

433 Teams

MEDICINE

29 | Healthcare associated infections



433medicine.team@gmail.com



جامعة
الملك سعود
King Saud University



COLOR INDEX

[Slides](#) - [Step-Up medicine](#) - [Kaplan Notes](#) - [Extre explanation](#) - [Doctor Notes](#)

Objectives:

Not given



Health Care-associated Infection (HCAI):

- It was called “**Nosocomial**” or “**hospital**” infection, but it has been changed to **HCAI** because patients aren’t all hospitalized.
- It is an infection occurring in a patient during the process of care in a hospital or other health-care facility which was not present or incubating at the time of admission.
- Localized or systemic condition resulting from an adverse reaction to the presence of an infectious agent(s) or its toxin(s).

Colonization:

The presence of microorganisms:

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

But they don’t cause adverse clinical signs or symptoms

Estimated rates of HCAI worldwide:

- In modern health-care facilities (In the developed world): **5–10%** of patients acquire one or more infections.
- In developing countries: HCAI **can exceed 25%**
- In intensive care units: HCAI affects about **30%** of patients and the **attributable mortality may reach 44%**.

Work in Rural area:

- A quarter (**25%**) of operations done in a well-equipped rural hospital in Tanzania are linked to **surgical-site infections**.
- **Millions** of cases of hepatitis B annually are caused by unsafe injection practices.

The deaths and illnesses that result are largely preventable

HCAI can cause:

- More serious illness (Increased morbidity).
- Patients stay longer in a health-care facility.
- Long-term disability.
- Excess deaths.
- High additional financial burden.
- High personal costs on patients.

Source of infection:

- 1- **Endogenous sources** are body sites, such as the skin, nose, mouth, gastrointestinal (GI) tract, or vagina that are normally inhabited by microorganisms.
- 2- **Exogenous sources** are those external to the patient, such as patient care personnel, visitors, patient care equipment, medical devices, or the health care environment.

Mode of transmission:

- 1- Contact.
 - **Direct contact**: contact with an infected person, **e.g. MERS CO**
 - **Indirect contact**: contact with contaminated surfaces touched by the infected person.
- 2- Airborne - "aerosols" tiny infected particles from an infected person released when they cough or sneeze which can be breathed (e.g. Pulmonary Tuberculosis)
Airborne is lighter than droplet and it's less than 5 micrometers.
- 3- Consuming contaminated food/water.
- 4- Blood exposures.

Types of healthcare associated infections: the most important

- 1- Catheter-associated urinary tract infections. (Most common)
- 2- Bloodstream infections
- 3- Ventilator-associated pneumonia.
- 4- Surgical site infections

1- Urinary Tract Infections (UTI)

- 30% caused by:
 - Invasive urinary procedures.
 - Urinary catheter (Catheter associated UTIs):
- **Most common type of HCAs**
 - (>30%) of HCAs
 - “>560,000” nosocomial UTIs annually.
- Increased morbidity & mortality; 13,000 deaths annually, and leading cause for secondary bacteremia with 10% mortality.
- Increased length of stay 2-4 days
- Increased costs.

Urinary Catheter Use:

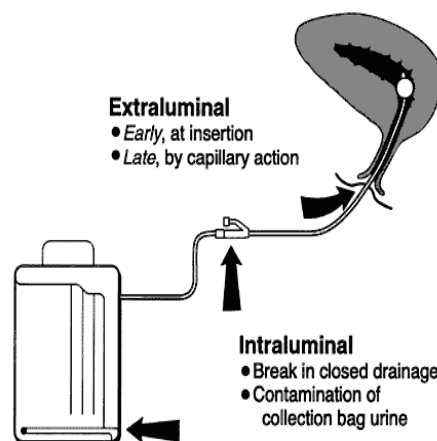
- 15-25% of hospitalized patients
- Often placed for inappropriate indications
- Physicians frequently unaware
- In a recent survey of U.S. hospitals:
 - > 50% did not monitor which patients catheterized
 - 75% did not monitor duration and/or discontinuation.

Pathogenesis of Catheter associated UTI (CAUTI):

Source of microorganisms:

- **Endogenous**; meatal, rectal or vaginal colonization. (Most common)
- **Exogenous**; contaminated hand of personnel.

The thin layer between the mucosa and the catheter facilitate colonizing and ascending of organisms along the urethra



- Studies suggest that the **extraluminal** route may be of greater relative importance in women because of the short urethra and its close proximity to the anus.
- Formation of **biofilms** by pathogens on the surface of catheter (bacteria within biofilms)
- **Resistant** to antimicrobial and host defense.

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.
- A positive culture of a urinary catheter tip is not an acceptable laboratory test to diagnose a urinary tract Infection.

