



SNS COLLEGE OF ALLIED HEALTH SCIENCES

SNS Kalvi Nagar, Coimbatore - 35

Affiliated to Dr MGR Medical University, Chennai



DEPARTMENT OF CARDIOPULMONARY PERFUSION CARE
TECHNOLOGY

COURSE NAME : CLINICAL MICROBIOLOGY

TOPIC : HOSPITAL ACQUIRED INFECTIONS AND ITS PREVENTION



NOSOCOMIAL INFECTIONS




- Infections acquired in health care settings, major causes of death and increased morbidity among hospitalized patients.
- HAI's are significant burden, both for patient and public health.
- Those infections which were not present in a person at the time of admission to a hospital which develop at least 48 hours after admission, but are acquired during a stay in hospital.




- [Nosocomial infections](#), also called health-care-associated or [hospital-acquired infections](#), are a subset of infectious diseases acquired in a health-care facility.
- These infections can lead to serious problems like [sepsis](#) and even death.
- Often, [nosocomial infections](#) are caused by multidrug-resistant pathogens acquired via invasive procedures, excessive or improper antibiotic use, and not following infection control and prevention procedures.
- In fact, many [nosocomial infections](#) are preventable through guidance issued by national public health institutes such as the Centers for Disease Control and Prevention (CDC).

TYPES


MOST COMMON:
STAPHYLOCOCCUS AUREUS





OTHER COMMON PATHOGENS:
ESCHERICHIA COLI
ENTEROCOCCI
CANDIDA




CAUSES

 **URINARY CATHETERS**
↳ URINARY TRACT INFECTIONS

 **SURGICAL PROCEDURES**
↳ SURGICAL SITE INFECTIONS

 **CENTRAL VENOUS CATHETERS**
↳ BLOODSTREAM INFECTIONS

 **MECHANICAL VENTILATION**
↳ PNEUMONIA

PREVENTION

 **FREQUENT HAND HYGIENE**

 **PROPER PPE USE**

 **REMOVE INDWELLING DEVICES ASAP**

 **APPROPRIATE ANTIMICROBIAL USE**

 **ROUTINE DISINFECTION**



Risk for a nosocomial infection



- Increasing age
- Greater length of hospitalization
- Excessive or improper use of broad-spectrum antibiotics
- Higher number of invasive devices and procedures (for instance: central venous catheters, urinary catheters, surgical procedures, and mechanical ventilation)
 - Diabetes
 - Chronic lung disease
 - Renal insufficiency
 - Malnutrition



Most common type of nosocomial infection



- **Urinary catheters**

- A urinary catheter is a tube inserted into the bladder to collect urine into a closed collection system.
- Can help patients who have difficulty controlling or emptying their bladder.
- As patients under anesthesia are unable to control their bladder, urinary catheters are typically placed during surgical procedures to keep the bladder empty.

