology of RDS without an identifiable cause.

A case is **not considered to be SARS** when an alternative diagnosis can fully explain the illness.

Treatment

There is currently no specific treatment that is available for SARS. The antiviral, Ribavirin, which was used in the first wave of SARS, was not a useful treatment. Health Canada recommends the same treatment that is given to any patient that has serious pneumonia as a result of a virus. This treatment may include supportive treatments such as oxygen therapy, fluid therapy, steroids, intubation and mechanical ventilation.

Scientists are currently testing different anti-viral medications in the hope of finding an effective treatment for SARS.

Expected Outcome

The majority of patients will develop pneumonia. The severity of pneumonia can vary from mild to very severe pneumonia that can progress to RDS and respiratory failure that necessitates mechanical ventilation. Mechanical ventilation is required in 10-20% of cases. Based on World Health Organization numbers the mortality rate during the SARS outbreak was 10%. It is too soon to predict the long-term effects that SARS has on the surviving 90% of patients.

How Can You Be Protected?

Currently there is no vaccine available for SARS. In the absence of an effective vaccine, the use of infection control procedures is the only way to protect against contracting SARS. These procedures include the proper use of personal protective equipment and regular use of excellent hand hygiene.

Health Canada recommends that the following protective equipment is used when treating a known or suspected SARS patient:

- Respirator mask of N95 or better.
- Gloves.
- Eye protection.
- Gown.

In addition, Health Canada recommends during outbreak and non-outbreak conditions that emergency service workers remain one metre from the patient while pre-screening them by asking the following questions:

- Do you have new or worsening cough or shortness of breath?
- Have you had fever or chills?

If the patient answers yes to either question an infectious respiratory disease cannot be ruled out and the patient should be treated with caution. The paramedic should immediately put on PPE and have the patient perform hand hygiene. A N95 respirator should also be put on the patient if oxygen therapy is not required.

Exposure Procedure

If a paramedic is exposed to SARS it is important that they are assessed immediately to determine the risk of the exposure. When PPE was not used or if PPE failed the exposure is considered a high risk and may require a quarantine period. During the quarantine period the paramedic should monitor for the development of SARS-like symptoms and avoid contact with others. Following the exposure the paramedic should follow departmental policy while ensuring that the unit and equipment are cleaned with an appropriate disinfectant and the patient linen is replaced. They should then wash hands with soap and warm water and change their contaminated uniform.

If a paramedic becomes symptomatic after an exposure to SARS they should maintain strict isolation and seek medical attention while wearing a N95 respirator. **As of July 2003, no new cases of SARS had been identified. The World Health Organization does not consider there to be a possibility of contracting SARS anywhere in the world.**

Sources

Ontario Ministry of Health and Long-Term Care
http://www.health.gov.on.ca/english/public/pub/disease/sars_4.html

United States Centers for Disease Control and Prevention
<http://www.cdc.gov/ncidod/sars/basics.htm>

Christian Science Monitor
<http://www.csmonitor.com/2003/0703/p01s03-wogi.html>

Scabies

Scabies is a fairly common infectious disease of the skin caused by a mite. Scabies mites burrow into the skin producing itchy pimple-like irritations or burrows.

Mode of Transmission

Scabies mites are transferred by direct skin to skin contact. Indirect transfer from undergarments or bedclothes can occur only if these have been contaminated by infected people immediately before contact. Scabies can also be transmitted during sexual contact.

Incubation Period

Symptoms will appear from 2-6 weeks in people who have not previously been exposed to scabies infestations. People who have had a previous bout with scabies mites may show symptoms within 1-4 days after subsequent re-exposures.

Persons at Risk

Scabies infestations can affect people from all socioeconomic levels with out regard to age, sex, race or standards of personal hygiene. Clusters or outbreaks are occasionally seen in nursing homes, institutions, and child care centres.

Period of Communicability

A person is able to spread scabies until mites and eggs are destroyed by treatment.

Signs and Symptoms

- Intense itching; particularly at night.
- Pimple like irritations on: webs and sides of the fingers, around the wrists, elbows, armpits, waist, thighs, genitalia, nipples, breasts and lower buttocks.
- Short, zigzag or S-shaped, lines or burrows will also appear.
- Sores may be caused by a secondary bacterial infection from scratching.

Treatment

The typical treatment for scabies involves applying 5% permethrin cream or lotion to the entire body from the neck down. The cream or lotion is left on for 8-14 hours and then washed off and then a second treatment may be needed a week later. Close contacts, including all family members, should also be treated at the same time.

You may also need treatment for the rash. This can include topical steroid creams, oral antihistamines, and other anti-itch treatments.

Since the mites can live for 48-72 hours on clothing, bedding, towels, etc., they should be washed in hot water and then dried in a hot dryer. Things that can't be washed can be placed in a plastic bag for a few weeks to make sure the mites have died. Furniture and carpeting should also be vacuumed carefully.

Prevention

Avoid physical contact with infested individuals and their belongings, especially clothing and bedding. Physical barriers such as a gown and nitrile gloves along with careful cleaning, disinfection, and linen replacement will help prevent the spread of scabies in pre-hospital care.

Sources

Public Health Agency of Canada

http://www.phac-aspc.gc.ca/publicat/std-mts/sti_j.html

United States Centers for Disease Control and Prevention

http://www.cdc.gov/ncidod/dpd/parasites/scabies/factsht_scabies.htm

Smallpox

Smallpox is a serious, contagious and sometime fatal disease caused by the variola virus. The disease is now considered eradicated after a successful world wide vaccination program. The last case of small pox in the USA was in 1949 and the last reported case in the world was in Somalia in 1977. Routine small pox vaccinations were eliminated at the end of 1972.

Mode of Transmission

Smallpox spreads from person to person usually by face to face contact lasting 3 hours or more. It can also be spread through direct contact with infected body fluids or objects such as bedding or clothing that have been infected with the smallpox virus.

Incubation Period

The incubation period is 7 to 17 days, during which time the infected person has no signs or symptoms of disease. The person is not contagious at this point.

Persons at Risk

Anyone not vaccinated against smallpox is at risk. Mass public vaccinations were discontinued in the early 1970s following smallpox eradication from the general public. The efficacy of those previous immunizations thirty years later is not known.

Signs and Symptoms

Symptoms during the first 2 to 4 days include:

- Fever (38° to 40° C).
- Malaise.
- Head and body aches.
- Vomiting.

A rash emerges as small red spots on the tongue and in the mouth. These develop into open sores in the mouth and throat. **This is the most contagious time as it allows for airborne spread of the virus.**

Usually the rash spreads to all parts of the body within 24 hours. By the third day the rash becomes bumps and by the fourth day these bumps fill with fluid with a depression in the middle. Fever will often rise again and remain high until the small pox pustules scab over. These bumps become pustules on about the 5th day which will form a crust and also scab. The scabs usually fall off between the 6-21 days leaving marks on the skin. The person is contagious until all the scabs have fallen off.