Core Prevention Strategies (go through them briefly)

- Insert catheters only for appropriate indications.
- Leave catheters in place only as long as needed.
- Ensure that only properly trained persons insert and maintain catheters.
- Insert catheters using aseptic technique and sterile equipment (acute care setting).
- Following aseptic insertion, maintain a closed drainage system.
- Maintain unobstructed urine flow.
- Hand hygiene.

Specific recommendations (go through them briefly)

Insert catheters only for appropriate indications

- Minimize use in all patients, particularly those at higher risk of CAUTI and mortality:
- Women, elderly, impaired immunity
- Avoid use for management of incontinence
- Use catheters in operative patients only as necessary.
- Remove catheters ASAP postoperatively, preferably within 24 hours, unless there are appropriate indications for continued use.
- 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.
- Change catheter every 2-3 weeks. If silicon catheter then it can stay up to 2-3 months but once you see signs of infection remove it
- Never lift the bag or place it above the bladder level it can reflux the urine back to the bladder causing cystitis and from there up to the kidneys (pyelonephritis).

2- Surgical Site Infections (17%)

- 2-5 % of patients undergoing inpatient surgeries.
- 3% mortality, with 2-11 times higher risk of death.
- Morbidity: long term disabilities

Most important risk factors:

- Inadequate antibiotic prophylaxis.
- Incorrect surgical skin preparation.
- Inappropriate wound care.

Others:

Surgical intervention duration

Type of wound

Poor surgical asepsis

Diabetes

Nutritional state

Immunodeficiency

Lack of training and supervision

Types:

1-Superficial incisional surgical (SIP or SIS) site infection:

Infection occurs within 30 days after the operative procedure and involves only skin and subcutaneous tissue of the incision.

- Diagnosis: pus or purulent drainage, organisms isolated from site of the incision and culture, pain, tenderness, swelling and redness.
- A culture-negative finding does not meet this criterion.

2-Deep incisional surgical site infection (more serious):

Infection occurs within 30 days after the operative procedure if no implant is left in place or within 1 year if implant is in place and the infection appears to be related to the operative procedure and involves deep soft tissues (e.g., fascial and muscle layers) of the incision.

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: (doctor said that might be a Q in Exam)

- **Staphylococcus aureus. (30%)**
- **Coagulase negative staphylococci. (13.7%)**
- Enterococcus spp. (11.2%)
- *Escherichia coli.* (9.6%)
- *Pseudomonas aeruginosa, Enterobacter spp, Candida spp. Klebsiella oxytoca, Acinetobacter baumannii.*

Preventive measures: Modifiable risk factors

- Antimicrobial prophylaxis (**Prophylaxis is given IV for maximum effect**)
- 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.

Preoperative Measures:

- Administer antimicrobial prophylaxis in accordance with evidence based standards and guidelines
 - **Administer within 1 hour prior to incision**
- 2hr for vancomycin and fluoroquinolones
 - Select appropriate agents on basis of:
- Surgical procedure
- Most common SSI pathogens for the procedure
- Published recommendations

Prevention strategies: (go through them briefly)

– Nasal screen and decolonize only

Staphylococcus aureus carriers undergoing.

- 1) Elective cardiac.
- 2) Orthopedic.
- 3) Neurosurgery procedures with implants.

USING: Preoperative mupirocin therapy.

3- Central Line-associated Bloodstream Infection

- Laboratory confirmed blood stream infection: must meet 1 at least 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 of infection at another site.

Common skin contaminant:

- Coagulase 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%):

Advices about blood infections:

1. For clinicians:

- Promptly removes unnecessary central lines.
- Follow proper insertion practices.

2. For facilities

- Train staff.
- Ensure efficient access to hand hygiene.
- Monitoring everything in the ICU.

Lower respiratory tract infections (13%):

Risk factors:

- **Mechanical ventilation.**
- Aspiration.
- **Nasogastric tube.**
- Patients on antibiotic (kills normal flora then other pathogens grow) or antacids (Lower acidity growth of bacteria)
- Advanced age.
- **VAP** is one of the most common infections acquired by adults and children in intensive care units.
- The mortality attributable to VAP may exceed **10%**
- **Pneumonia** is the most frequently reported infection in intensive care unit patients, predominantly in mechanically ventilated individuals.

Mechanisms by which Ventilator associated pneumonia (VAP) develops:

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

Transmission of multidrug-resistant/marker organisms: (for your information)

1. MRSA: Staphylococcus aureus is common cause of healthcare associated infections.
2. VRE
3. Tuberculosis (MDR).
4. Aspergillus in immunocompromised patient
5. Clostridium difficile: causes colitis.

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 healthcare workers' hands requires strict hand hygiene.
- Hand rubbing with alcohol-based hand rub is the preferred routine method of hand hygiene if hands are not visibly soiled. This takes only 20–30 seconds.
- To effectively reduce the growth of germs on hands, hand rubbing must be performed by following all of the illustrated steps.

Most important prevention of infection is hand washing.



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.