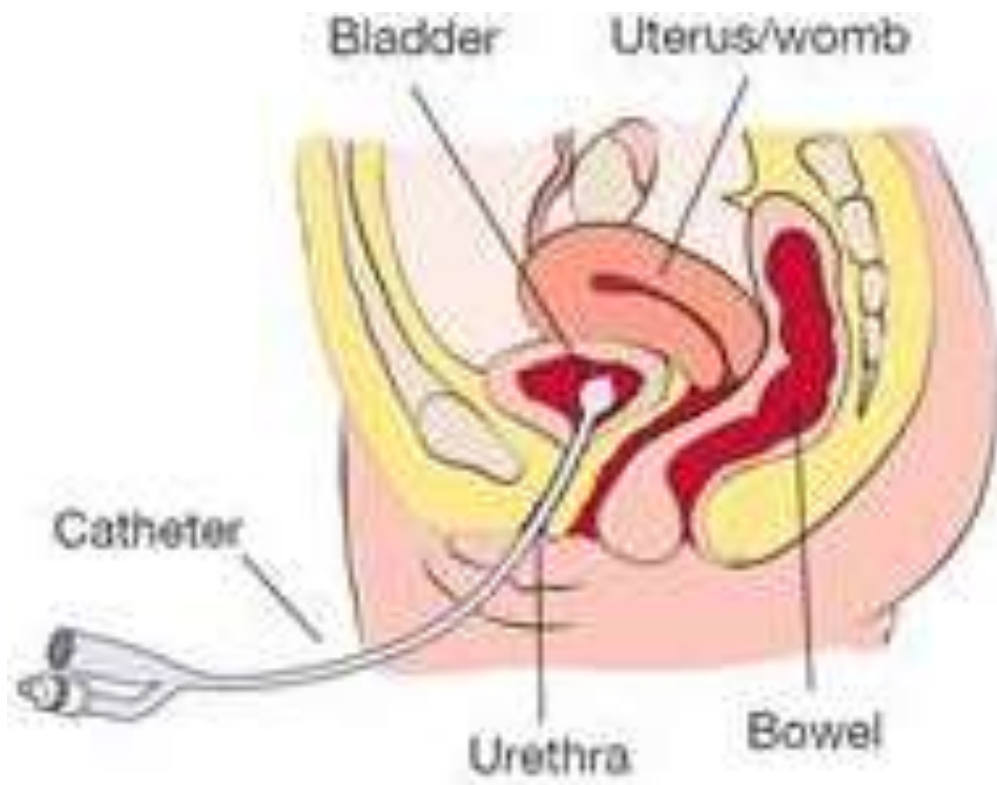


Figure 1 – Female catheter

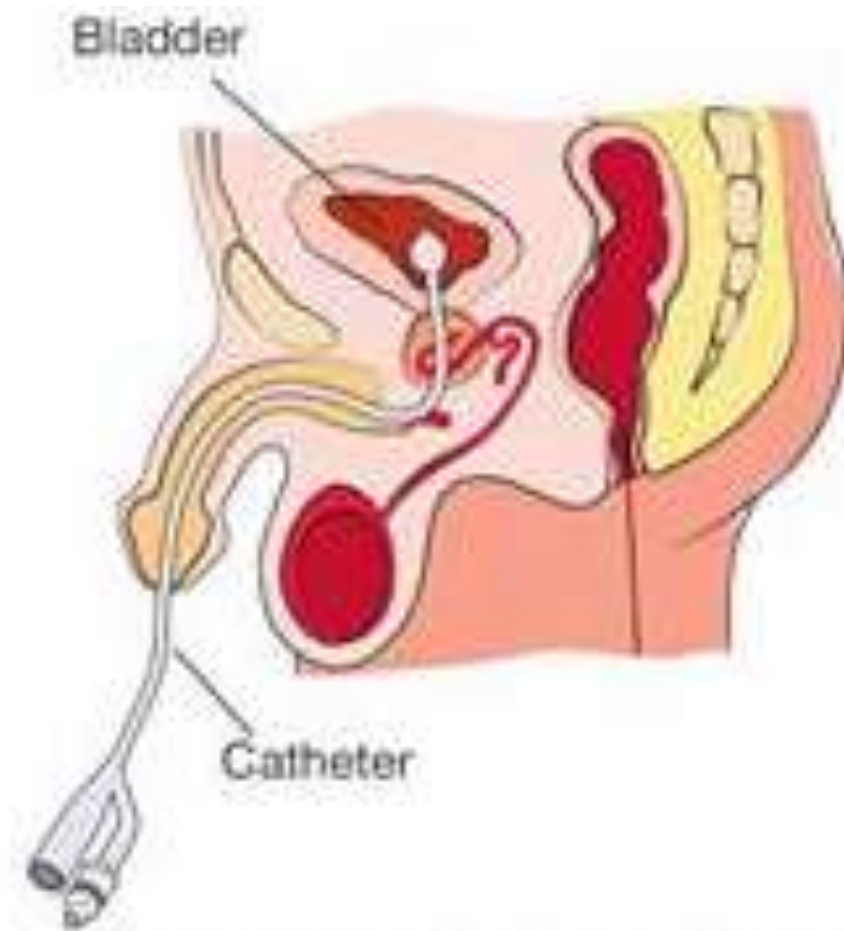
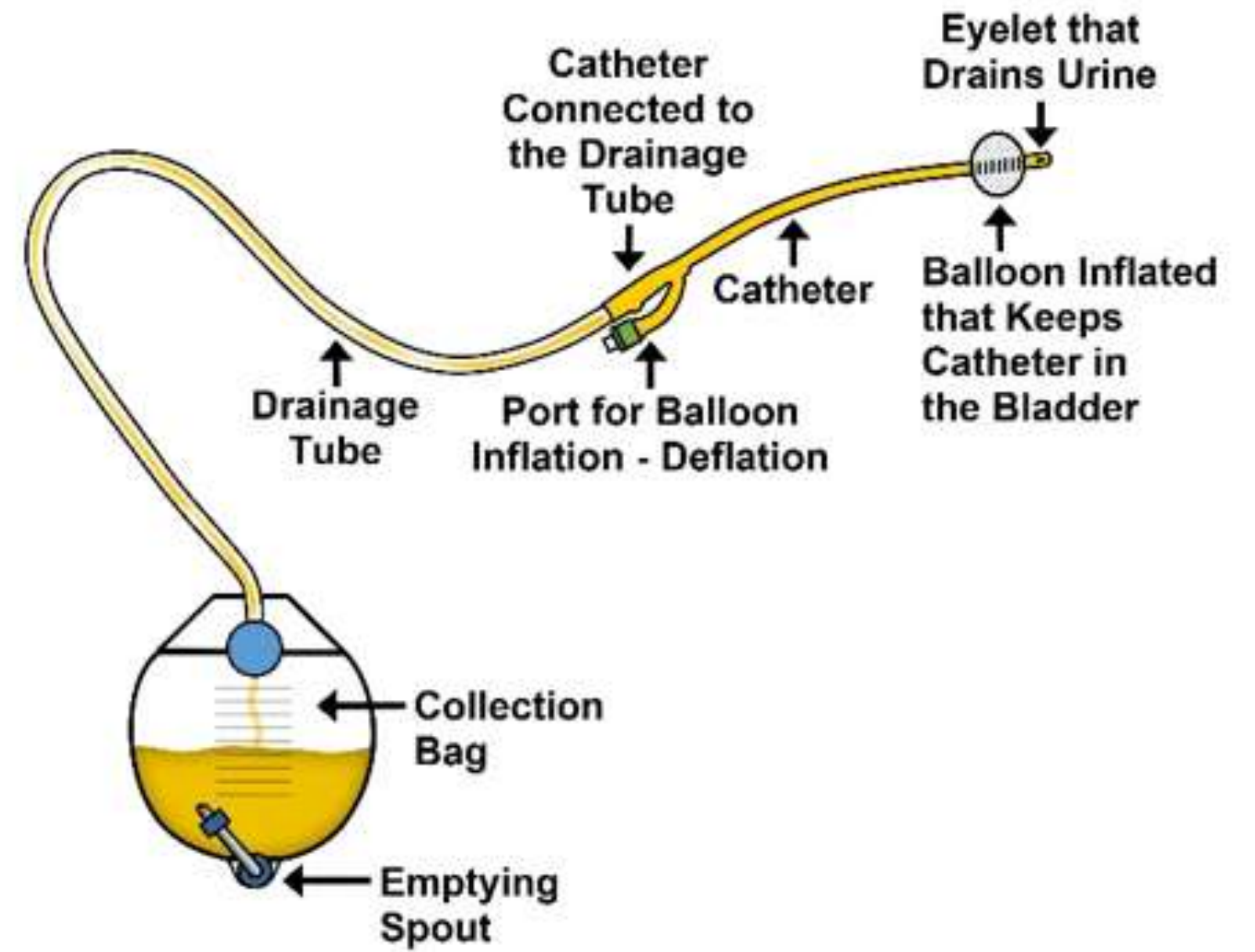


Figure 2 – Male catheter





Urinary tract infections

- Pathogens spread through an individual's perineum or a contaminated urinary catheter can lead to urinary tract infections, which are the most common nosocomial infections.
 - About 8% of UTI's are associated with the use of an indwelling bladder catheter.
- Used catheters are difficult to sterilize and may be the cause of cross contamination/cross infection also.
- Disposable sterilized catheters should be used aseptically.
 - **Symptoms** of urinary tract infections include painful urination, flank pain, and fever.

Bacteria responsible for UTI arise from the gut flora like *Escherichia coli* and *Klebsiella*



Surgical Site Infections



- **Surgical procedures**

- Surgical site infections are the second most common type that can develop after surgery.

