بسم الله الرحمن الرحيم
NOSOCOMIAL INFECTIONS
(Hospital acquired infection)

BY
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Def.

- It is an infection acquired in hospital by a patient after 48 hours or more after hospital admission.

- This includes not only infections acquired in the hospital but also infection appearing after discharge, and also occupational infections among staff of the facility.
Sources of infection

a-Endogeneous: patient's own flora of the skin, respiratory, GI, GU tract

b-Exogeneous from

- **1-Inanimate environment:**
  - *Aspergillus* from hospital construction,
  - *Legionella* from contaminated water, IV fluids & catheters

- **2-Animate environment:**
  - From medical personnel
  - From patient to patient, visitors
Modes of transmission

**Contact:** direct (person-person), indirect (transmission through an intermediate object--contaminated instruments)

**Airborne:** organisms that have a true airborne phase as pattern of dissemination (TB, Varicella)
Common vehicle transmission applies to microorganisms transmitted to the host by contaminated items such as food, water, medications, devices, and equipment.

**Droplet**: brief passage through the air when the source and patient are in close proximity.

**Vector borne transmission** occurs when vectors such as mosquitoes, flies, rats, and other vermin transmit microorganisms.
1. The microbial agent
2. Patient susceptibility
3. Environmental factors

Factors Influencing Nosocomial Infection
Microbial Agent

Developing of clinical disease depends on organism's virulence, infective dose and patient resistance
Patient Susceptibility

- **Age:** infants and old age have decreased resistance to infection.

- **Immune status:** Patients with chronic diseases as malignancy, leukaemia, diabetes mellitus, renal failure or AIDS have increased susceptibility to infection, using Immunosuppressenerative drugs or irradiation.
Environmental Factors

- **Healthcare settings** are environments where both infected persons and persons at high risk of infection congregate.

- **Crowded conditions** within hospitals, frequent transfers of patients between units.

- **Microbial flora** may contaminate objects, devices and materials which subsequently contact susceptible body sites of patients.
PATHOGENESIS OF NOSOCOMIAL INFECTIONS

The infectious disease process:

the interaction between the pathogenic microorganism, the environment, and the host. The process may be thought of as a circular chain with six links as follow
The four most common types of nosocomial infections are urinary infections, surgical site infection, nosocomial pneumonia, and nosocomial bacteremia.
Urinary infections

- Eighty percent of these infections are associated with the use of an indwelling catheter.

- They are associated with less morbidity than other infections but can sometimes lead to septicemia and death.
Surgical infections

- An incidence varying from 0.5% to 15% depending on the type of surgery and the underlying patient status.

- A surgical infection is indicated by the presence of purulent discharge around the wound or the insertion site of a drain, or by the presence of cellulites which is emanating from the wound.
Patients usually acquire the infection during the procedure itself, either endogenously from flora on the skin or in the operative site, exogenously from air, medical equipment, doctors, or other staff, or rarely, from blood given during the procedure.

The extent of contamination during the surgery is the main risk factor. Contamination varies with the length of the procedure and the patient’s general condition.
Nosocomial pneumonia

It is also a significant problem. About 3% of patients on ventilators acquire pneumonia, which in this circumstance, has a very high case-fatality rate.

The source of the microorganism is often endogenous but may also be exogenous with transfer of an organism from the respiratory equipment.
Nosocomial bacteremia

- It is the fourth type of nosocomial infection, represents about 5% of nosocomial infections.

- Although they are only a small proportion of nosocomial infections, they have high case-fatality rates, sometimes greater than 50%.
These infections may occur at the entry site of the intravascular device or along the path of a catheter (tunnel infection).

The sources of infection-causing microorganisms for these infections are endogenous.
Managing outbreaks of infection
**Def of outbreak**

It is the occurrence of a larger than usual number of cases of a specific infection acquired in an institution or certain population.

**Identification of the cause of the outbreak involves the following:**

- Isolation of organisms from patients & suspected sources of infection
- Identification of organisms to species level
- Typing of similar species to recognize identical strains in patients & source
Typing methods

Non molecular typing methods

- Biochemical typing according to biochemical reaction
- Antibiotic resistance patterns
- Serological typing
- Phage typing

Molecular typing methods

- Plasmid profile analysis
- Restriction endonuclease analysis & PFGE
- PCR based ribotyping
- Nucleotides sequences analysis
Device-related infections have been a big problem for a long time.

