



Healthcare Associated Infections

by Dr.Fahad Al Majid

The lecture is more of clinical guidelines and titles that you should be aware of for the future

Done by: Najla Aldraiweesh & Dovish

Revised by: Sarah Almubrik & Mohanad Alsuhaime

Objectives:

- **Not given yet**

References:

Slides - Black

Doctor's notes - Red

Step up / davidson - Blue

Extra explanation - Grey

[Editing file](#)

Health Care-associated Infection (HCAI):

- ❖ **An infection occurring in a patient during the process of care in a hospital or other healthcare facility which was not present or incubating at the time of admission.**
 - ❖ Can be either Localized or Systemic
 - ❖ This includes infections acquired in the health-care facility but appearing after discharge.
 - ❖ In the past it was referred to as “**nosocomial**” or “**hospital infection**”. But it has changed to HCAI (WHY ??) because patients aren't all hospitalized. (dressing changes, dialysis)

- ❖ **Colonization: The presence of microorganisms on skin, on mucous membranes, in open wounds, or in excretions or secretions **WITHOUT causing adverse clinical signs or symptoms.****

- ❖ **The Impact of HCAI:**

1. More serious illness (↑Morbidity)
2. Longer hospital stay
3. Long-term disability
4. Excess death
5. Financial burden

HCAI RATES

Developed world: 5-10%
Developing countries : exceed 25%
ICU: 30%, attributable mortality may reach 44%
(25%) of operations done in a well-equipped rural hospital in Tanzania are linked to surgical-site infections
Millions of hepatitis B cases annually caused by unsafe injection practices

- ❖ **Sources of infection:**

- **Endogenous sources** (body sites): skin, nose, mouth, GIT, or vagina that are normally inhabited by microorganisms.
- **Exogenous sources** (external to the patient): patient care personnel, visitors, patient care equipment, medical devices, or the health care environment

- ❖ **Mode of transmission:**

1. **Contact:**
Direct contact= actual contact with an infected person
Indirect contact= contact with contaminated surfaces touched by the infected person, or where droplets of body fluid have landed; Spread on unwashed hands)
2. **Airborne "aerosols"**: tiny infected particles from an infected person released when they cough or sneeze which can be breathed in. e.g. Pulmonary Tuberculosis
3. **Consuming contaminated food/water, swallowing of microorganisms carried on the hands**
4. **Blood exposures**

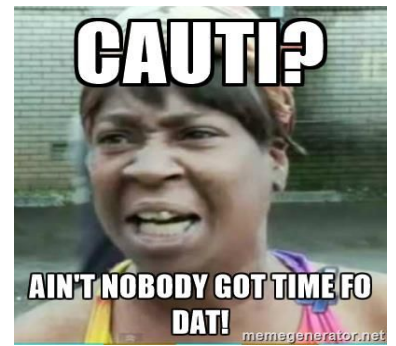
1. URINARY TRACT INFECTIONS (UTI'S) :

30% CAUSED BY :

- 1- Invasive urinary procedures.
- 2- Urinary catheter .

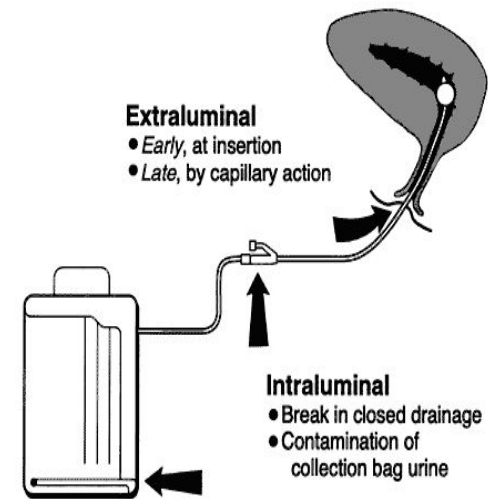
(Catheter associated UTIs):

- **Most common type of HCAs (>30%)**, ">560,000" nosocomial UTIs annually.
- 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 **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.