- Length of operation, surgical technique, and operating room sterility are all factors that can affect the incidence of surgical site nosocomial infections.

- **Caused by pathogens already prevalent on the skin or by organisms shed from members of the operating room staff**, and often involve the skin, organs, or implanted materials.

- **Symptoms** may include skin redness, tenderness, and drainage from surgical sites.

- *Staphylococcus aureus* – main pathogen responsible for this type of HAI's followed by *E.coli*, *Proteus*, *Enterococcus* and *S.epidermis*

INFLAMMATION OF THE SEAM





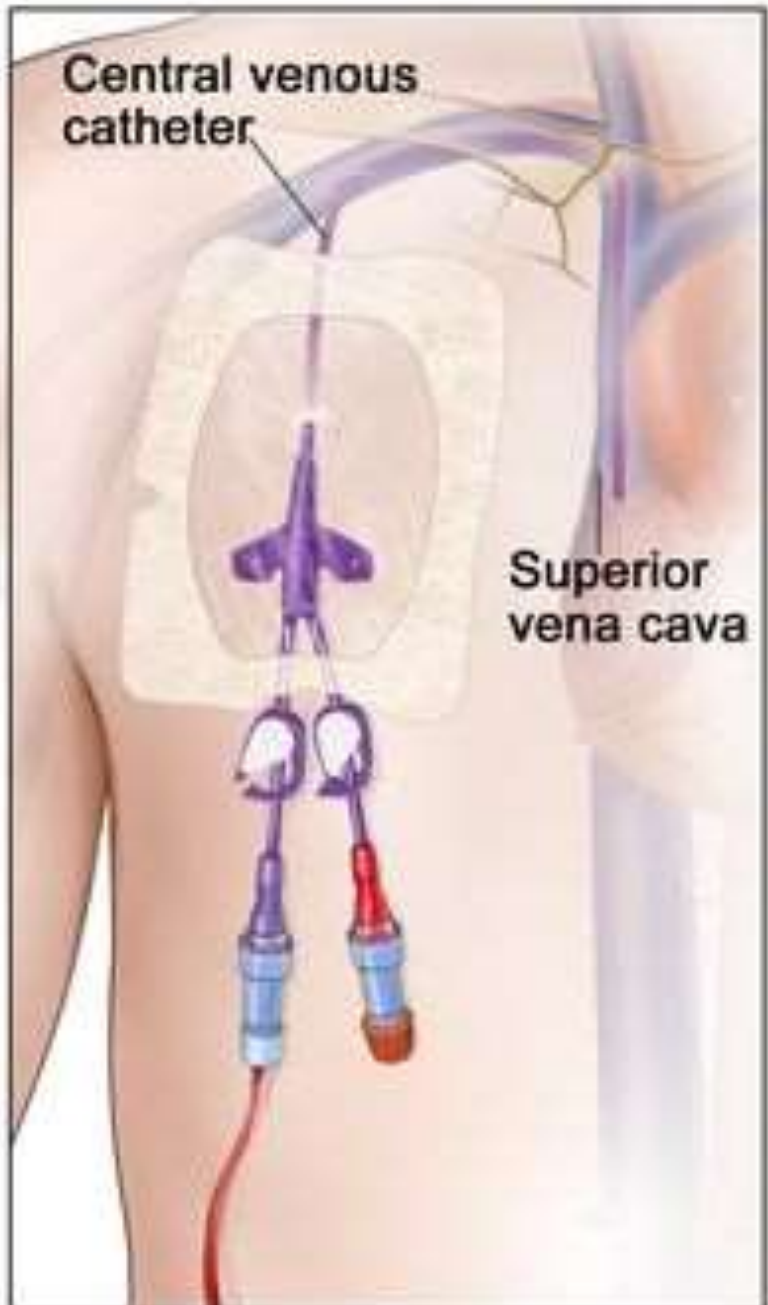
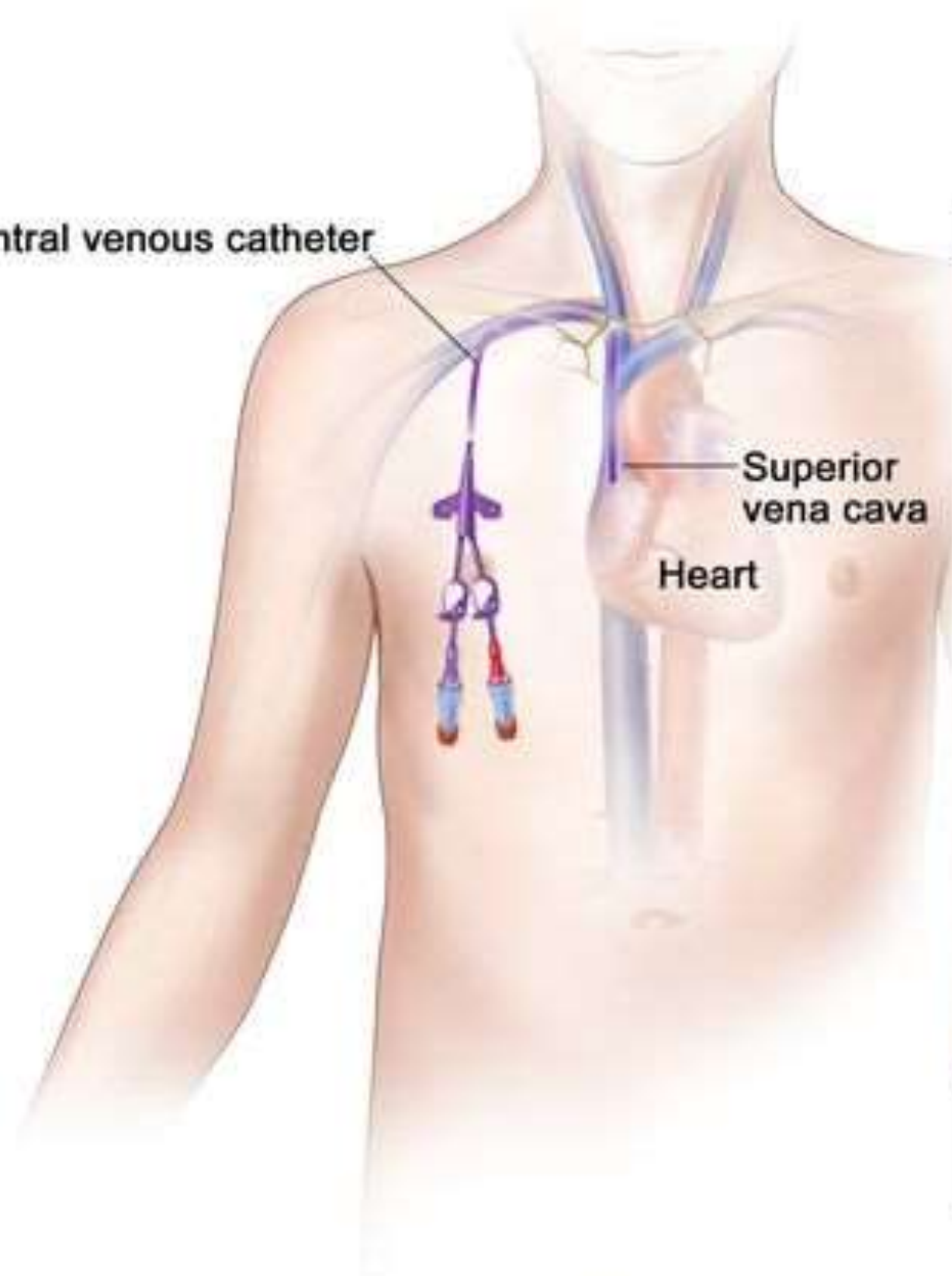
Central venous catheters