Smallpox Vaccine

Smallpox vaccine is made from a living virus called vaccinia. Vaccinia is like the smallpox virus but less harmful.

The small pox vaccine can not give you smallpox.

Vaccinated persons may need to get the vaccine again at least every 3-10 years depending on their risk of exposure to smallpox.

The smallpox vaccine is not recommended for everyone if there is no smallpox disease. People who should not be vaccinated include pregnant women, people with immune system problems, people with certain skin conditions, and people living with a child less than one year old.

After the 911 terrorist attacks in the USA, smallpox vaccine is being made to stockpile in the event of biological warfare using the smallpox virus. Health Care providers and the military are to be vaccinated so they can respond quickly if a smallpox attack occurs.

Sources

Ontario Ministry of Health and Long-Term Care

<http://www.health.gov.on.ca/english/public/pub/disease/smallpox.html>

United States Centers for Disease Control and Prevention

<http://www.bt.cdc.gov/agent/smallpox/>

Tuberculosis

Tuberculosis (TB) is a bacterial infection that is caused by mycobacterium tuberculosis. The bacteria most frequently attacks the lungs. This is referred to as pulmonary TB. Tuberculosis can also affect other areas of the body, and this is called extra-pulmonary TB. The areas most commonly affected are the lymph nodes, the kidney, spine, brain, middle ear, eye, intestines, bones, joints, and larynx.

TB was once a leading cause of death in Canada, but with the introduction of antibiotics and an increase in public health programs there has been a significant decrease in the number of TB cases. Currently there are approximately 2000 cases of TB in Canada each year.

TB is categorized either as latent TB infection or active TB disease. Most people who breathe in the bacteria in sufficient quantities to actually become infected, will have an immune response capable of stopping the replication of the bacteria. Some of the bacteria will remain alive and inactive, resulting in a latent TB infection. Most people with a latent TB infection will never experience any symptoms and they will never be contagious to others. Latent TB infected people have only a 10% chance of ever developing active TB disease over their entire lifetime.

Active TB results when the body's immune system can no longer stop the bacteria from growing, at which point the person will become symptomatic and potentially contagious.

Mode of Transmission

Tuberculosis is difficult to catch and requires prolonged close contact to a person with an active case of pulmonary TB. Transmission is only through breathing in respiratory droplets that become airborne when a person sneezes, coughs, speaks or sings. Health care workers can be exposed during high-risk procedures such as suction and intubation.

TB infections of the lungs or larynx are the only forms of TB disease that are contagious. TB in other parts of the body is not infectious, as the bacteria cannot become airborne. You cannot get TB from sharing clothes, linen, drinks, cigarettes or dishes.

Incubation Period

The time from breathing in the bacteria to infection is about two to 12 weeks. A TB skin test done during this time will be negative as the body has not had enough time to generate an immune response. The risk of developing a case of active TB, either pulmonary or extrapulmonary, is greatest in the first two years after infection. A latent TB infection may never become active disease as it can remain dormant for a lifetime. The risk of developing active TB disease is increased when the immune system weakens and is unable to keep the bacteria from growing, such as when a person has another medical condition, is malnourished, aged or under extreme amounts of stress.

Period of Communicability

People with latent TB infections are not contagious. When a person's immune system is no longer able to keep the bacteria from growing, they may develop an active case of pulmonary TB and will become contagious. They will remain infectious while there are still live bacilli being discharged in the sputum that is aerosolized through coughing, sneezing, speaking or singing.

Some untreated or inadequately treated patients can remain infectious for years. Patients who are correctly treated with anti-tuberculosis medication are not infectious after two to three weeks of medication and can then return to normal activities. It is important to complete the full course of antibiotics because failure to do so can result in the patient developing a drug resistant form of TB.

Young children with pulmonary TB are generally not infectious as they cannot cough significant levels of bacteria into the air.

Persons at Risk

The risk of infection with the TB bacteria is directly related to the degree of exposure. People who have poor health due to chronic illnesses or malnutrition are more likely to become sick with active TB disease if infected, and are more able to spread the disease to others if they are living in crowded conditions. As this is a common scenario in many developing countries, TB is considered endemic in the majority of the developing world.

TB infection is more likely in people who have:

- Prolonged contact with someone who has TB, such as health care workers or family caring for those who are sick.
- Lived or visited areas of the world where TB is common such as Asia, Africa, India, the Middle East, Central America, and South America.
- Previously had TB that was not treated adequately.
- Medical conditions that lower the body's resistance to infection such as diabetes, cancer, and malnutrition.
- HIV.
- Lived in aboriginal communities with a high rate of TB.
- Lived within homeless or under-housed populations.

Signs and Symptoms

A person with latent TB infection will not exhibit any signs and symptoms with the exception of a positive skin test.

The signs and symptoms of active TB disease are:

- Positive skin test (if the person is not too sick to manifest an immune response to the test).
- Cough with chest pain.
- Shortness of breath.
- Hemoptysis (coughing up blood).
- Fever, chills, night sweats.
- Loss of appetite.
- Unexplained weight loss.
- Weakness and fatigue.
- Abnormal chest x-ray.
- Pain in affected area; joint pain.

Treatment

TB is completely curable with antibiotics. A person with active TB will be put on four or more different antibiotics for at least six months. Taking several different drugs does a better job of killing the bacteria and prevents the bacteria from becoming resistant to the drugs.

It is important to take the medication as prescribed by the doctor until the complete course is done. Failure to do so will result in a patient having a relapse of the disease and becoming symptomatic and infectious once again. It may result in a multi-drug resistant form of the disease. When the medication is taken properly, a patient is no longer contagious after three weeks of treatment.

Depending on their risk factors, a person with a latent case of TB may need to go on antibiotics to prevent the development of active TB disease. This is a decision that should be made with the advice of a TB specialist.

Medications used to treat TB include:

- Isoniazid (INH)
- Rifampin
- Pyrazinamide
- Ethambutol
- Streptomycin

Expected Outcome

Only ten percent of people that have a latent TB infection will ever develop active TB disease. Active TB disease is treated very effectively with the above mentioned antibiotics.

How Can You Be Protected?

A TB vaccine does exist and is recommended for areas where the rate of TB infection is very high, but Canada's low TB rate precludes the vaccine from being beneficial here. Proper use of N95 respirators and effective infection control procedures are the best way to prevent being infected by TB bacteria.

