Infection Prevention and Control for Emergency Response Personnel

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The Department of Epidemiology would like to acknowledge the following for their slide contributions to our program:

CDC

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Topics

• Infection Transmission and Prevention Strategies
• Ryan White Act
• Bloodborne Pathogens
• Communicable Diseases and Post-Exposure Management
• Bioterrorism
• Influenza and Pandemics
• Emerging Respiratory Pathogens
Chain of Infection

- pathogen
- portal of exit
- portal of entry
- reservoir
- transmission
- host
Routes of Transmission

- Contact: Direct and Indirect
- Airborne
- Droplet
- Vehicle
- Vectorborne
**STANDARD PRECAUTIONS FOR INFECTION CONTROL**

**Wash Hands** (Frequent)
- Wash after contact with blood, body fluids, secretions, excretions, and contaminated items.
- Wash immediately after gloves are removed and between patient contacts.
- Avoid transfer of microorganisms to other patients or environments.

**Wear Gloves**
- Wear when touching blood, body fluids, secretions, excretions, and contaminated items.
- Put on clean gloves prior to touching mucous membranes and nonintact skin.
- Change gloves between tasks and procedures on the same patient after contact with material that is in high concentrations of microorganisms.
- Remove gloves promptly after use, before touching nonsterile items and environmental surfaces, and before going to another patient, and wash hands immediately after transfer of microorganisms to other patients or environments.

**Wear Mask and Eyewear Protection or Face Shield**
- Protect mucous membranes of the eyes, nose, and mouth during procedures and patient care activities that are likely to generate splashes or sprays of blood, body fluids, secretions, or excretions.

**Wear Gown**
- Protect skin and prevent soiling of clothing during procedures that are likely to generate splashes or sprays of blood, body fluids, secretions, or excretions.
- Remove a soiled gown as promptly as possible and wash hands after transfer of microorganisms to other patients or environments.

**Patient-Care Equipment**
- Handle used patient-care equipment soiled with blood, body fluids, secretions, or excretions in a manner that prevents exposures and contamination of clothing and avoids transfer of microorganisms to other patients and environments.
- Ensure that reusable equipment is not used for the care of another patient until it has been appropriately cleaned and reprocessed and single-use items are properly discarded.

**Environmental Control**
- Follow hospital procedures for routine care, cleaning, and disinfection of environmental surfaces, beds, bedrails, bedside equipment, and other frequently touched surfaces.

**Linen**
- Handle, transport, and process used linen soiled with blood, body fluids, secretions, or excretions in a manner that prevents exposure and contamination of clothing and avoids transfer of microorganisms to other patients and environments.

**Occupational Health and Bloodborne Pathogens**
- Prevent injuries when using needles, syringes, and other sharp instruments or devices when handling sharp instruments after procedures when cleaning, and when disposing of used needles.
- Never recap used needles by hand.
- Dispose of used needles in puncture-resistant sharps containers.
- Use appropriate hygiene or environmental control practices to reduce the risk of acquiring or transmitting bloodborne pathogens.

**Patient Placement**
- Use a private room for a patient who contaminates the environment or who does not or cannot be expected to maintain appropriate hygiene or environmental control.
- Consult Infection Control if a private room is not available.

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*The information on this page is adapted from: Issued by the CDC, Infection Control; For more information, contact your facility’s Infection Control Program.*
Standard Precautions

• Primary strategy for successful nosocomial infection control

• Applies to:
  – blood
  – all bodily fluids, secretions, excretions (except sweat), regardless of whether they contain blood
  – non-intact skin
  – mucous membranes
Standard Precautions

Key Points:

– Must anticipate contact with bodily fluids

– Select personal protective equipment (PPE) to prevent skin contact, or soiling of uniform, with bodily fluids
Standard Precautions (PPE)