SOURCE OF CATHETER ASSOCIATED UTI (CAUTI) :

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

PATHOGENESIS

Extraluminal contamination may occur early, by direct inoculation when the catheter is inserted, or later, by organisms ascending from the perineum by capillary action in the thin mucous film contiguous to the external catheter surface.

Intraluminal Contamination occurs by reflux of microorganisms gaining access to the catheter lumen from failure of closed drainage or contamination of urine in the collection bag.

- 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:

Must at least meets **1** of the following criteria :

- **Fever, urgency, frequency, dysuria.**
- **Positive urine culture** (10⁵ microorganism/cc of urine) **with no more than 2 species of organisms.** Why? when it exceeds 1 or 2 types of species that means it is contaminated “false +ve”
- A positive culture of a urinary catheter tip **is not an acceptable** laboratory test to diagnose a urinary tract Infection.
- **DO NOT** treat patient with UTI unless he is **symptomatic**

CORE PREVENTION STRATEGIES (GO THROUGH THEM BRIEFLY):



To diagnose one with UTI, he/she must has:

- 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.
- 1 symptom of UTI
 - Positive urine culture 10⁵ microorganism
 - Should not be more than 2 different species of organism in the sample
 - Why? when it exceeds 1 or 2 types of species that means it is contaminated “false +ve”

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:

- Burden : 17% of all HCAI; second to UTI , 2%-5% of patients undergoing inpatient surgery.
- Mortality : 3 % mortality, **2-11 times** higher risk of death
75% of deaths among patients with SSI are directly attributable to SSI.
- Morbidity : long-term disabilities.

MOST IMPORTANT RISK FACTORS:

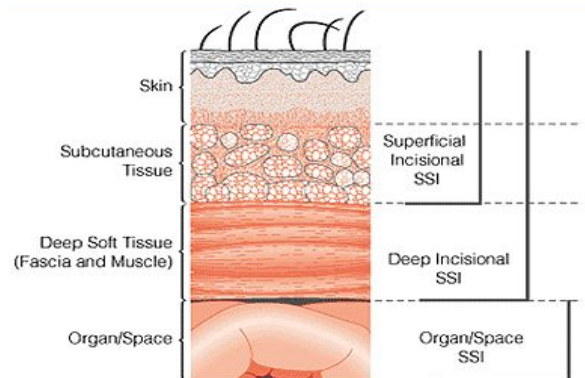
- Inadequate antibiotic prophylaxis.
- Incorrect surgical skin preparation.
- Inappropriate wound care.
- Immunodeficiency
- Others: Surgical intervention duration, Type of wound, Poor surgical, asepsis, Diabetes, Nutritional state, Lack of training and supervision.

TYPES OF SURGICAL SITE INFECTIONS (SSI) :

- 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.
- 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 SURGICAL SITE INFECTIONS :

- 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: (IMPORTANT)

- **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.**
- You can get an ecoli pneumonia from HAI because the fecal matter can be in the skin.
- HAI bugs differ from community acquired bugs they can be more resistant and more virulent.
- MRSA>> resists all other types of antibiotics. Treat by giving vancomycin.
- Our bodies don't resist these drugs cause we are not hospitalized unlike admitted patients where they start.
- Developing resistance against almost all effective drugs

PREVENTIVE MEASURES: MODIFIABLE RISK FACTORS :

- **Antimicrobial prophylaxis (Prophylactic antibiotics are given **IV within 1 hour** prior to surgery. So, it reaches its peak during the procedure!)**
- **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:

- **Nasal screen and decolonize only Staphylococcus aureus carriers undergoing.**
 - 1) **Elective cardiac.**
 - 2) **Orthopedic.**
 - 3) **Neurosurgery procedures with implants.****USING: Preoperative Mupirocin therapy**