When treating a patient that you suspect of having an active case of pulmonary TB, wear an N95 respirator. Eye protection and nitrile gloves should also be worn as part of routine practise. As with all patients, following treatment of the patient with possible TB, all linen should be changed and packaged for cleaning. Clean and disinfect the vehicle and all equipment as per procedure. Remember to wash your hands thoroughly with warm water and soap as part of routine practise.

Toronto public health recommends that all health care workers who have had a previously negative skin-test receive an annual TB skin test in order to identify any possible exposure over the previous year. This enables the infected person to start any recommended preventative treatment.

Anyone who has had a positive skin test will always test positive for TB even when prophylactic medication is taken. As the positive skin test reaction can increase with multiple tests, a person with a positive skin test should never be retested. People who have negative skin test reactions cannot become positive from repeated skin test.

Exposure Procedure

If you are exposed to a person with active pulmonary TB it will be necessary for a previously negative person to have a TB skin test within a few days of exposure in order to rule out previous TB infection. If this test is negative, the exposed paramedic was not previously infected with TB, and therefore should have a repeat skin test three months after contact to allow their immune system time to recognize if it is now infected. If the skin test is negative at three months no further action is required. If the skin test is positive, the paramedic should consult a TB specialist.

The paramedic should be instructed to have a chest x-ray and a sputum sample tested to rule out the development of active pulmonary disease before prophylactic medication is started. All those who had previously positive skin test should self-monitor for the development of signs and symptoms of TB disease and report to a doctor for assessment if any symptoms do develop.

Remember: A positive skin test means that there is a TB infection; disease and infection are not the same thing. A person with TB infection is asymptomatic and is not infectious.

Only ten percent of those with TB infection will ever develop active TB disease. Contact your doctor, public health, or TEMS Infection Control for more direction and counselling.

Sources

Toronto Public Health

http://www.toronto.ca/health/tb_prevention/tbfactsheet.htm

Ontario Ministry of Health and Long-Term Care

<http://www.health.gov.on.ca/english/public/pub/disease/tuber.html>

Varicella (Chickenpox)

Varicella, also known as chickenpox, is a generalized viral illness that is caused by the varicella zoster virus in the herpes family. Contrary to popular belief, varicella can be a very serious illness, with severe complications and death.

Mode of Transmission

Varicella is a highly infectious virus spread through the air in respiratory droplets resulting from coughs or sneezes from an infected person. It is also spread from person to person through direct contact with the secretions from the chicken pox lesion. It can also be transmitted indirectly through articles freshly soiled by the discharge from the lesions.

Incubation Period

The typical incubation period is 14-16 days, but it can take up to three weeks for varicella to develop.

Period of Communicability

An infected person is usually communicable for one to two days before the onset of the rash but it can be as long as five days. Communicability last until the last lesion has formed a scab (usually five days). Susceptible individuals should consider themselves infectious for 10-21 days following exposure.

Persons at Risk

Varicella is an extremely contagious disease, especially in the early stages of blister formation. A person who has not had varicella previously and has not been immunized has a 90% risk of becoming infected following exposure. At least 90% of the non-immune population worldwide have had the disease by 15 years of age and 95% by adulthood. Adults who become sick with varicella are more likely to have severe complications from the illness. Previous infection usually imparts lifelong immunity, but cases of second occurrences do occasionally happen. For approximately 15% of older adults, the virus can remain latent and disease may reoccur as Herpes Zoster (Shingles). Varicella is a vaccine-preventable disease.

Signs and Symptoms

- Fever
- Blistering rash (250-500 Blisters)
- Severe Itching
- Fatigue
- Dehydration
- Headache
- Vomiting/diarrhea

People who are more likely to suffer severe complications from chickenpox are infants, adolescents, adults, and those who have weak immune systems due to illness or medication.

These complications include:

- Bacterial infections, including necrotizing fascitis
- Bleeding problems
- Pneumonia
- Encephalitis
- Death

Treatment

Treatment for varicella is primarily aimed at relieving the symptoms. Acetaminophen can be given to control fever and muscle aches while itching can be eased with a cool bath or the application of calamine lotion. Antihistamines can be used to control severe itching, which is important to prevent scratching of lesions which can lead to secondary bacterial infections. Patients should have their nails trimmed short and some children may have to wear mittens in order to reduce scratching.

The use of an antiviral drug called Acyclovir has been shown to shorten the period of new lesion formation. This results in fewer lesions and more rapid healing. To be effective, it must be given within a week of exposure. Acyclovir is more likely to be prescribed to those with a higher risk of complications.

The varicella vaccine, when administered within three days of exposure, is likely to prevent or significantly decrease the severity of the disease. Any treatment decision should be made with the advice of your family doctor, and those who are experiencing serious side effects of chicken pox should seek medical attention at the hospital.

Expected Outcome

You may remember varicella as an annoying, itchy illness that went away after a few days. This is the expected outcome for the majority of cases. However it is important to remember that it can result in serious complications up to and including death due to pneumonia, encephalitis, or bacterial infection.

How Can You Be Protected?

There is a safe and completely effective vaccine available. Up to 85% of people vaccinated against varicella are immune from the disease, and 100% of people vaccinated will be spared a severe case.

A previously common practice was to take a well child to visit a child who was ill with varicella in order to have the well child become ill and then develop immunity to the disease. The problem with this practise of “chicken pox parties” is that it is impossible to predict who will have a mild case and who will have a more severe, or even deadly, case of varicella.

Some things to consider:

- Prior to varicella vaccination there were approximately four million cases of chicken pox annually in the USA, resulting in approximately 9000 hospitalizations and 100 deaths.
- CDC Atlanta reports that deaths continue to occur from Chickenpox, but only among individuals not previously vaccinated.
- Fewer than 5% of the cases of chicken pox occur in adults over 20 years of age, but they account for 55% of the deaths.
- Routine precautions including N95 respirator, nitrile gloves, handwashing, and careful linen exchange will protect you while caring for a patient with varicella.

Vaccination is still the most effective tool to prevent chicken pox in persons not previously rendered immune to the disease.

Exposure Procedure

If you are non-immune and have been exposed to varicella, a physician may recommend the varicella vaccine be administered within 3 days of exposure. This has been shown to prevent or reduce the severity of illness. If you belong to a group who are high risk for developing complications from chickenpox, antiviral therapy may also be prescribed.

People should remain at home for the duration of the period of communicability of their chicken pox. Avoid contact with people who may be high-risk for complications from the disease. Gloves and N95 respirators should be worn as a precaution by all non-immune people making contact with the sick person. Ensure that all linen and clothing is washed separately in order to ensure that all infectious secretions are cleaned. If symptoms persist or complications arise you should consult your family physician or hospital emergency room.

