

Infection Control Update

**Satellite Conference and Live Webcast
Thursday November 29, 2007
9:00 - 11:00 A.M. (Central Time)**

Produced by the Alabama Department of Public Health
Video Communications and Distance Learning Division

Faculty

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Objectives

Discuss

- The major infectious disease threats occurring today and how they impact infection control
- The role of the 4 major organizations and their influence on the practice of infection control
- The basic infection control measures needed to be taken by all healthcare providers

Mode of Transmission of Bloodborne Pathogens

- Occurs when blood or body fluids from an infected person enter the body of a person who is not infected by:
 - Unprotected sex with an infected person

Mode of Transmission of Bloodborne Pathogens

- Sharing needles when doing drugs
- Needle sticks or sharps exposures
- Infected mother to her baby during birth

Human Immunodeficiency Virus

- Human immunodeficiency virus (HIV)
 - Retrovirus that attacks the immune system resulting in impairment of the t-cell mediated immunity

Human Immunodeficiency Virus

- Loss of function of the t-cells results in the shut down of the immune system and patient having opportunistic infections
- This leads to the acquired immune deficiency syndrome (AIDS)

HIV

- June 5, 1981 CDC published the first report of *Pneumocystis carinii* pneumonia in five previously healthy young men in Los Angeles, California - First reported cases of AIDS
- In 2006, more than 1 million persons are living with HIV/AIDS in the US, and an estimated 40,000 new cases will occur this year

HIV/AIDS

- Infections diagnosed 2001-2004
 - 71% male, 29% female
 - 50% in 30-44 age category
 - 51% black, non-hispanic
 - 29% white, non-hispanic

HIV/AIDS

- Distribution of infection by risk category
 - Male-to-male sexual contact - 44%
 - IV drug use - 17%
 - Male-to-male sexual contact/IDU - 4%
 - Heterosexual contact - 34%

Hepatitis B

- Number of new infections per year has declined from an average of 260,000 in the 1980s to 60,000 in 2004
- Estimated 1.25 million chronically infected Americans, of whom 20-30% acquired the infection in childhood

Hepatitis B

- Chronic infection occurs in
 - 90% of infants infected at birth
 - 30 % of children infected at age 1-5 years
 - 06% of persons infected after 5 years
- Death from chronic liver disease occurs in 15-25% of chronically infected persons

Hepatitis C

- Estimated almost 4 million Americans are infected
- Termed the “silent epidemic” as most people don’t have symptoms when first infected
- Chronic infection: 55%-85% of infected persons

Hepatitis C

- 70% of chronic infected persons have chronic liver disease
- Deaths from chronic liver disease 1-5% of infected persons may die
- Leading indication for liver transplantation

Resistant Organisms

- MRSA (Community & Healthcare associated)
- Vancomycin Resistant Enterococcus
- Clostridium difficile
- Extended Spectrum Beta Lactamase (ESBL) Producing Gram Negative Bacteria

Staphylococcus Aureus

- Staphylococcus aureus as a community pathogen is best known for its ability to produce furuncles and infect soft tissues.
 - There are several biblical descriptions of staphylococcal infection

Staphylococcus Aureus

- Of the ten plagues brought on the Egyptian Pharaoh, the sixth cast boils or sores upon man and beast (Exodus 9:8-12)
- Job is stricken by Satan with boils that made his body black (Job 2:7)

Clinical Manifestations

- Furuncle (boil)
 - a painful superficial skin infection that develops in a hair follicle or gland. These lesions found commonly on the neck or buttock and are the most common infection caused by Staph. aureus

Clinical Manifestations

- **Carbuncle**
 - spread of infection from furuncle to the deeper subcutaneous tissues resulting in abscess formation

Clinical Manifestations

- **Impetigo**
 - highly contagious superficial skin infection characterized by large blisters and large numbers of organisms. Seen most often in infants and children under conditions where direct spread can occur (e.g. sharing contaminated towels)

Clinical Manifestations

- **Secondary Cutaneous Infections**
 - occurs in people with eczema
- **Scalded Skin Syndrome**
 - shedding of epithelial layer of skin caused by staphylococcal toxins
 - most commonly found in children less than 8

Clinical Manifestations

- **Toxic Shock Syndrome**
 - seen most commonly in young women
 - symptoms include high fever, vomiting, diarrhea, sore throat, and can lead to severe shock

Clinical Manifestations

- **Food Poisoning**
 - Results from the production of Staphylococcal enterotoxin in food before ingestion
 - acute vomiting and diarrhea occurs 1-5 hours after ingestion of food