Summary

Type of Healthcare associated infections:

- 1- CAUTI. (Most common)
- 2- Bloodstream infections
- 3- VAP.
- 4- Surgical site infections
 - a. Superficial
 - b. Deep

MCQs

1-A 30-year-old man presents with right upper quadrant pain. He has been well except for an episode of diarrhea that occurred 4 months ago, just after he returned from a missionary trip to Mexico. He has lost 7lb. He is not having diarrhea. His blood pressure is 140/70, pulse 80, and temperature 37.5°C (99.5°F). On physical examination there is right upper-quadrant tenderness without rebound. There is some radiation of the pain to the shoulder. The liver is percussed at 14 cm. There is no lower quadrant tenderness. Bowel sounds are normal and active.

Which of the following is the most appropriate next step in evaluation of the patient?

- A. Serology and ultrasound
- B. Stool for ova and parasite
- C. Blood cultures
- D. Diagnostic aspirate

2-You are a physician in charge of patients who reside in a nursing home. Several of the patients have developed influenza-like symptoms, and the community is in the midst of influenza A outbreak. None of the nursing home residents have received the influenza vaccine.

Which course of action is most appropriate?

- A. Give the influenza vaccine to all residents who do not have a contraindication to the vaccine (ie, allergy to eggs).
- B. Give the influenza vaccine to all residents who do not have a contraindication to the vaccine; also give oseltamivir for 2 weeks to all residents.
- C. Give amantadine alone to all residents.
- D. Give azithromycin to all residents to prevent influenza-associated pneumonia.

3-A 60-year-old female patient is admitted to the hospital in septic shock secondary to a urinary tract infection. The patient is started on antibiotics awaiting culture results. She improves with complete resolution of her symptoms. The patient continues to have a urinary catheter in place. On the 10th hospital day, the patient is discharged to a rehabilitation facility. As a part of the routine admission orders, urinalysis and culture are ordered. The patient denies fever, abdominal pain, nausea, or vomiting. The urinalysis shows 5 to 10 white blood cells and a negative dipstick for nitrite and leukocyte esterase, but the culture grows more than 10⁵ colonies of *Candida albicans*.

Which of the following is the best course of action?

- A. Start antifungal therapy with fluconazole.
- B. Continue broad-spectrum antibiotics.
- C. Remove the urinary catheter.
- D. Encourage water intake and continue to observe.
- E. Remove the urinary catheter and start liposomal amphotericin B.

ANSWERS

1. **The answer is A.** (Fauci, pp 1275-1279.) The history and physical examination suggest amebic liver abscess. Symptoms usually occur 2 to 5 months after travel to an endemic area. Diarrhea usually occurs first but has usually resolved before the hepatic symptoms develop. The most common presentation for an amebic liver abscess is abdominal pain, usually RUQ. An indirect hemagglutination test is a sensitive assay and will be positive in 90% to 100% of patients. Ultrasound has 75% to 85% sensitivity and shows abscess with well-defined margins. Stool will not show the trophozoite at this stage of the disease process. Blood cultures and broad-spectrum antibiotics would be ordered in cases of pyogenic liver abscess, but this patient's travel history, the chronicity of his illness, and his lack of clinical toxicity suggest *Entamoeba histolytica* as the probable cause. Aspiration is not necessary unless rupture of abscess is imminent. Metronidazole remains the drug of choice for amebic liver abscess.

2- **The answer is B.** (Fauci, pp 1127-1132.) Influenza A is a potentially lethal disease in the elderly and chronically debilitated patient. In institutional settings such as nursing homes, outbreaks are likely to be particularly severe. Thus, prophylaxis is extremely important in this setting. All residents should receive the influenza vaccine unless they have known egg allergy (patients can choose to decline the vaccine). Since protective antibodies to the vaccine will not develop for 2 weeks, oseltamivir can be used for protection against influenza A during the interim 2-week period. Because of increasing resistance, amantadine is no longer recommended for prophylaxis. The best way to prevent influenza-associated pneumonia is to prevent the outbreak in the first place.

3. **The answer is C.** (Southwick, pp 1-10.) Every positive culture requires interpretation. A positive culture could represent a pathogen, a colonizer, or a contaminant. The presence of symptoms and signs of infection in addition to supportive laboratory and radiologic data makes a cultivated microbe a pathogen. The patient has no symptoms or signs of infection and her urinalysis shows no pyuria. In this case, *Candida albicans* is a colonizer, and no antifungal therapy is indicated. Predisposing risk factors need to be eliminated to reduce the chances of colonization and to prevent a colonizer from becoming a pathogen. Removing a Foley catheter, controlling hyperglycemia and stopping broad-spectrum antibiotics, when feasible, represent some examples of risk factor elimination. Antifungal therapy (such as with fluconazole or amphotericin B) is inappropriate for fungal colonization alone.

Done By:

Ahmad Alenizi	Othman Abid
Shahad Almazrou	Areej Alalwan
Faroq Abdulfattah	Areej Alwahaib