Sources

Toronto Public Health

http://www.toronto.ca/health/chickenpox_factsheet.htm

United States Centers for Disease Control and Prevention

<http://www.cdc.gov/nip/diseases/varicella/vac-chart.htm>

Viral Haemorrhagic Fever

Viral haemorrhagic fevers (VHF) are a group of highly infectious and often fatal diseases that are caused by several different groups of viruses. These include arenaviruses, filoviruses, bunyviruses, and flaviviruses. The term haemorrhagic fever is used to describe a severe multi-system syndrome that damages the vascular system, resulting in haemorrhaging from body orifices.

A few examples of VHF are:

- Ebola virus.
- Marburg virus.
- Lassa fever.
- Machupo (Bolivian) haemorrhagic fever.
- Crimean-Congo haemorrhagic fever.

Though there are many diseases that are considered VHF with varying levels of severity, this sheet will focus only on those VHF for which human-to-human transmission is possible.

Mode of Transmission

The natural reservoirs for VHF are rodents, monkeys, mosquitoes, and ticks. Human infection occurs following contact with an infected rodent or its body fluids and from insect bites from an infected tick or mosquito vector. The viruses depend upon the animal host for survival, which restricts the virus to the geographical area where the host lives. The rare exception is when a person is infected in an endemic region and travels to another area while incubating the disease.

Once infected, human-to-human transmission of VHF can take place through close contacts with an infected person. The virus is easily transmitted through direct and indirect contact with body fluid such as blood, saliva, urine, or semen. Close contacts are defined as those living with and caring for infected persons as well as laboratory workers that handle the specimens from these patients. Casual contact, such as being in the same room or walking by an infected person, does not constitute a risk.

Incubation Period

The incubation varies between different VHFs from one to twenty one days:

- Lassa Fever - 6 to 21 days.
- Marburg Virus – 3 to 9 days.
- Ebola Virus – 2 to 21 days.
- Machupo Fever – 7 to 16 days.
- Crimean Congo – 1 to 3 days; can range up to 12 days.

Period of Communicability

A person with VHF will be communicable as long as the virus remains in the body. Lassa fever is spread from human-to-human during the acute febrile stage and the virus remains in the patient's urine three to nine weeks from the onset of the disease. The Ebola and Marburg viruses can be spread as long as the virus is present in the blood and secretions which can last for as long as 60 days. Crimean Congo Fever is highly contagious from exposure to blood and secretions. Human transmission of Machupo fever is not common but there have been documented cases.

The corpse of a person who has died from VHF should also be considered highly contagious.

Persons at Risk

Susceptibility is general with no differences between age, sex, or ethnicity. With the exception of the rare travel case, VHF is confined to the geographical area where the animal and insect reservoirs live.

Lassa, Marburg and Ebola virus are limited to sub-Saharan Africa. Machupo fever is limited to rural areas of Bolivia. Crimean-Congo fever is more widely distributed in Africa, the Mediterranean region, the Middle East, Eastern Europe, Central Asia, and China.

Signs and Symptoms

The signs and symptoms of VHF vary from virus to virus and they may include:

At Onset:

- Headache.
- Myalgia.
- Weakness.
- Sore Throat/Cough.
- Abdominal Pain.
- Vomit/Diarrhea.
- Dizziness.

Advanced:

- Petechiae.
- Internal haemorrhage.
- Haemorrhage - body orifices (eyes, ears, nose).
- Severe shock.
- Nervous system malfunction.
- Multi organ failure.
- Delirium.

Treatment

There is no cure for VHF. The antiviral Ribavirin has been effective in treating some patients with Lassa fever and it is thought to be useful when treating Crimean-Congo fever as well. In the absence of a cure, treatment is focused on supportive care, including oxygen therapy and fluid and electrolyte maintenance. Ribavirin is recommended as preventative medicine for close contacts of Lassa fever and Crimean-Congo fever.

Expected Outcome

There are some forms of VHF that result in fairly minor symptoms and full recovery. However the five types that have person-to-person transmission can have a more serious outcome. During outbreaks, the fatality rates are very high.

Lassa Fever

80% of those that are infected will only have asymptomatic or mild infections and will recover completely. 20%, however, will have more severe disease with 15% of them dying. Of the survivors, 25% will have 8th cranial nerve deafness, with half of this number regaining their hearing after about three months.

Crimean-Congo Haemorrhagic Fever

The case fatality rate is 30% percent. The surviving patients they will begin to get well on the ninth or tenth day of the illness. This will be followed by a prolonged convalescent stage.

Marburg Virus

The case fatality rate is 25%.

Ebola Virus

The case fatality rate is as high as 88%.

Machupo Haemorrhagic Fever

The case fatality rate ranges between 15-30%

How Can You Be Protected?

Vaccines are available for Yellow fever and Argentine fever. Human-to-human transmission does not occur with these VHF and the vaccine is only recommended when travelling to areas where these diseases are common. Vaccines do not exist for any other VHF. Survival of Crimean-Congo fever probably results in life long immunity, but it is unknown if a survivor will have immunity to any other VHF.

In the areas where the natural reservoirs for VHF are common, prevention methods include the control of the population of mice, rats, ticks, and mosquitoes. Insect repellent and mosquito netting should be used in order to prevent being bitten by an insect vector.

In North America the risk of transmission through these vectors is almost zero and as a result VHF are extremely rare. When a human infection occurs, infection control measures are required to prevent human-to-human transmission.

When treating or transporting a person with known or suspected VHF, wear full PPE including N95 respirator, gloves, gown and eye protection. Avoid contact with body fluids and ensure that you engage in excellent hand hygiene practices. Avoid needle stick injuries through safe sharps handling. Make sure that all equipment and surfaces are cleaned and disinfected with the high level disinfectant provided, and ensure that all linens and soiled uniforms are removed and cleaned as per departmental procedure.

Exposure Procedure

If you are exposed to any VHF you should be assessed immediately in an emergency department. If the exposure is through a needle stick injury, allow the wound to bleed freely and then wash with soap and water or alcohol-based waterless hand sanitizer. Depending on the risk of your contact, you may be required to begin symptom surveillance. If you have been exposed to Lassa fever or Crimean-Congo fever, the doctor may prescribe the antiviral medicine Ribavirin to reduce the risk of developing the disease.

If you develop a fever of 38 degrees or higher following an exposure, you will need to be isolated and treated as a VHF patient. You should wear an N95 respirator and go to the nearest hospital emergency room for assessment and treatment.

Sources

World Health Organization

<http://www.who.int/mediacentre/factsheets/fs103/en/>

http://www.who.int/mediacentre/factsheets/fs_marburg/en/index.html

<http://www.who.int/mediacentre/factsheets/fs208/en/index.html>

United States Centers for Disease Control and Prevention

<http://www.cdc.gov/ncidod/dvrd/spb/mnpages/dispages/lassaf.htm>

West Nile Virus

West Nile Virus (WNV) is an avian disease that can spread to mammals, including humans by infected mosquitoes. The virus was first identified in Uganda in 1937 and has spread across the globe. The first North American outbreaks were identified in 1999. Although not life-threatening for most people, the virus can cause severe complications and even death.

