**Nosocomial infections**

**Introduction**

Nosocomial infections (also referred to as HAIs or healthcare acquired infections) occur while in the hospital or long-term healthcare facility. They are believed to have originated during the time of the hospital or healthcare facility stay. Healthcare personnel may also acquire nosocomial infections. These are referred to as infections that arise after 48 hours of hospital admission. Those arising prior to that time are presumed to have had the exposure to the infection prior to hospital admission and are normally not defined as nosocomial infections. This is not always true. With shorter hospital stays and more use of outpatient surgery, there may be many infections that are not termed nosocomial, but the exposure actually did occur during the short stay.

Nosocomial infections typically affect patients who are immuno-compromised because of age, underlying disease, medical or surgical treatments. With today’s aging population, increase in medical procedures and transplant activity, nosocomial infections may be experienced in an increased number of patients. The young are also of concern, given their lack of sufficient immunity. Of particular concern are patients in Intensive Care Units (ICU) where medical devices such as catheters, endotracheal and tracheostomy tubes of patients on ventilator support and intravenous connections offer the potential for contamination.

**Types of nosocomial infections**

- Urinary tract infections (most common nosocomial generally caused by E. coli, pseudomonas, or enterococcus)
- Surgical site infections
- Respiratory infections (nosocomial pneumonia such as Pseudomonas), the second most common type of nosocomial infection in the U.S.)
- Blood infections/bacteremia
- Skin infections (especially from burns)
- Gastrointestinal tract infections
- Central nervous system infections

**History of nosocomial infections**

- In the 1840s, Ignaz Semmelweis demonstrated the importance for hand hygiene in controlling the transmission of infection in hospitals. This early study marks the groundwork for modern infection control practices.
control. During this time, gram-positive cocci (particularly streptococci and staphylococcus aureus) were the main hospital pathogens of concern.

- Between 1940 and 1950, S. aureus continued to cause major nosocomial problems.
- In the 1970s, gram-negative bacilli (particularly Pseudomonas aeruginosa and Enterobacteriaceae) were of major concern regarding nosocomial infections.
- By the late 1980s and early 1990s, there were several different classes of antimicrobial drugs effective against gram-negative bacilli.
- Unfortunately, today many of the bacteria that were once controllable using antimicrobial drugs (antibiotics) have become widely resistant to these drugs.
- Along with the threat of bacterial resistance, viral, fungal, and parasitic resistance is becoming prevalent. This is due, in large part, to the fact that there are fewer therapeutic options for these pathogens.
- Current studies reveal the overall annual direct medical costs of HAI to U.S. hospitals ranges from $28.4 to $33.8 billion (after adjusting to 2007 dollars using the CPI for all urban consumers) and $35.7 billion to $45 billion (after adjusting to 2007 dollars using the CPI for inpatient hospital services).
- CDC’s 2007 Guideline for Isolation Precautions report addresses the following areas:
  1. Recommendations that include the spectrum of healthcare delivery systems, as opposed to primarily addressing acute care hospitals.
  2. With the emergence of new pathogens, there is renewed concern for evolving known pathogens, development of new therapies, and increased concern for the threat of bioweapon attacks.
  3. Standard Precaution recommendations have been expanded to include respiratory hygiene/cough etiquette and safe injection practices.
  4. Components of the Protective Environment were updated due to evidence that environmental controls decrease the risk of life-threatening fungal infections.
  5. New emphasis and recommendations were presented regarding the importance of organizational characteristics in influencing healthcare personnel to adhere to recommended infection control practices.
  6. With the increase of HAIs caused by multidrug resistant organisms, a need for more specific recommendations for surveillance and control was recognized.

Common reasons for nosocomial infections

- Use of antimicrobial drugs in hospitals and long-term care facilities, leading to increased drug resistance
- Failure of personnel to follow basic infection control procedures, such as hand washing between patients
- An increased number of patients who are immuno-compromised. With the increased number of patients that are obtaining care in an outpatient setting, those that are in the hospital as “inpatients” are considered very ill and immuno-compromised
- Inadequately sterilized instruments
- Aerosol droplets from other ill patients or employees
- Improperly prepared food
- Contaminated drinking water
- Unclean and non-sterile environmental surfaces

Monitoring and regulating organizations

- The Center for Disease Control (CDC) developed the National Nosocomial Infections Surveillance (NNIS) system in the early 1970s in an effort to minimize the burden of nosocomial infection data collection and reporting by participating hospitals. It was developed in order to help infection control professionals and hospitals stay abreast of the rapidly expanding science and practice of infection prevention and control and better manage endemic and epidemic episodes of healthcare-associated (nosocomial) infections (HAI). CDC is revising its case definitions and data collection protocol for HAI urinary tract infections and pneumonia.
- In 1976, the Joint Commission (TJC) published standards for infection control. TJC continues to be particularly concerned with nosocomial infections as they regularly update their requirements for hospital infection-control activity. Their 2009 National Patient Safety Goal Seven is aimed at reducing the risk of
HAs. In particular, this safety goal addresses hand hygiene, multidrug resistant organisms, central line associated bloodstream infections and surgical site infections.

- Although no direct standard has been developed concerning prevention of nosocomial infections contracted or spread by employees in the healthcare setting, OSHA’s concern regarding tuberculosis and bloodborne pathogens suggests we may anticipate further attention to this area in the future.
- The U.S. Department of Health and Human Services (HHS) is in the process of implementing the "HHS Action Plan to Prevent HAs.

**Prevention**

Healthcare organizations of all sizes should:

- Consider implementation of aggressive antibiotic control programs.
- Stress the importance of immunization.
- Enforce strong infection control programs, with an adequate number of infection control personnel.
- Ensure strict hand washing techniques are enforced.
- Avoid hand contact to the conjunctiva or nasal areas.
- Assure complete sterilization of medical equipment, a clean environment, adequate ventilation, sanitary food preparation and water treatment methods are in place.
- Continue to communicate with local and national regulatory agencies (city/state health departments, CDC, OSHA) regarding problems related to nosocomial infections.

**Summary**

It is important that studies continue to pertain to the causes and preventative measures regarding nosocomial infections. As the U.S. population ages, its prevalence may increase if proper controls are not instituted as part of an effective infection control program.

**References**