- Gloves for all anticipated contact with blood, secretions, excretions, non-intact skin, and mucous membranes
- Gowns if soiling of clothing is anticipated
- Face shield to protect mucous membranes from splashing or spraying
Standard Respiratory Precautions/Etiquette

- Masks for evaluation of patients with respiratory symptoms
- Mask patient or provide tissues and instruction for disposal
- Hand hygiene
- Masks for EMS if patient unable to wear mask
Contact Precautions

- Prevents transmission of all infections spread by contact routes
- Gloves
- Gowns
- Equipment
Droplet Precautions

• Prevents infections spread by large respiratory droplets
• Surgical masks if within 3 feet of patient
Airborne Precautions

- Prevents spread of infections transmitted via airborne droplet nuclei
- N-95 respirator
Masks
Ryan White Act

- Enacted April 1994
- Disclosure only to designated officers
- Diseases:
  - Infectious pulmonary TB
  - Diphtheria
  - Meningococcal disease
  - Plague
  - Hepatitis B
  - Hemorrhagic fevers
  - HIV
  - Rabies
New York State Public Health Law
Reportable Diseases

- Anthrax
- Botulism
- *Diphtheria*
- Encephalitis
- Measles
- *Meningitis*
- *Meningococcemia*
- *Viral hemorrhagic fever*
- Hepatitis C
- Mumps
- Pertussis
- *Plague*
- Rabies
- Rubella
- *Tuberculosis*
- Smallpox
- *Hepatitis B*
- SARS
• Request to designated officer (DO) to make exposure determination
• DO collects facts to determine if exposure meets established criteria
• DO prepares written request to facility:
  – No patient identifying information
  – Exposure information needs to be specific
Ryan White Requests
Medical Facility’s Responsibilities

- Exposure determination and ensure enough information is available
- Medical record review
- Written response within 48 hours
  - Does not meet exposure criteria
  - Meets exposure criteria and presence or absence of disease
  - Insufficient information
- Late diagnosis upon discharge or up to 60 days from date of transport
Ryan White Requests
Insufficient Information

- Designated officer can request assistance from a public health official
  - Evaluate the designated officer’s request
  - Medical facility’s response
- Public Health official must respond within 48 hours of the request
  - Designated officer if insufficient information (can resubmit if more information is obtained)
  - Medical facility if information is sufficient
Source Testing

• There is no provision in the Ryan White Law that requires source testing for HIV.
Bloodborne Pathogens

• Hepatitis B, HIV and Hepatitis C are the most significant for health care exposures

• Malaria, syphilis, babesiosis, brucellosis, leptospirosis, arboviruses, relapsing fever, Creutzfeld-Jakob disease, adult T-cell leukemia/lymphoma or myelopathy (caused by HTLV-I), HTLV-II related diseases, and viral hemorrhagic fever.
Exposure Incident Definition

- Exposure with blood or other potentially infectious materials with:
  - * mucous membrane or non-intact skin (mucocutaneous)
  - * Bites
  - * Percutaneous injury with a contaminated sharp
If You Have a Blood or Body Fluid Exposure

- Wash the area with soap and water or flush mucous membranes
- Notify designated officer (infection control officer)
- Complete a report
- Report for post-exposure evaluation as soon as possible
Hepatitis B

- Affects the liver
- Symptoms include anorexia, malaise, abd. pain, jaundice, elevation of liver enzymes
- Disease presentation varies
- 10% of cases become chronic carriers
- Can lead to cirrhosis or liver cancer
- Transmitted by contact with blood or other potentially infectious materials.
Hepatitis B Vaccine

- 1-2 months following completion of 3 dose vaccine series HBsAb titer should be obtained from healthcare worker
- Non responders should complete second series* or be evaluated to determine if they are HBsAg-positive
- Minimal side effects

*30% - 50% chance of responding to the second series
Hepatitis C

- Affects the liver
- Symptoms include anorexia, malaise, abd. pain, jaundice, elevation of liver enzymes
- 75% of cases are asymptomatic
- 85% are chronically infected
- Can lead to cirrhosis or liver cancer
- Transmitted by contact with blood or other potentially infectious materials.
Hepatitis C

