

# Team Medicine

# 27

**Healthcare  
Associated Infections**

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# Health Care Associated Infection (HCAI)

- Was referred to as “Nosocomial” or “hospital” infection.
- An infection occurring in a patient during the process care of in a hospital or other health care facility which was not present or incubating at the time of admission.
- This includes infections acquired in the health care facility but appearing after discharge.

**Health care associated infections:** localized or systemic condition resulting from an adverse reaction to the presence of an infectious agent or toxin.

**Colonization:** The presence of microorganisms in:

- Skin; **the commonest site.**
- Mucus membranes.
- Open wounds.
- Excretions or secretions.

**We don't give them any attention; they don't cause any clinical signs or symptoms.**

**Estimated rates of HCAs worldwide: (The burden is very huge)**

- In developed world: 5-10% of patients acquire **1 or more** infections.
- In developing countries: can exceed **25%**.
- In ICU: **30%**, and the mortality **44%** (**very significant percentage, so we have to know how to avoid it or at least reduce it**).
- In rural area: in a well-equipped hospital in Tanzania, **25%** of patients developed surgical-site infections.
- **Millions** of hepatitis B infections are caused by unsafe injection practice. (**many ways of transmitting the infection**)
- **What shocks the most is that deaths because of HCAs are preventable.**

## HCIAs can cause:

- More serious illnesses → increased morbidity.
- Patients stay longer in health-care facilities.
- Long term disability
- High financial burden.
- High personal costs on patients.

## Source of infections:

- Endogenous source (usually): skin, nose, mouth, gastrointestinal tract. **The colonizer of the body is usually the source of infection,**
- Exogenous source: personnel, visitors, equipment, devices, environment.

## Mode of transmission:

- Contact:
  - Direct: e.g. **shaking hands with infected persons.**
  - Indirect: contaminated surfaces touched by infected person.
- Airborne: e.g. **open TB or influenza, when they cough or sneeze.**
- Consuming contaminated food/water.
- Blood exposure.

## Types of healthcare associated infections: the 4 most important ones.

- **Central line**-associated bloodstream infections (**most common**)
- **Catheter** associated urinary tract infections.
- Ventilator associated pneumonia.
- Surgical site infections.

## Urinary tract infections (30%), caused by:

- 1- Invasive urinary procedures.
- 2- **Urinary catheter**(Catheter associated UTIs):
  - **Most common** type of HCAs (>30%), “>560,000” nosocomial UTIs annually.
  - Among UTIs acquired in the hospital, approximately **75%** are associated with a urinary catheter
  - The most important risk factor for developing a catheter-associated UTI (CAUTI) is **prolonged use** of the urinary catheter.
  - Therefore, catheters should only be used for appropriate indications and should be removed as soon as they are no longer needed.
  - **Increased** morbidity & mortality; 13,000 deaths annually, and leading cause for secondary bacteremia with 10% mortality.
  - **Increased** length of stay.
  - **Increased** costs.
  - Source of CAUTI:
    - Endogenous; meatal, rectal or vaginal colonization.
    - Exogenous; contaminated hand of personnel.
  - **Pathogenesis of CAUTI:**
    - Formation of biofilms by pathogens on the surface of catheter.
    - Resistant to antimicrobial and host defences.
  - **Diagnosis of UTI: (1 criteria of the following)**
    - Fever, urgency, frequency, dysuria.
    - Positive urine culture ( $10^5$  microorganism/cc of urine) **with no more than 2 species of organisms (why? It means the urine got contaminated when taken).**
    - A positive culture of a urinary catheter tip is not an acceptable laboratory test to diagnose a urinary tract infection.

- We cannot eradicate catheter related infections whether it is in the bladder or in the vascular compartment without removing the catheter.