Mode of Transmission

WNV predominantly infects crows, blue jays, and ravens, and is spread by mosquitoes. The insect will bite an infected bird and pass the virus on to the next bird it bites. Human infection can occur when a mosquito bites an infected bird and then a person.

Rare cases of WNV transmission by blood transfusions, organ donation, and from mother to child during birth or breastfeeding have been reported.

No evidence to suggest casual-contact human transmission of WNV has been discovered.

Incubation Period

The incubation period after a mosquito bites a person is 3-14 days.

Persons at Risk

Anyone can be infected by WNV. People spending more time in mosquito breeding areas or outside during dusk and dawn are at a higher risk. Elderly, very young, and immuno-compromised are at a higher risk for complications from the illness.

Signs and Symptoms

Most people infected with WNV will be asymptomatic and not feel ill.

20% of those infected may develop symptoms such as:

- mild fever
- headache
- fatigue
- muscle aches and weakness
- skin rash
- swollen glands

In rare cases, predominantly in the elderly, very young, or immune-suppressed patients, the illness may progress and have serious complications such as meningitis or encephalitis.

Rapid onset of the following symptoms should prompt the patient or care-givers to seek medical attention immediately:

- Severe headache.
- High fever.
- Vomiting.
- Drowsiness and confusion.
- Stiff Neck.
- Coma.

Treatment & Expected Outcome

As there is no known cure or vaccine for WNV, treatment is based on relieving symptoms and ensuring fluid and electrolyte balance. Most infected people do not require any treatment as they are asymptomatic and do not feel ill. Minor symptoms such as fever and muscle aches may be relieved with acetaminophen.

Cases involving meningitis or encephalitis will require hospital care, and may include medications and advanced life support practices.

How Can You Protect Yourself?

Limiting exposure to mosquitoes is the best way to reduce the risk of contracting WNV. Wearing light-coloured long sleeve shirts, full length pants, socks, shoes, and insect repellent with DEET on exposed skin reduces the chance of being bitten by an infected mosquito.

Avoiding the outdoors during the dawn and dusk periods also decreases the potential for mosquito bites. Working to reduce the number of mosquito habitats can reduce the concentration of mosquito populations in urban areas. Catch basins, bushes, long grass, and objects such as old tires can contain standing water in which mosquitoes can breed, and should be inspected and emptied on a regular basis.

Sources

Public Health Agency of Canada

http://www.phac-aspc.gc.ca/tmp-pmv/info/wnv_e.html

United States Centers for Disease Control and Prevention

http://www.cdc.gov/ncidod/dvbid/westnile/wnv_factsheet.htm

HIV/AIDS

The human immunodeficiency virus (HIV) is a retrovirus that was first identified in 1981. HIV attacks the body's immune system, damaging and killing the CD4 (also known as T4 or T-helper) cells. Over time, the immune system is weakened and loses its ability to fight off infection. Acquired immune deficiency syndrome (AIDS) is the most advanced form of HIV infection. The US Centre for Disease Control (CDC) in Atlanta has defined specific criteria for a diagnosis of AIDS.

As defined by the US Centers for Disease Control and Prevention (CDC), a person who is HIV positive with at least one of the following is said to have AIDS:

- Fewer than 200 CD4 positive T cells per cubic millimetre of blood.
- A CD4 cell percentage of total lymphocytes less than 14%.
- Having one or more of the 26 defined AIDS indicator illness such as: Pneumocystis pneumonia, Kaposi's sarcoma, and HIV wasting syndrome.

Mode of Transmission

HIV transmission can occur when blood, semen, vaginal fluid, or breast milk of an infected person enters the body of an uninfected person. HIV can enter the body through veins, or the mucous membranes of the body including the anus, vagina, penis, mouth, eyes, nose, and through open cuts and sores. The most common ways that HIV is transmitted are:

- having unprotected sex (anal, vaginal and oral) with an infected individual
- sharing needles contaminated with HIV
- from an HIV infected mother to a baby before or during birth and through breast feeding after birth

HIV can also be transmitted through donated blood and organs from an infected donor. However since 1985, all donors are screened for HIV and blood is heat-treated to destroy HIV, reducing the risk considerably. Transmission of HIV is possible through deep open mouth kissing but the risk is considered extremely low.

HIV has been found in saliva and tears, but in amounts so small that they may be incapable of causing an HIV infection. Infections caused by contact with saliva and tears have never been reported. HIV is also incapable of surviving outside of its human host so there is no risk of

environmental exposures. Transmission cannot occur through casual contact, closed mouth kissing of an infected person, or from an insect that has bitten an infected person.

Paramedics and other health care workers need to be aware that they can be exposed to HIV through needle stick injuries and other blood exposures. Efforts and precautions to prevent these potentially infectious exposures must be taken.

Incubation Period

The incubation period for HIV infection is usually one to three months, but it may take up to six months for HIV antibodies in an infected person's blood to reach detectable levels. The time to the development of AIDS in an HIV-infected person can range from less than one year to more than fifteen years. Approximately half of the HIV infected adults will develop AIDS within ten years of infection.

Period of Communicability

The period of communicability is unknown and is presumed to begin early after HIV infection and extend through life.

An HIV positive individual will be more infectious:

- During the initial period following infection.
- With advancing immune deficiency and increasing viral load.
- With an increase in clinical symptoms.
- When other sexually transmitted diseases are present.

Persons at Risk

Everyone is susceptible with no difference between age, gender, or race. Increased risk of infection is associated with specific high-risk behaviours.

These behaviours include:

- Unprotected sex with infected persons.
- Multiple sexual partners with unknown HIV status.
- Intravenous injection drug users.
- People with sexually transmitted infections, specifically those with sores and ulcerations.

Health care workers, including paramedics, have an increased risk due to the possibility of needle stick injuries and other exposures to blood and body fluid. The risk is low however, and national surveys of health care workers exposures shows infection rates of 0.3% after a percutaneous exposure to HIV positive blood and 0.09% after mucous membrane exposure to HIV positive blood.

Signs and Symptoms

When a person becomes infected with HIV they may not experience any symptoms at all. However in some individuals, symptoms of fever, headache, fatigue, and enlarged lymph nodes may appear and last for one to four weeks. As the HIV infection progresses, and before the development of AIDS, a person may have symptoms including:

- Enlarged lymph nodes
- Lack of energy
- Pelvic Inflammatory Disease, unresponsive to treatment
- Short term memory loss
- Flaky skin
- Fever and sweats
- Persistent skin rash
- Weight loss

When an HIV positive person develops AIDS they will experience symptoms that are specific to the opportunistic illness that they may be suffering from.