Clinical Manifestations

- **Bacterial Pneumonia**
 - most always secondary to a respiratory viral infection such as Influenza
- **Bacteremia**
 - many times associated with intravenous catheters

Clinical Manifestations

- Endocarditis
 - causes damage to the heart valves, seen commonly in IV drug users, patients with posthetic valves, and the elderly
- Post Op Wounds
 - the most common organism causing post operative surgical site infections

Persons At Risk For Colonization and Infection of Healthcare Associated MRSA

- Dialysis Patients
- Users of IV drugs
- Persons with dermatologic disease such as eczema
- Insulin dependent diabetes mellitus
- Hospitalized patients in special units such as the ICUs or burn unit

Healthcare Associated MRSA

- Post Op wounds
- Device related Bacteremias
- Healthcare associated Pneumonia

Four Pediatric Deaths from Community acquired MRSA- - Minnesota and North Dakota, 1997- 1999

- MRSA is an emerging community pathogen among patients without established risk factors for MRSA infection (e.g., recent hospitalization, recent surgery, residence in a long term care facility, or injecting-drug use)

CA-MRSA Causes Outbreaks

- First detected as clusters of abscesses or spider bites
- Various settings
 - Sports participants
 - Football, wrestlers, fencers

CA-MRSA Causes Outbreaks

- Inmates of correctional facilities
- Military recruits
- Men who have sex with men
- Daycare centers

CA-MRSA Definition

- CA-MRSA
 - An Infection with MRSA in a person who does not have any recent healthcare exposure such as
 - Recent hospitalization
 - Surgery
 - Permanent intravenous lines
 - Residence in a chronic care facility

Factors in Transmission “The Five Cs”

- Crowding
- Frequent skin to skin contact
- Compromised skin
- Contaminated surfaces and shared items
- Cleanliness (lack of)

CA-MRSA Predominately Causes Skin Disease

Disease Syndrome	(%)
Skin/soft tissue	1,266 (77%)
Wound (Traumatic)	157 (10%)
UTI	64 (4%)
Sinusitis	61 (4%)
Bacteremia	43 (3%)
Pneumonia	31 (2%)

CA-MRSA Produces Toxins

- CA-MRSA found to have Panton-Valentine Leukocidin (PVL) toxin
 - Necrotizing cytotoxin
 - Associated with abscesses and severe pneumonia
- Strain causing majority of community outbreaks is USA 300

Enterococcus

- Most common gram positive cocci found in the bowel flora and lower female genital tract
- Commonly associated with urinary tract infections
- recovered from abdominal and pelvic wound infections and abscesses

Vancomycin Resistant Enterococcus

- Enterococcus are normally present in the human intestines and female genital tract
- VRE are organisms that have become resistant to Vancomycin

Vancomycin Resistant Enterococcus

- Risk factors for becoming infected with VRE include
 - Patients previously treated with vancomycin
 - Hospitalized patients who have been on antibiotics for a long period of time

Vancomycin Resistant Enterococcus

- Patients with weakened immune systems such as ICU or oncology patients
- Patients who have undergone abdominal or chest surgery
- Patients with medical devices that stay in for a long time

Healthcare Associated Infections Caused by VRE

- Urinary tract infections
- Bacteremias
- Intraabdominal /Pelvic infections
- Skin and soft tissue infections

Clostridium Difficile

- Common cause of antibiotic - associated diarrhea
- Patients at increased risk are those exposed to antibiotics, had gastrointestinal surgery/manipulation, a long stay in healthcare settings, a serious underlying illness, immunocompromising conditions or increased age

Clostridium Difficile

- Spore forming gram positive anaerobic organism that is shed in feces
- Surfaces that become contaminated with feces may serve as a reservoir for C.diff spores
- Spores can then be transmitted via hands of healthcare personnel who have touched a contaminated surface or item

Clostridium Difficile

- Soap and water need to be used with these patients since instant hand sanitizers are not as effective against this organism
- In the past two years, several states have reported to CDC the emergence of a new strain of C. difficile causing outbreaks. This new strain causes a more severe disease and an associated increased mortality

Respiratory Illnesses

- Tuberculosis
- Respiratory Syncytial Virus
- Influenza

Tuberculosis

- Major global health problem
- Estimated 8 million new cases occur each year and 3 million deaths annually
- Rates are rising in institutional settings and crowded conditions

Tuberculosis

- Latent Infection
 - Person has no signs or symptoms of disease
 - TB skin test is positive
 - Stratification due to risk factors
 - Prophylactic treatment given
- Disease
 - Pulmonary disease transmitted by respiratory route