The three most common device-related infections are central line-associated bloodstream infection, ventilator-associated pneumonia (VAP), and foley catheter-associated urinary tract infection (UTI). Recent studies have also named several medical implants.
Pathogenesis of device-associated infection

It is the interaction among the bacteria, the device and the host. Bacterial factors are probably the most important in the pathogenesis of infection.
Prevention of Device-Related Infections

- devices sterile as packaged
- aseptic technique
- perioperative site preparation
- prophylactic topical
- antibiotic treatments (exit sites)
- prophylactic systemic antibiotic coverage
PREVENTING NOSOCOMIAL INFECTIONS

- adhering to recommended infection prevention practices, especially
- hand hygiene and wearing gloves;
- paying attention to well-established processes for decontamination and cleaning of soiled instruments and other items, followed by either sterilization or high-level disinfection; and
- improving safety in operating rooms and other high-risk areas where the most serious and frequent injuries and exposures to infectious agents occur.
Hand Washing

Wash Your Hands the Right Way to Stay Healthy

Use Your Favorite Soap Brand!
Flexible Topper fits onto ALL standard liquid soap pumps
VACCINATION FOR HEALTH CARE WORKERS (HCW)
Category A - Direct contact with blood or body substances

This includes all persons who have physical contact with, or potential exposure to blood or body substances.
Category B - Indirect contact with blood and body substances

This includes workers in patient areas who rarely have direct contact with blood or body substances. These employees may be exposed to infections spread by droplets, such as measles and rubella, but are unlikely to be at risk from blood borne diseases.
Laboratories pose special risks because of the equipment used (such as centrifuges) and the possibility of exposure to high concentrations of micro-organisms generated by culture procedures.
Category D - Minimal patient contact

In many health care establishments, clerical staff, gardening staff and other occupational groups have no greater exposure to infectious diseases than the general public. These employees do not need to be included in vaccination programs or other programs aimed at protecting category A, B and C staff.
<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Recommendations in brief</th>
</tr>
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<tbody>
<tr>
<td>Hepatitis B</td>
<td>Give 3-dose series (dose *1,*2 in 1 month interval.*3 approximately 5 months after <em>2). Give IM, obtain anti-HBs serologic testing 1-2 months after dose</em>3.</td>
</tr>
<tr>
<td>Influenza</td>
<td>Give 1 dose of the current influenza vaccine</td>
</tr>
<tr>
<td>MMR</td>
<td>For HCW born before 1957 or later without serologic evidence of immunity or prior vaccination, give 2 doses of MMR, 4 weeks apart</td>
</tr>
<tr>
<td>Varicella (chicken pox)</td>
<td>For HCW who have no serological proof of immunity, prior vaccination, or history of varicella disease, give 2 doses of varicellar vaccine, 4 weeks apart, Give SC.</td>
</tr>
<tr>
<td>Tetanus, diphtheria, pertussis</td>
<td>Give HCW a Td booster dose /10 years, following the completion of the primary 3-doses series. Give a 1-time dose of Tdap to all HCW &lt; 65 years with direct patient contact. Give IM.</td>
</tr>
<tr>
<td>Meningoccoccal</td>
<td>Give 1 dose for microbiologist who are routinely exposed to N.meningitidis isolates</td>
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For Hepatitis B

Perform post-vaccination serological testing one month after the third dose of vaccine. If adequate anti-HBs antibodies are not reached following the third dose, the possibility of HBsAg carriage should be investigated.
Those who are HBsAg negative and do not respond should be offered either a further double dose or a further three doses at monthly intervals of hepatitis B vaccine. Further testing should be performed four weeks later. Persistent non-responders should be informed about the need for HBIg within 72 hours of parenteral exposure to hepatitis B.

Booster doses of hepatitis B vaccine are no longer recommended for people who have an adequate antibody response to the primary course, as there is good evidence that a primary course provides long lasting protection.
ENVIRONMENTAL CLEANING

Definition

- General cleaning of environmental surfaces and maintenance of cleanliness in a health care facility.

- It is the physical removal of organic materials such as soil and dirt, which removes a large proportion of microorganisms, followed by complete drying.
General Guidelines for Cleaning

Protective Clothing for Cleaning

During cleaning, workers should always wear gloves (preferably heavy utility gloves) and shoes that cover the toes, they may need additional protection such as an impermeable apron, mask, and protective eyewear.
Common Methods for Cleaning

Dry Cleaning Method

Sweeping

Wet Cleaning Method
Dry Cleaning Method

The dry cleaning method relies on mechanical action to loosen and to remove large objects and particulate soil but does not remove stains.

Dry cleaning is not suitable for wet or greasy areas.
Sweeping

The use of dry brooms, dry mops and dry dusters should be avoided in patient treatment and food preparation areas as it is not efficient and it is potentially hazardous.
Wet Cleaning Method

Wet cleaning is accomplished manually by a damp cloth, damp mop, or deck scrubber using water with or without detergent and with or without disinfectant.
Types of cleaning solutions used during housekeeping

- Plain detergent and water (i.e., detergent solution).

Detergent cleaners are used for general cleaning tasks. Detergents, e.g., soap, remove dirt and organic material and dissolve or suspend grease, oil, and other matter for easy removal by scrubbing. 68
Disinfectant

– Disinfectants rapidly kill or inactivate infectious microorganisms during the cleaning process.
– In most settings a chlorine solution made from locally available bleach is the cheapest and most accessible disinfectant.
– Chlorine (bleach) solutions should never be mixed with cleaning products that contain ammonia or phosphoric acid. Combining these chemicals will result in the release of a chlorine gas, which can cause nausea, eye irritation, tearing, headache, and shortness of breath.