- Transmitted by contact with blood or other potentially infectious materials.
- Approximately 4 million in US are infected.
- There is no vaccine or effective post-exposure prophylaxis.
Hepatitis C

• Transmission has been reported from mucous membrane contact with blood
• No transmissions have been documented from nonintact skin exposure to blood
• Approximately 4 million in US are infected
HIV
Human Immunodeficiency Virus

- Attacks the Immune system
- Symptoms of early infection are often “flu-like”
- New MDR, more virulent strain
- Transmitted by contact with blood or other potentially infectious materials
Occupationally Acquired HIV Cases

- 57 confirmed
- 137 possible
<table>
<thead>
<tr>
<th><strong>Hepatitis B</strong></th>
<th><strong>Hepatitis C</strong></th>
<th><strong>HIV</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Pre-exposure vaccine available.</td>
<td>• Pre-exposure vaccine not available.</td>
<td>• Pre-exposure vaccine not available.</td>
</tr>
<tr>
<td>• Post-exposure Immune Globulin available for unprotected HCWs.</td>
<td>• No effective post-exposure prophylaxis.</td>
<td>• Post-exposure prophylaxis with anti-retroviral therapy.</td>
</tr>
<tr>
<td>• Risk after percutaneous exposure is 31%.</td>
<td>• Risk after percutaneous exposure is 1.8%.</td>
<td>• Risk after percutaneous exposure is 0.3%.</td>
</tr>
</tbody>
</table>
BESSIE -- I CAN'T BELIEVE YOU ACTUALLY DID IT!!

Hey! I Gotta be ME!
Prevention of Bloodborne Diseases in Health Care Workers through Engineering and Work Practice Controls

Avoiding occupational blood exposures is the primary way to prevent transmission of Hepatitis B, Hepatitis C and HIV in health care settings.

Needlestick Injuries

- CDC estimates 600,000 percutaneous injuries per year
- 62 - 88% could be eliminated by using safer medical devices

Needlestick Safety and Prevention Act, 11/00
Work Practice Controls

Work practice controls must be implemented to eliminate or reduce the likelihood of exposure to potentially infectious material.
Active Device: Retractable Safety IV Stylet
Active Device: Safety -Lok Butterfly
Diseases that Require Post-Exposure Management

• Airborne or droplet transmission
  - TB
  - Pertussis
  - Rubella
  - Varicella
  - Rubeola
  - Mumps
  - Invasive meningococcal disease

• Contact transmission (all employees)
  - Scabies

• Bloodborne: Hepatitis B and C, HIV
Exposure Investigations
Tuberculosis

- Exposure criteria based on clinical presentation
- No exposure follow up for persons with latent TB
- Baseline PPD
- 12 week PPD
- Induration of $\geq 5$ mm is conversion for known exposures
- INH for 9 months post-exposure for converters (reduces risk of disease from 10% to 1%)
Pertussis

- Causative agent: *Bordetella pertussis*
- URI, paroxysms of cough, “whoop”, post-tussive vomiting, apnea in children < 6 months
- Persistent cough in adults
- Transmits via contact with respiratory secretions and droplet (mask patient for transport)
Exposure Investigations
Pertussis

• Exposure defined as contact with respiratory secretions when barriers were not used or face-to-face exposure during a coughing attack without the use of a mask

• Asymptomatic exposed health care workers: no work restrictions but prophylaxis required

• Symptomatic exposed health care workers: Exclude from work until 5 days of effective treatment
Types of Meningitis

- Viral
- Fungal
- Bacterial:
  - Meningococcal
  - Streptococcus Pneumoniae
  - Invasive *Haemophilus influenzae*
  - Gram positive and gram negative organisms