Symptoms may include:

- Cough and SOB.
- Seizure.
- Lack of co-ordination.
- Difficult or painful swallowing.
- Confusion.
- Severe, persistent diarrhea.
- Fever.
- Vision loss.
- Coma.
- Weight loss.
- Extreme fatigue.
- Severe headache.
- Forgetfulness.
- Nausea, vomiting, abdominal pain.

Treatment

There are four types of drugs that are used to treat HIV.

- Nucleoside analog reverse-transcriptase inhibitor.
Impede HIV's ability to copy a cell's DNA in order to copy itself. Some examples are Zidovudine and Didanosine.
- Non-nucleoside reverse-transcriptase inhibitor.
Prevent HIV from using a cell's DNA to replicate itself. Examples are Delavirdane and Nevirapine.
- Protease inhibitors.
Work by preventing infected cells from releasing HIV into the body. Examples are Saquinavir and Ritonavir.
- Fusion inhibitors.
Prevent the entry of HIV into the body's healthy cells.

These drugs are commonly taken in combination and referred to as the "cocktail". They have been shown to effectively slow down the effects of HIV on the immune system and delay the development of AIDS.

Additional treatments include medications to prevent and treat opportunistic infections that are common with HIV and AIDS. All treatment should take place in consultation with an infectious disease specialist.

Expected Outcome

There is no cure for HIV or AIDS. Advances in treating the diseases have slowed the development of AIDS in HIV positive patients, while increasing the duration and quality of life for those infected. Side effects from drug treatments are common.

How Can You Be Protected?

There is no vaccine available for HIV so it is necessary to avoid certain behaviour in order to minimize the risk of infection. High-risk activities such as unprotected sex, sex with multiple partners, the use of IV drugs, and sharing needles must be avoided.

Take actions and use equipment designed to prevent contact with blood and other body fluids. It is important to always use routine practices, including the use of gloves, gown, N95 respirators and eye protection when there is the potential of exposure to blood and body fluids. Wash skin with warm water and soap following contact with any blood or body fluids to remove gross soiling from the skin. Skin can then be thoroughly cleansed with alcohol-based waterless hand sanitizer. Cover all open sores or cuts, especially those on the hand or forearms; avoid unnecessary invasive procedures; and always use principles of sharps safety when handling and disposing of sharps.

Some methods to improve sharp safety include:

- Use of safety products such as the Protec IV catheter.
- Immediate disposal of all used sharps by the user.
- Never re-cap needles.
- Never pass used sharps to another person.
- Be aware when other health-care workers are using sharps and stay out of the way.
- Ensure sharps containers are exchanged for empty ones when 2/3 full.
- The use of safety-engineered single use disposable injection equipment.

Exposure Procedure

If you are exposed to HIV infected blood or body fluids there are procedures that can reduce the chance of becoming HIV positive.

Percutaneous Exposure

This occurs due to needle stick injuries, bites, and blood or body-fluid splash on non-intact skin. Immediately induce bleeding at the site (if possible) and wash the wound for 10 minutes with soap and water, or alcohol-based waterless hand sanitizer.

Cutaneous Exposure

If the skin is intact, wash the site with soap and water. Exposures to areas with broken skin are to be treated as a percutaneous exposure.

Mucous Membrane Exposure

Rinse the area thoroughly for 10 minutes with water or saline.

Regardless of the nature of the exposure, a paramedic should proceed to the triage area of the emergency department where the patient was transported in order to report and consult with a doctor. The Infection Control Practitioner and/or Duty Officer should be informed of the exposure immediately.

The attending physician will determine the risk of the exposure, the need for post-exposure prophylaxis (PEP), and testing of the subject patient. PEP is associated with an 81% reduction of HIV infection in health care workers. It should be started within two hours of exposure. In addition, it is recommended that HIV testing be conducted at the initial assessment as well as at six weeks, three months and six months after exposure. Avoiding activities that could potentially spread HIV, such as having unprotected sex, will also be suggested for the six months following exposure in order to prevent the potential spread of HIV.

In the event that a paramedic becomes HIV positive they should consult with their doctor in order to begin the appropriate treatment.

Sources

City of Toronto – Public Health

http://www.toronto.ca/health/aids_resources/index.htm

Public Health Agency of Canada

http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/97vol23/23s2/23s2j_e.html

Health Canada – It's Your Health – HIV/AIDS

http://www.hc-sc.gc.ca/iyh-vsv/diseases-maladies/hiv-vih_e.html

United States Centers for Disease Control and Prevention

<http://www.cdc.gov/hiv/>

AIDSinfo – US Department of Health and Human Services

http://aidsinfo.nih.gov/ContentFiles/HIVandItsTreatment_cbrochure_en.pdf

Pediculosis (Lice)

Pediculosis, or lice, is an infestation of parasitic insects in human hair. Pediculosis is very common, relatively easy to catch, and easy to treat.

There are three types of pediculosis

- Head lice - pediculosis humanus capitis.
- Body lice – pediculosis humanus corporis.
- Pubic lice - phthirus pubis.

Lice do not fly or jump but can crawl quickly.

Mode of Transmission

Head lice are mainly acquired by direct head to head contact with an infested person's hair, but may infrequently be transferred through shared combs, hats, or other head coverings. A head lice infestation is not caused by a lack of cleanliness, and head lice do not carry disease. Head lice from another person will not cause illness.

Body lice are acquired mainly through direct contact with an infested person or their clothing and bedding. They are most commonly found on individuals who infrequently change or wash their clothes.

Pubic or crab lice are most frequently found around the pubic region of the infected person, but may also be found elsewhere on the body such as in facial hair and eyelashes. Pubic lice are acquired through sexual contact with an infested person.

Life Cycle

The life cycle of head lice consists of three stages.

- Nits (eggs) are oval, usually white in colour, may be mistaken for dandruff, and are firmly attached to a hair shaft close to the scalp. It takes one week to hatch into nymphs.
- It takes nymphs only one week to mature a louse. During this time they live on the scalp and feed off human blood. Nymphs that fall off the infested person can only survive one day.
- An adult louse can live up to 30 days on a person's head while feeding on human blood. If a louse falls off a person, it may survive one to two days.

Persons at Risk

Adults and children are equally susceptible to head lice; the highest incidence is in children aged 3 to 10 and their families. Although short hair does not prevent lice infestations, longer hair is more likely to catch lice from another person due to the longer reach of the hair. Lice do not live on cats, dogs or other animals.