Respiratory Syncytial Virus

- RNA virus, which is unstable in the environment (surviving only a few hours on environmental surfaces)
- Most common cause of bronchiolitis and pneumonia in infants less than 1 year
- Spread from respiratory secretions through close contact with contaminated surfaces or objects

Influenza

- Classified on the basis of their surface antigens, which are called hemagglutinins (H) and neuraminidases (N)
- Antigenic shift vs. drift
- Yearly vaccination
- Avian influenza (H1N1)

Foodborne Illness

- Salmonella outbreaks
 - Peanut Butter (Peter Pan, Great Value)
 - Feb 07 - Reported from 47 states with 628 people ill
 - Veggie Booty & Super Veggie Crunchy Corn Sticks

Foodborne Illness

- Jul 07 - 60 people ill of which 90% in children <3 yrs
- E coli 0157
 - Lettuce
 - Dec 06 - 71 ill from eating at Taco Bells in the NE
 - Jul 07 - 15 ill from eating at Little Rosie's in Huntsville

Organizations Impacting Infection Control

Joint Commission Accreditation of Hospitals Organization

- Chapter on Infection Control
- National Patient Safety Controls
 - Compliance to CDC Hand Hygiene guidelines
 - Hospital associated infection that causes death or permanent loss of function considered a sentinel event and has to be investigated

Occupational Safety and Health Organization (OSHA)

- Bloodborne Pathogen Standard
 - Introduced into law on December 6, 1991
 - Passed into legislation on March 6, 1992
 - Requires Healthcare facilities to have

Occupational Safety and Health Organization (OSHA)

- Detailed plan available to all employees
- Exposure Determination
- Control Measures

Occupational Safety and Health Organization (OSHA)

- Education about the viruses and risk of exposure
- Hepatitis B vaccine available to all at risk healthcare workers
- Post exposure follow up

Recommendations and Guidelines

- Hospital Infection Control Practices
- Advisory Council (HICPAC)
 - Preventing Healthcare Associated Pneumonia 2003
 - Environmental Infection Control in Healthcare Facilities 2003

Recommendations and Guidelines

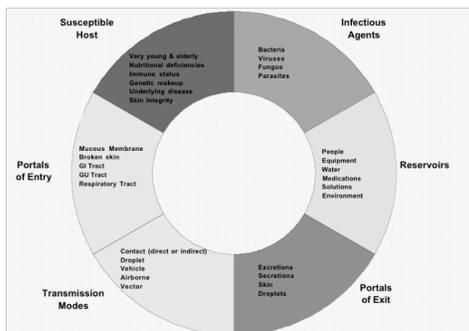
- Hand Hygiene in Healthcare Settings - 2002
- Intravascular Device-Related Infections - 2002
- Surgical Site Infections - 1999
- Isolation Precautions - 2007

Alabama Dept. of Public Health

- Reportable Diseases
- Proposed mandated reporting of hospital acquired infections

Infection Control Practices

The Chain of Infection



Standard Precautions

- Handwashing
 - After touching blood, body fluids, or contaminated items, whether or not gloves are worn
 - After gloves are removed, between patient contacts, if necessary when performing procedures on same patient to prevent cross contamination

Standard Precautions

- **Gloves**
 - Wear when touching blood, body fluids, secretions, excretions, and contaminated items
 - Change between tasks and procedures on the same patient after contact with material that may contain a high concentration of microorganisms

Standard Precautions

- **Face Protection**
 - Wear mask and eye protection, or face shield to 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, and excretions

Standard Precautions

- **Gown**
 - Wear during procedures and patient-care activities that are likely to generate splashes of blood, body fluids, secretions or excretions or cause soiling of clothing
 - Remove soiled gown as promptly as possible and wash hands to avoid transfer of microorganisms

Contact Precautions

- Use for patients with known or suspected infections or evidence of syndromes that represent an increased risk for contact transmission, including colonization or infection with MDROs

Contact Precautions

- vancomycin-resistant *Enterococcus* (VRE)
- methicillin-resistant *Staphylococcus aureus* (MRSA)
- *Clostridium difficile*, Respiratory syncytial virus

Contact Precautions

- **Patient Placement**
 - In acute care settings place patients in single patient room
 - Alternatives when single-patient rooms are in short supply
 - Prioritize patients with conditions that may facilitate transmission

Contact Precautions

- Cohort patients in the same room who are infected or colonized with the same pathogen
- Ensure patients are >3 feet from each other
- Change protective attire and perform hand hygiene between patients