*Only meningococcal meningitis requires post-exposure management*
Invasive Meningococcal Disease

- Causative agent: *Neisseria meningitidis*
- Meningitis, meningococcemia, primary pneumonia
- Can be recovered from the respiratory tract of asymptomatic carriers
- Droplet transmission (mask patient for transport)
- Abrupt onset, high fever, meningitic symptoms, petechial rash
- Gram negative diplococci on gram stain
Exposure Investigations
Invasive Meningococcal Disease

• Exposure defined as contact with respiratory secretions when barriers were not used
  – Mouth-to-mouth resuscitation
  – Intubation or extubation
  – Suctioning
• Rifampin, Ciprofloxacin or Gatifloxacin within 24 hours of exposure
Scabies

- Causative agent: *Sarcoptes scabiei*
- Cutaneous infestation with pruritic rash
  - Rash commonly found between fingers and in “warm areas” of body
  - Itching intensifies at night
  - Rash progresses without treatment
- Use gloves and gown if necessary to avoid contact with rashes
• Occupational exposure defined as skin-to-skin contact with an infested patient
• Occupational exposures: CDC vs. NYSDOH
• Asymptomatic health care workers: no work restrictions but prophylaxis required
• Symptomatic health care workers: Work restrictions until 24 hours after treatment (Norwegian)
Bioterrorism

• Be aware of your County Health Department’s Bioterrorism Plan - and know the expectations
• Protect yourself and those in the community from exposures utilizing sound infection control principles and knowledge of disease transmission
• Utilize your resources - County and State DOH, CDC
• DON”T PANIC!
Bioterrorism
Who are 1st Responders?

• Primary Care Personnel
• Hospital ER Staff
• EMS Personnel
• Public Health Professionals
• Other Emergency Preparedness Personnel
• Laboratory Personnel
• Law Enforcement
Categories of Bioterrorism Agents/Diseases

Category A

- High-priority agents that pose a risk to national security
- Easily disseminated or transmitted person-to-person
- High mortality, potential for major public health impact, panic and social disruption
- Requires special action for preparedness
Category A

- Anthrax
- Botulism
- Plague
- Smallpox
- Tularemia
- Viral Hemorrhagic Fevers
Anthrax

- Caused by the spore-forming bacterium, *Bacillus anthracis*
- Zoonotic disease in herbivores (e.g., sheep, goats, cattle) follows ingestion of spores in soil
- Human infection typically acquired through contact with anthrax-infected animals, animal products or atypically through intentional exposure
- Anthrax is NOT contagious. Person to person transmission has never been reported.
Anthrax Routes of Infection

• Skin
  – Cuts
  – Abrasions
  – Mucosal membranes

• Respiratory
  – Inhalation of spores, droplets & aerosols
  – Aerosols most effective delivery method
Anthrax Routes of Infection

- Gastrointestinal
  - Food
    - Potentially significant route of delivery
    - Secondary to either purposeful or accidental exposure to aerosol
  - Water
    - Capacity to affect large numbers of people
    - Dilution factor
    - Water treatment may be effective in removal of agents
Anthrax Cutaneous

- Begins as a papule, progresses through a vesicular stage to a depressed black necrotic ulcer (eschar)
- Edema, redness, and/or necrosis without ulceration may occur
- Form most commonly encountered in naturally occurring cases
- Case-fatality:
  - Without antibiotic treatment—20%
  - With antibiotic treatment—1%
Anthrax: Cutaneous

Vesicle development
Day 2

Day 4

Eschar formation

Day 6

Day 10
Anthrax: Cutaneous

Left, **Forearm lesion on day 7**—vesiculation and ulceration of initial macular or papular anthrax skin lesion. Right, **Eschar of the neck on day 15** of illness, typical of the last stage of the lesion. From Binford CH, Connor DH, eds. *Pathology of Tropical and Extraordinary Diseases*. Vol 1. Washington, DC: AFIP; 1976:119. AFIP negative 71-1290–2.
Anthrax: Cutaneous