Homeless persons are at a higher risk for body lice as their lifestyles may not permit regular changing and washing of clothing and bedding. People living in shelters or sharing living spaces with many other people are also at higher risk.

Sexually active people are more likely to contract pubic lice. The higher the number of different partners a person has the higher the risk of catching lice.

Signs and Symptoms

- Tickling feeling of something moving in the hair.
- Itching, caused by an allergic reaction to the bites.
- Irritability, due to lack of sleep from persistent itching.
- Sores on the head or body caused by scratching (these can sometimes be infected).

Treatment

Talk to your doctor if you are pregnant, breast feeding, have a seizure disorder or if you have an infection on your scalp **before using an over-the-counter medication.**

There are products available at the pharmacy to treat lice. They include Lindane shampoo (Kwell), Pyrethrin with piperonyl butoxide (RID*) and Malathion (Prioderm lotion). These should be applied as directed. These products kill head lice and many eggs but a second treatment is needed 7-10 days later to ensure all lice have been destroyed.

Nits should be removed with a nit comb or fingernails especially around ears, forehead and nape of neck.

All close contacts should be checked for lice.

All clothing, hairbrushes, linen, head-rests, and other objects that may have come into contact with the lice must be cleaned. Any machine-washable items should be washed in hot, soapy water after each anti-lice treatment. Items may be placed in an air-tight bag for 10 days to kill lice; other items such as car head-rests should be vacuumed to remove loose lice and nits from the surface.

Prevention

Minimizing the sharing of hats, scarves, combs, and hair brushes with other people will reduce the likelihood of contracting lice.

When treating or transporting a patient suspected of having a lice infestation, paramedics should:

- Keep long hair tied back.
- Wear nitrile gloves and a gown.
- Change linen after transport; place used linen in a sealed bio-hazard bag for cleaning.
- Clean and disinfect surfaces that contacted the patient's head.

The risk of contacting lice is very small when proper PPE is worn.

Exposure Procedure

If you should exhibit any of the signs and symptoms of lice please fill out a communicable disease report and see your family doctor or pharmacist for immediate recommended treatment. Remember to check family members for signs of lice.

Sources

Toronto Public Health

http://www.toronto.ca/health/hl_index.htm

United States Centers for Disease Control and Prevention

http://www.cdc.gov/ncidod/dpd/parasites/lice/factsheet_public_lice.htm



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“ADVISORY”
2005-17 (CACC)
2005-13 (Operations)

August 3, 2005

TO: All Operations and Communications Staff
FROM: Community Medicine Program
SUBJECT: **HIGH-RISK AND LESSER RISK EXPOSURES TO INFECTIOUS DISEASES**

While exposure to infectious diseases is always a concern, only certain exposures constitute an emergency that requires immediate assessment by an emergency physician.

High-risk exposures include:

- A stab, scrape, cut or abrasion by a sharp or other item contaminated with a patient's blood or body fluid **not** including sweat, vomit, stool or urine.
- A bite wound that breaks the skin.
- Blood or body fluid **not** including sweat, vomit, stool or urine splashed onto a mucous membrane, such as the eye or mouth.
- Blood or body fluid **not** including sweat, vomit, stool or urine in contact with non-intact skin.
- A copious amount of blood or body fluid **not** including sweat, vomit, stool or urine contacting intact skin.
- Exposure to respiratory secretions from a patient with meningitis.
- A bite lick, or scratch from a potentially rabid animal.
- Exposure to a viral haemorrhagic fever.

Exposures **not including the above** are not considered high-risk and therefore do not require immediate assessment by an emergency physician. All other exposures should be evaluated for follow-up by your family physician. Non-emergency exposures include:

- Exposure to an unmasked patient who is suspected of having active Tuberculosis disease in the larynx or lungs.
- Exposure to the respiratory secretions or purulent wound drainage of a patient with MRSA
- Exposure to the stool or vaginal secretions of a patient with VRE
- Exposure to the stool of a patient with *C. difficile*.
- Exposure to a patient with lice, scabies or other parasites.

*** Exposure to a patient with a Febrile Respiratory Illness (FRI) may or may not constitute an emergency exposure and needs to be evaluated on a case-by-case basis.**

All exposures, regardless of their severity, require the completion of a Supervisors' Report of Injury/Illness and a Communicable Disease Exposure Assessment Form.

Please remember that **the best way to prevent exposure to infectious diseases is to wear appropriate PPE; and remove your gloves and wash your hands after every patient contact.**

For more information, please contact the Community Medicine Program at: 416-338-2151.

References

Association for Professionals in Infection Control and Epidemiology. (2002). *APIC Text of Infection Control and Epidemiology*. Washington: Author.

BC Health Files. (2002). *Necrotizing Fasciitis (Also known as Flesh-Eating Disease)*.
<http://www.bchealthguide.org/healthfiles/hfile60.stm>

Centers for Disease Control and Prevention. (2000). *Laundry: Washing Infected Material*. Retrieved March 22, 2006, from http://www.cdc.gov/ncidod/dhqp/bp_laundry.html

Chin, J. (Ed). (2000). *Control of communicable disease*. Washington: American Public Health Association.

[Durham Region Department of Health.](#)

Fowler, R. A., Guest, C. B., Lapinsky, S. E., et al. (2004). *Transmission of severe acute respiratory syndrome during intubation and mechanical ventilation*. [Electronic Version]. American Journal Respiratory Critical Care Medicine, 163, 1198-1202.

Grahs, P. (2001). *Disinfection of Bloodborne Pathogens*. Infection Control Today. Retrieved March 22, 2006, from <http://www.infectioncontrolday.com/articles/111clean.html>

Health Canada. (1995). A national consensus on guidelines for the establishment of a post-exposure notification protocol for emergency responders. (Volume 21-19) [Electronic version]. Ottawa: Author.

Health Canada. (1997). *Preventing infection associated with indwelling intravascular access devices* (volume 23S8) [Electronic version]. Ottawa: Author.

Health Canada. (1998). Handwashing, cleaning, disinfection and sterilization in health care. (Volume 24S8) [Electronic version]. Ottawa: Author.

Health Canada. (1999). *Routine practice and additional precautions for preventing the transmission of infection in health care* (25S4) [Electronic Version]. Ottawa: Author.

Mangram, A., Horna, T.C., Pearson, M.L., et al. (1999). *Infection control and epidemiology: Guideline for prevention of surgical site infection*. 20(4). 247 - 278. Atlanta: Centers for Disease Control and Prevention.

Nixon, R.G. (2000). *Communicable disease and infection control for EMS*. New Jersey: Brady/Prentice Hall.

O'Grady, N.P., Alexander, M., Dellinger, J.L., et al. (2002). *Guidelines for the prevention of intravascular catheter related infections*. Morbidity and Mortality Weekly Report, 51(RR10) 1 - 26. Atlanta: Centers for Disease Control and Prevention.