Contact Precautions

- In long term settings decision made on a case-by-case basis balancing infection risks to other patients in the room and the potential adverse psychosocial impact on the patient
- In ambulatory setting place patients in an examination room or cubicle as soon as possible

Contact Precautions

- Hand hygiene and gloves
 - Observe hand hygiene practices and wear gloves according to Standard Precautions and whenever touching the patient's intact skin or surfaces and articles in close proximity to the patient

Contact Precautions

- Gowns
 - Wear gown whenever anticipating that clothing will have direct contact with patient or potentially contaminated environmental services

Contact Precautions

- Patient transport
 - Limit transport of patients outside of the room to medically necessary purposes. When transport is required, ensure that infected or colonized areas of the patient are contained and covered

Contact Precautions

- Remove contaminated PPE and perform hand hygiene transport prior to transporting patient
- Don clean PPE to handle patient when destination has been reached

Droplet Precautions

- Use for patients known or suspected to be infected with microorganisms transmitted by respiratory droplets (large-particle droplets [>5 microns in size] that can be generated by the patient during coughing, sneezing, talking, or the performance of cough-inducing procedures)

Droplet Precautions

- In acute care settings place patient in single patient room if possible
- In residential care settings, decisions made on a case-by-case basis
- Ambulatory settings place patient in examination room or cubicle as soon as possible

Droplet Precautions

- Wear surgical mask for close patient contact (within 3 feet)
- For patients with suspected SARS or Avian flu wear both eye protection and respiratory protection (NIOSH-approved N95 or higher)
- Limit transport of patient but if necessary the patient wears a surgical mask

Airborne Infection Isolation (All) Precautions

- Use for patients known or suspected to be infected with infectious agents transmitted person-to-person by the airborne route
 - tuberculosis, measles, chickenpox, smallpox, viral hemorrhagic fevers, and SARS

Airborne Precautions

- Patient Placement
 - Acute care hospitals or residential settings
 - single patient room with monitored negative air pressure
 - At least 6 (existing facility) or 12 (new construction) air exchanges per hour

Airborne Precautions

- Direct exhaust of air to the outside or HEPA filters to the air-handling system serving exclusively the isolation room

Airborne Precautions (ALL)

- In ambulatory settings
 - Place surgical mask on patient immediately and maintain until the patient has been placed in an ALL room
 - Place patient in exam room at the farthest distance from other patient rooms

Airborne Precautions (ALL)

- Once patient leaves, room should remain vacant for the appropriate time according to the number of air exchanges per hour (usually 1 hr) to allow for full exchange of air

Airborne Precautions

- Employees wear fit tested N95 respirator when entering the room or home of patient with
 - Infectious pulmonary or laryngeal tuberculosis or draining tuberculosis skin lesions
 - Smallpox, viral hemorrhagic fevers, SARS

Airborne Precautions

- Employees wear nose/mouth protection upon entering room or home of patient with
 - measles, varicella, disseminated zoster

Protective Environment (PE)

- Place allogeneic hematopoietic stem cell transplant (HSCT) patients in a protective environment
 - See Guideline for Environmental Infection Control in Health-Care Facilities
 - See Guidelines for Preventing Health-Care Associated Pneumonia

Prevention of Transmission of MDROs

- General Recommendations
 - Administrative measures
 - Education and training of healthcare personnel
 - Judicious use of antimicrobial agents
 - Surveillance

Prevention of Transmission of MDROs

- Establish systems for detecting emergence of MDRO in clinical isolates
- Notify infection control staff or medical director when noval resistance pattern (VISA, VRSA, ESBL-producing GNB) is detected

Immunizations

- Measles, Mumps, Rubella (MMR)
- Varicella
- Hepatitis B vaccine
- Influenza vaccine
- Tetanus and Pertussis (Tdap) (?)

Safety and Infection Control Activities

Infection Trending, Reporting,
Follow Up Action

Upcoming Programs

Cultural Diversity, Health Disparities
and Public Health

Wednesday, November 28, 2007
12:00-1:30 p.m. (Central Time)

Two Years Later: Continued
Psychological Difficulties of First
Responders and the Affected
General Population Post Katrina

Friday, November 30, 2007
12:00-1:30 p.m. (Central Time)

Upcoming Programs

International Public Health Education:
The Experience from Masters of Public
Health Programs in Developing
Settings Worldwide

Wednesday, January 16, 2008
1:00-2:30 p.m. (Central Time)

Fitness for Duty: A Simple System for
Making Health Related Change

Thursday, January 17, 2008
12:00-1:30 p.m. (Central Time)