- A central venous catheter (also known as a central line) is a tube placed in a large vein in the neck, arm, chest, or groin and can remain in place indefinitely.
- Can be used to give [intravenous](#) therapies such as [total parenteral nutrition](#) (TPN), which provides nutrients and fluids to patients.
- [Bloodstream infections](#) can result from pathogens that may penetrate the skin during insertion of hubs of central lines.
- This is the third most common form of [nosocomial infection](#) and has the highest [rate of mortality](#).
 - **Symptoms** of infection may include skin redness, tenderness, and drainage at insertion sites.

Central Venous Catheter

Central venous catheter



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Mechanical ventilation



- Ventilator-associated pneumonia is a respiratory infection caused by breathing in contaminated oropharyngeal flora during mechanical ventilation (machine-assisted breathing).
 - Together with central-line bloodstream infections, it is the third most common nosocomial infection.
 - Early-onset nosocomial pneumonia occurs within the first four days of admission and is commonly caused by community-acquired pathogens like *Staphylococcus aureus*, *Streptococcus pneumoniae*, and *Haemophilus influenzae*.
 - Late-onset pneumonia is frequently caused by multi-drug resistant bacteria like *MRSA*, *S.aureus*, *Proteus*, *Pseudomonas aeruginosa*, *Klebsiella*, and *Enterobacter*.



Other HAI's



- Skin and soft tissue infections – Ulcers, burns, bedsores encourage bacterial colonization – lead to systemic infection
- Gastroenteritis – Nosocomial infection in children
- Clostridium difficile – nosocomial gastroenteritis among adults
- Sinusitis – Enteric infections
- Endometritis – Infection of reproductive organs following childbirth
- Infections of eye and conjunctiva.



Symptoms



- Symptoms of HAIs will vary by type. The most common types of HAIs are:
 - Fever,
 - Increased mucus production,
 - Increased white blood cell count
 - Abnormal [chest X-ray](#) findings.
- Urinary tract infections (UTIs)
- Surgical site infections
- Gastroenteritis
- Meningitis
- Pneumonia



The symptoms for these infections may include:

- discharge from a wound
- fever
- cough, shortness of breathing
- burning with urination or difficulty urinating
- headache
- nausea, vomiting, diarrhea



PREVENTION



- Implementation of infection control protocols to reduce exogenous and endogenous transmission in health-care facilities.



Exogenous transmission



- Occurs due to person-to-person interactions and through environmental cross-contamination.
 - Frequent [hand hygiene](#) is the most important preventative measure to limit the spread of pathogens.
 - Compliance with isolation precautions
 - Proper use of [personal protective equipment](#)
 - Avoidance of unnecessary use of indwelling devices, and remove them as soon as advisable.
 - Practicing proper aseptic and/or sterile techniques during insertion and maintenance of devices.
 - Routine [disinfection](#) of surfaces, patient equipment, and medical devices
 - Appropriate waste management



Endogenous transmission



- From excessive and improper use of broad-spectrum antibiotics.
 - [Vancomycin](#) affects the normal balance in the patient's own endogenous [bacterial flora](#), ultimately leading to an overgrowth of some bacteria
 - Appropriate antimicrobial use with the correct agent, dose, and duration is needed to minimize the [growth](#) of antibiotic-resistant pathogens
- Transfer from one part of the [body](#) to the other (as with [urinary tract infections](#))
- Depressed [immune system](#) from factors like malnourishment or chemotherapy



- **Some general measures for infection control include:**
- Screening the ICU to see if people with HIAs need to be isolated.
- Observing hand hygiene, which involves washing hands before and after touching people in the hospital.
- Wearing appropriate gear, including gloves, gowns, and face protection.
- Cleaning surfaces properly, with recommended frequency.
- Making sure rooms are well ventilated.



- **To reduce the risk of UTIs, your healthcare provider can:**
- Follow the aseptic insertion technique to minimize infection.
- Insert catheters only when needed and remove when no longer needed.
- Change catheters or bags only when medically indicated.
- Make sure the urinary catheter is secured above the thigh and hanging below the bladder for unobstructed urine flow.
- Keep a closed drainage system.



TREATMENT



- Symptomatic treatment of shock, hypoventilation along with administration of broad spectrum anti-microbial therapy.
- When it is found to be bacteria – Penicillin, Cephalosporins, Tetracyclines or Erythromycin should be used.
- In case of multi-drug resistant bacteria – Vancomycin and Imipenem can be used.
- For Viruses – Acyclovir, Ganciclovir can be used.
- In Fungal – Ketoconazole, Fluconazole, Voriconazole are used



Assessment



1. What are the other names of Hospital acquired infection and explain in brief?
2. Types of micro organisms involved in HAI and mention its names?
3. What are the causes and prevention of HAI?
4. List of Bacteria responsible for UTI, Surgical site infections and Mechanical Ventilation?
5. Modes of Transmission?



THANK YOU