NEJM 1999; 341: 815–826
Anthrax: Cutaneous

Healing after treatment
Anthrax: Cutaneous

Ulcer and vesicle ring

Black eschar. Redness remains
Anthrax: Cutaneous

Notice the edema and typical lesions.
Anthrax Inhalation

- A brief prodrome resembling a “viral-like” illness, characterized by myalgia, fatigue, fever, with or without respiratory symptoms, followed by hypoxia and dyspnea, often with radiographic evidence of mediastinal widening.
- Meningitis in 50% of patients
- Rhinorrhea (rare)
Anthrax Inhalation

- Extremely rare in United States (20 reported cases in last century)
- Incubation period: 1–7 days (possibly ranging up to 42 days)
- Case fatality:
  - Without antibiotic treatment—97%
  - With antibiotic treatment—75%
Anthrax Gastrointestinal

- Abdominal distress, usually accompanied by bloody vomiting or diarrhea, followed by fever and signs of septicemia
- Gastrointestinal illness sometimes seen as oropharyngeal ulcerations with cervical adenopathy and fever
- Develops after ingestion of contaminated, poorly cooked meat.
- Incubation period: 1–7 days
- Case-fatality: 25–60%
Small Pox

- Causative agent: Variola virus
- Fever, vomiting and headache followed 2-3 days later by lesions
- Incubation period: average 12 days (range 7-17)
- 30% fatality rate
- Transmits by droplet and airborne (less commonly) routes and contact with lesions - use Airborne/Contact Precautions
Smallpox
Smallpox
Smallpox

Day 3
Day 5
Day 7
Smallpox
Smallpox
Categories of Bioterrorism Agents/Diseases
Category B

- High-priority agents that pose a threat to national security.
- Moderately to easily disseminated.
- Moderate morbidity and low mortality.
- Requires enhancements of diagnostic capacity and surveillance.
Category B

- Q fever
- Ricin Toxin
- Food Safety Threats (Salmonella, Shigella, E. Coli 0157)
- Viral Encephalitis
- Water Safety Threats (Vibrio Cholera, Cryptosporidium)
- Typhus fever
Categories of Bioterrorism Agents/Diseases
Category C

Includes Emerging Pathogens that could be engineered for mass dissemination because of:

– availability
– ease of production and dissemination
– potential for high morbidity and mortality rates
– major health impact
Category C

Emerging Infectious Diseases such as:
  Nipah virus
  Hantavirus
SARS

- Outbreak from 11/02 - 7/03 with > 8,000 cases in 29 countries.
- 27 in the US.
- 774 SARS-related deaths (Case-fatality rate of 9.6%).
- Small clustering of cases in China in April 2004 (9 cases).
- All were laboratory workers.
- All cases were Epi linked.
SARS

• Transmitted through close contact with infected persons.
• Most likely spread by droplet transmission however airborne and spread from inanimate objects can’t be ruled out.
• Procedures that produce aerosols appear to have an impact on transmissibility (nebulized treatment, deep suctioning, intubation/extubation).
• The infected EMS providers from Canada either did not use PPE or used it too late.
## Summary of Cases

<table>
<thead>
<tr>
<th>Areas</th>
<th>Total</th>
<th>Number of HCWs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada</td>
<td>251</td>
<td>109</td>
</tr>
<tr>
<td>China</td>
<td>5327</td>
<td>1002</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>1755</td>
<td>386</td>
</tr>
<tr>
<td>Taiwan</td>
<td>346</td>
<td>68</td>
</tr>
<tr>
<td>Singapore</td>
<td>238</td>
<td>97</td>
</tr>
<tr>
<td>Viet Nam</td>
<td>63</td>
<td>36</td>
</tr>
</tbody>
</table>
Infection Control Measures Based on the Level of Known SARS Activity

Practice *Body Substance Isolation* or Standard Precautions for *all* patients *every* time.