### Surgical site infections (17%):

- 2-5 % of patients undergoing inpatient surgeries.
- 3% mortality, with 2-11 times higher risk of death.
- **Most important** risk factors:
  - Inadequate antibiotic prophylaxis.
  - Incorrect surgical skin preparation.
  - Inappropriate wound care.
  - Immunocompromised patients.
- **Types:**
  - **Superficial** incisional surgical site infection: Infection occurs within 30 days after the operative procedure and involves only skin and subcutaneous tissue of the incision.
    - Diagnosis: pus, organisms isolated from site, pain, tenderness, swelling.
    - **A culture-negative finding does not meet this criterion.**
  - **Deep** incisional surgical site infection (**more serious**): involves deep soft tissues.
- **Source of infection:**
  - Endogenous; flora on skin, mucus membranes, GI tract (e.g. **colon surgery**) or seeding from distant focus of infection.
  - Exogenous; personnel, equipment, environment.
- **Pathogens causing SSI:**
  - **Staphylococcus aureus (30%)**
  - Coagulase negative staphylococci (13.7%)

- **Preventive measures: Modifiable risk factors:**
  - Antimicrobial prophylaxis
    - Inappropriate choice
    - Improper timing (pre-incision dose)
    - Inadequate dose based on BMI.
  - Skin or site preparation ineffective.
  - Colorectal procedures.
  - Inadequate wound dressing.
  - Improper glucose control.

## Central-line associated blood stream infection

**Laboratory confirmed blood stream infection:** must meet 1 of the following:

- **Recognized pathogen:** cultured from 1 or more blood cultures and is not related to an infection at another site with **one of the following;**
- **Fever, chills, hypotension** which is not related to other source or infection at another site.

Common skin contaminant:

- **Coag negative staph** (gram positive cocci)
- **Corynebacterium** (gram positive rods)
- **Propionibacterium acnes** (anaerobic gram positive rods)
- **Bacillus species** (anaerobic gram positive rods)

Is cultured from 2 or more blood cultures drawn on **separate occasions**.

## Blood infections (14%):

**Risk factors:**

- Vascular catheter
- Neonatal age

- Critical care
- Immunocompromised

### Advices about blood infections:

- For clinicians:
  - o Promptly remove unnecessary central lines.
  - o Follow proper insertion practices.
- For facilities
  - o Train staff.
  - o Ensure efficient access to hand hygiene.
  - o Monitoring everything in the ICU.

### Lower respiratory tract infections (13%):

#### Risk factors:

- Mechanical ventilation.
- Aspiration.
- Nasogastric tube.
- Patients on antibiotic (kills normal flora → other pathogens grow) or antacids (Lower acidity → growth of bacteria)
- Advanced age.

#### Mechanisms by which VAP develops:

- Aspiration of secretions.
- Colonization of the aerodigestive tract.
- Use of contaminated equipment.

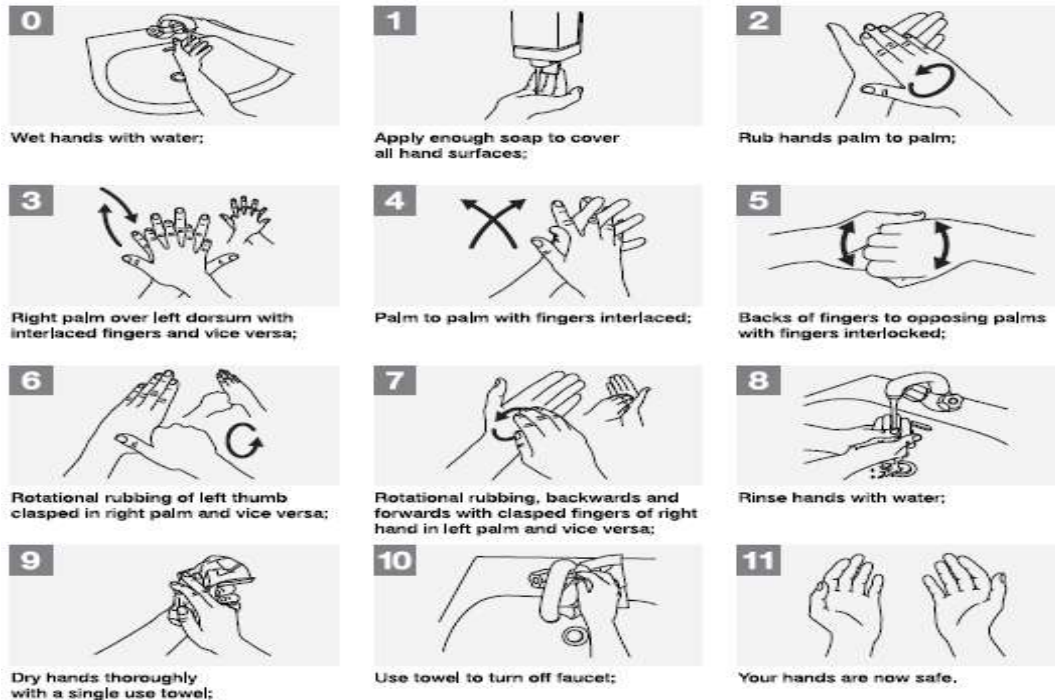
## Prevention of Healthcare Associated Infections:

- At least 50% of HCAI could be prevented.
- Most solutions are simple and not resource-demanding and can be implemented in developed, as well as in transitional and developing countries.
- **Hands are the most common vehicle** to transmit health care-associated pathogens.
- Transmission of health care-associated pathogens from one patient to another via health-care workers' hands requires strict hand hygiene.
- Handrubbing with alcohol-based handrub is the preferred routine method of hand hygiene if hands are not visibly soiled. **This takes only 20–30 seconds.**





- Handwashing with soap and water – essential when hands are visibly dirty or visibly soiled (following visible exposure to body fluids)**handwashing must last 40–60 seconds.**



### Why should you clean your hands?

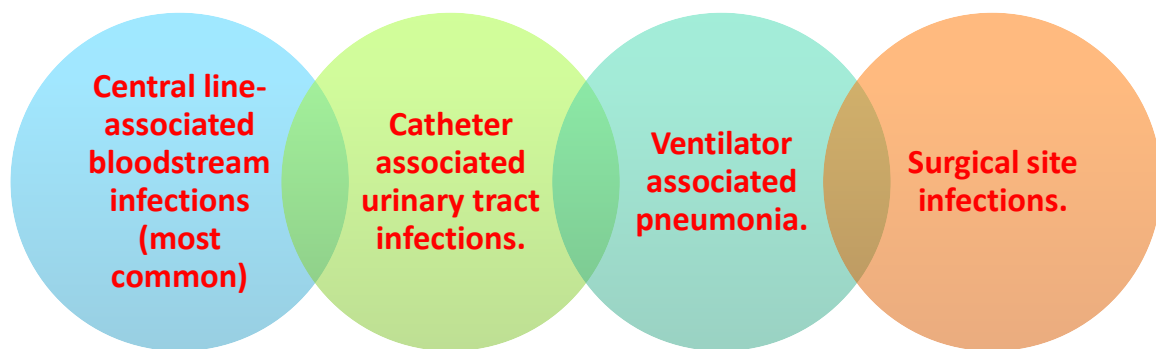
- **Protect the patient** against harmful germs carried on your hands or present on his/her own skin.
- **Protect yourself** and the health-care environment from harmful germs.

## Summary

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Types of healthcare associated infections: the 4 most important ones.



Urinary tract infections (30%), caused by:

- 1- Invasive urinary procedures.
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Surgical site infections (17%):

- Types:
  - o **Superficial** incisional surgical site infection.
  - o **Deep** incisional surgical site infection (more serious).

## MCQs

1- A procedure which often predisposes a hospitalized patient to a urinary tract infection is:

- A. Urinary catheterisation.
- B. Antibiotic therapy.
- C. Colonisation of periurethral areas with 'hospital organisms'.
- D. Immunosuppressive therapy.
- E. Diabetes.

2- Which of the following is a common type of hospital acquired infection?

- A. Urinary tract infection
- B. Surgical wound infection
- C. Lower respiratory tract infection
- D. Skin infection
- E. All of the above.

3- An example of an endogenous infection would be:

- A. Infection of a surgical wound with organisms from another patient.
- B. A lung infection in which the causative organisms are inhaled.
- C. Cystitis caused by organisms from the person's own gastrointestinal tract.
- D. An infection which relates to some genetic abnormality.
- E. A surgical site infection with MRSA.

For more MCQs about this topic,  
visit: <http://quizlet.com/12741185/bio3-mcqs-nosocomialinfectioncontrol-flash-cards/>

1- A

2- E

3- C