Ontario Ministry of Health and Long-Term Care. (1994). *Preventing and assessing occupational exposures to selected communicable diseases*. Toronto: Author.

Ontario Ministry of Health and Long-Term Care. (2003). *Directive to all Ontario acute care facilities for high-risk respiratory procedures*. Toronto: Author.

Ontario Ministry of Health and Long-Term Care. (2004). *Standard for all Ontario health care facilities/settings for high-risk respiratory procedures under non-outbreak conditions*. Toronto: Author.

Ontario Ministry of Health and Long Term Care: Emergency Health Services Branch. (2002). *Ambulance service and patient care standards*. Toronto: Author.

Population and Public Health Branch, Centre for Infectious Disease Prevention and Control. (2002). *Canadian Immunization Guide* (6th ed.), P. 105-115. Ottawa: Health Canada.

Public Health Agency of Canada. (2002). *Vaccine Preventable Diseases: Pneumococcal*. Retrieved May 24, 2006, from: http://www.phac-aspc.gc.ca/im/vpd-mev/pneumococcal_e.html.

Regional Municipality of Halton. *Communicable Disease Infection Control, **Extended Spectrum Beta Lactamase (ESBL)** For use by Health Care Professionals.*
<http://www.halton.ca/health/programs/infectionctrl/ESBL.htm>

Somogyi, R. (2004). *Dispersal of respiratory droplets with open vs. closed oxygen delivery masks: Implications for the transmission of severe acute respiratory syndrome.* [Electronic Version]. CHEST – The Cardiopulmonary and Critical Care Journal, 125, 1155-1157.
Northbrook: American College of Chest Physicians.

Tablan, O.C., Anderson, L.J., Besser, R., et al. (2004). *Guidelines for preventing health care associated pneumonia.* Morbidity and Mortality Weekly Report, 53(RR03) 1 - 36. Atlanta: Centers for Disease Control and Prevention.

Toronto Emergency Medical Services, Professional Standards Unit. (2001). *Standard Operating Procedures.* Toronto: Author.

United States Centers for Disease Control and Prevention. (1997). *Guidelines for the prevention of nosocomial pneumonia.* [Electronic version]. Morbidity and Mortality Weekly Report, 46(RR-1) 1 - 79. Atlanta: Author.

United States Centers for Disease Control and Prevention. (2003). *Guidelines for environmental infection control in health care facilities.* [Electronic version]. Morbidity and Mortality Weekly Report, 52(RR10) 1 - 31. Atlanta: Author.

Van Hooser, T., Truscott, W. (2005) *Preventing ventilator associated pneumonia.* [Electronic Version]. Washington: Association for Professionals in Infection Control and Epidemiology.

Appendix 'A' - Risk Assessment Process – Blood Exposure Guidelines
Risk Assessment and Treatment – HIV

SOURCE EXPOSURE	KNOWN HIV NEGATIVE Recent negative test, No known risk factors, no recent illness associated with Acute Retroviral Syndrome	HIV POSITIVE LOW VIRAL LOAD Usually Asymptomatic and high CD4 count	HIV POSITIVE HIGH VIRAL LOAD Advanced HIV, Primary HIV Disease	HIV STATUS UNKNOWN
Prolonged, high volume contact with INTACT SKIN	NO PROPHYLAXIS RECOMMENDED	CONSIDER TRIPLE ANTIRETROVIRAL PROPHYLAXIS	CONSIDER TRIPLE ANTIRETROVIRAL PROPHYLAXIS	NO PROPHYLAXIS RECOMMENDED
Short duration, low volume contact with NON-INTACT SKIN OR MUCOUS MEMBRANES	NO PROPHYLAXIS RECOMMENDED	CONSIDER TRIPLE ANTIRETROVIRAL PROPHYLAXIS	CONSIDER TRIPLE ANTIRETROVIRAL PROPHYLAXIS	NO PROPHYLAXIS RECOMMENDED
Long duration, Large volume contact with NON-INTACT SKIN OR MUCOUS MEMBRANES	NO PROPHYLAXIS RECOMMENDED	CONSIDER TRIPLE ANTIRETROVIRAL PROPHYLAXIS	START TRIPLE ANTIVIRAL PROPHYLAXIS IMMEDIATELY	CONSIDER TRIPLE ANTIRETROVIRAL PROPHYLAXIS (Modify based on results of soured HIV testing)
PERCUTANEOUS EXPOSURE with a solid needle or superficial scratch with a hollow-bore needle	NO PROPHYLAXIS RECOMMENDED	START TRIPLE ANTIVIRAL PROPHYLAXIS IMMEDIATELY	START TRIPLE ANTIVIRAL PROPHYLAXIS IMMEDIATELY	CONSIDER TRIPLE ANTIRETROVIRAL PROPHYLAXIS (Modify based on results of soured HIV testing)

Risk Assessment and Treatment – Hepatitis B

EMPLOYEE VACCINATION STATUS	KNOWN HB POSITIVE OR HIGH RISK SOURCE	SOURCE UNKNOWN
Never Vaccinated	Administer HBIG immediately Start accelerated course of vaccine at 0, 1, 2 and 6 to 12 months. Draw blood for LFTs and HB-sAg at 0, 4 and 8 weeks after exposure	HBIG rarely if ever required. Start accelerated course of vaccine at 0, 1, 2 and 6 to 12 months.
Incomplete Vaccination Series	HBIG usually not required Test for Anti-HBs. Administer one dose of vaccine. Draw blood for LFTs and HB-sAg at 0, 4, and 12 weeks after exposure. Complete vaccination series	HBIG rarely if ever required. Complete vaccination Series
Known non-responder (2 complete vaccination series with inadequate titres [< 10 IU])	Administer HBIG immediately Draw blood for LFTs and HB-sAg at 0, 4 and 8 weeks after exposure	HBIG rarely if ever required. Draw blood for LFTs and HB-sAg at 0, 4, and 12 weeks after exposure.
Completed Vaccination series Titres inadequate (< 10 IU) or unknown	HBIG usually not required Test for Anti-HBs. Administer one dose of vaccine. Draw blood for LFTs and HB-sAg at 0, 4, and 12 weeks after exposure. Restart vaccination series	HBIG rarely if ever required. Draw blood for LFTs and HB-sAg at 0, 4, and 12 weeks after exposure. Restart vaccination series

Hepatitis B immune globulin (HBIG) is a sterile solution of ready-made antibodies against hepatitis B virus

HEPATITIS C PROTOCOL

Collect blood specimens as directed by the institution's Needle Stick Injury Protocol

above decision process adopted from the UHN Needlestick protocol