1. No SARS identified worldwide

2. SARS re-emerges without local transmission

3. SARS re-emerges with local transmission
No SARS Identified

Utilize *Standard Respiratory Precautions* for all patients with respiratory symptoms.

* Provide surgical mask to all patients with respiratory symptoms.

* Wear a surgical mask within 3 feet of patient.

* During transport, the door/window between the driver and pt should be closed, if no barrier, then driver should wear surgical mask.
No SARS Identified

* Use a waterless hand sanitizer *immediately* after removing gloves.

* Assure adequate cleaning of equipment and vehicle between transports.

* Only perform procedures that may re-aerosolize infectious material if medically necessary.

* Use HEPA filters on suction equipment and mechanical ventilators.
SARS Re-emerges Without Local Transmission

• Assign a point person to regularly assess the CDC website for updated information.

• Screen ALL patients for:
  * Fever
  * Respiratory symptoms
  * SARS risk factors
SARS Risk Factors

* Travel or close contact with persons who recently returned within 10 days from an area with documented or suspect transmission of SARS.
* Employment as a Healthcare Worker
* Close contact within 10 days with a person with confirmed or probable SARS.
And Established Case Definition

- Temperature > 100.4 and one or more clinical finding:
  - *Cough
  - *SOB
  - *Dyspnea
  - *Hypoxia

* Utilize Airborne, Contact and Standard Precautions including an N95 respirator, gloves, gown and approved eye protection.
Continued Recommendations

* During transport, the door/window between the driver and pt should be closed, if not, then driver should wear an N95 respirator, do not re-circulate the air, and consider opening a window.

* Using a land or cell phone, notify both the destination hospital and the LHD prior to arrival of the suspected case of SARS.

* PPE and disposable equipment is disposed as regulated medical waste.
SARS Re-emerges *With* Local Transmission

- Follow all of the previous recommendations for specific infection control guidance.
- Actively screen *all* patients for fever or respiratory symptoms.
- Utilize Airborne, Contact, and Standard Precautions for *all patients* presenting with respiratory symptoms regardless of risk.
- Notify the receiving hospital of the need for an Airborne Isolation room.
Avian Influenza A (H5N1)

- Outbreaks of highly pathogenic influenza occurred among poultry in 8 countries in Asia (Cambodia, Thailand, Vietnam, China, Indonesia, Japan, Lao, and South Korea) during late 2003 and early 2004.
- More than 100 million birds either died from the disease or were killed.
- There were 12 confirmed human cases in Thailand and 23 in Vietnam, resulting in 23 deaths.
- There was no sustained human-to-human transmission.
Avian Influenza A (H5N1)

- Beginning in late 2004 a new lethal outbreak of H5N1 was reported in Thailand, Cambodia, Vietnam, China, Indonesia, Malaysia.
- As of 2/05, there have been 55 human cases resulting in 42 deaths.
- Of particular concern, is probable human-to-human transmission in Thailand but no evidence of sustained transmission.
Avian Influenza A (H5N1)

• If these H5N1 viruses gain the ability to efficiently transmit between humans, an influenza pandemic could occur with high rates of illness and death.
• Samples from human cases in Vietnam and Thailand show resistance to 2 of the 4 commonly used antiviral medications.
Avian Influenza A (H5N1) Symptoms

- Range from typical influenza-like symptoms (fever, cough, sore throat, and muscle aches)
- Eye infections
- Pneumonia, acute respiratory distress, viral pneumonia
- Other severe and life threatening complications
Websites

- www.health.state.ny/nysdoh/ems/policy/policy.htm
- www.cdc.gov/ncidod/hip/ISOLAT/Isolat.htm
- www.health.state.ny.us
- www.cdc.gov
- www.cdc.gov/ncidod/sars
- www.cdc.gov/flu/avian/index.htm