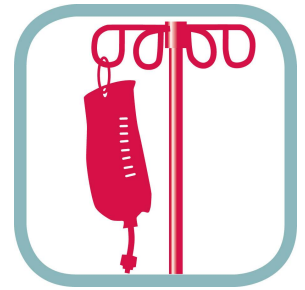
3. CENTRAL LINE-ASSOCIATED BLOODSTREAM INFECTION :

- ❖ The most common route of central line-associated bloodstream infection is Migration along the catheter track

- ❖ Laboratory-confirmed bloodstream infection:

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
- or Hypotension



*which is also not related to other source of infection at another site.

- ❖ Common skin contaminant (is cultured from 2 or more blood cultures drawn on separate occasions.):

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



Femoral IV line =
DIRTIEST
Subclavian IV line =
CLEANEST

- ❖ How to avoid? ***Advices***

1. For Clinicians

- Promptly remove unnecessary central lines: Perform daily audits to assess whether each central line is still needed (no maximum # of days)
- Follow proper insertion practices
 - Hand hygiene before insertion
 - Adhere to aseptic technique
 - Use maximal sterile barrier precautions (e.g. sterile gloves)
 - Perform skin antisepsis with >0.5% chlorhexidine with alcohol
 - Choose best site to minimize complications (Avoid femoral site in adult patients)
 - Cover the site with sterile gauze or sterile, transparent, semipermeable dressings

2. For Facilities

- Empower staff to stop non-emergent e.g. Insertion if proper procedures are not followed.
- “Bundle” supplies (e.g. in a kit)
- Provide the checklist
- Ensure efficient access to hand hygiene
- Monitor and provide prompt feedback for adherence to hand hygiene
- Provide recurring education sessions on central line insertion, handling and maintenance

4. Lower Respiratory Tract infections:

(Ventilator-Associated Pneumonia)

- **VAP is one of the most common infections acquired by adults and children in ICU**
- Pneumonia is the most frequently reported infection in ICU patients, critically ill and predominantly in **mechanically ventilated individuals** (Patients most at risk)
- VAP is a cause of significant patient morbidity and mortality, increased utilization of healthcare resources, and excess cost.
- The mortality attributable to VAP may exceed 10%

Pathogenesis and Risk Factors:

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

Transmission of multidrug-resistant/marker organisms

<p>MRSA Methicillin-resistant Staphylococcus aureus</p>	<p>-MRSA is predominant cause of S. aureus infection in healthcare (49-65%) and community settings</p> <p>-Second most common overall cause of healthcare HCAI (14%). 1st Coagulase-negative staphylococci (15%)</p> <p>-Most common cause of: surgical site infections (30%) and VAP (24%), IV lines infection</p> <p>-Resistant to a number of widely used antibiotics</p> <p>-WORSE than Acinetobacter</p>
<p>VRE</p>	
<p>Carbapenem-resistant Acinetobacter</p>	<p>-Acinetobacter is commonly found in soil and water</p> <p>-Outbreaks typically occur in ICU and healthcare settings housing very ill patients.</p> <p>-While there are many types or “species” of Acinetobacter and all can cause human disease, Acinetobacter baumannii accounts for about 80% of reported infections.</p> <p>-rarely occur outside of healthcare settings</p>
<p>ESBL-producing organisms → MDR Enterobacteriaceae</p>	
<p>Clostridium difficile</p>	<p>difficile is a bacterium that causes colitis. Diarrhea and fever are the most common symptoms of Clostridium difficile infection.</p> <p>Overuse of antibiotics is the most important risk for getting C. difficile infection.</p>
<p>Aspergillus</p>	<p>in immunocompromised patient .</p>
<p>Tuberculosis (MDR)</p>	<p>MDR= Multi-drug resistance</p>

Prevention of healthcare-associated infection:

Validated and standardized prevention strategies have been shown to reduce HCAI. At least 50% of HCAI could be prevented

Hand Transmission:

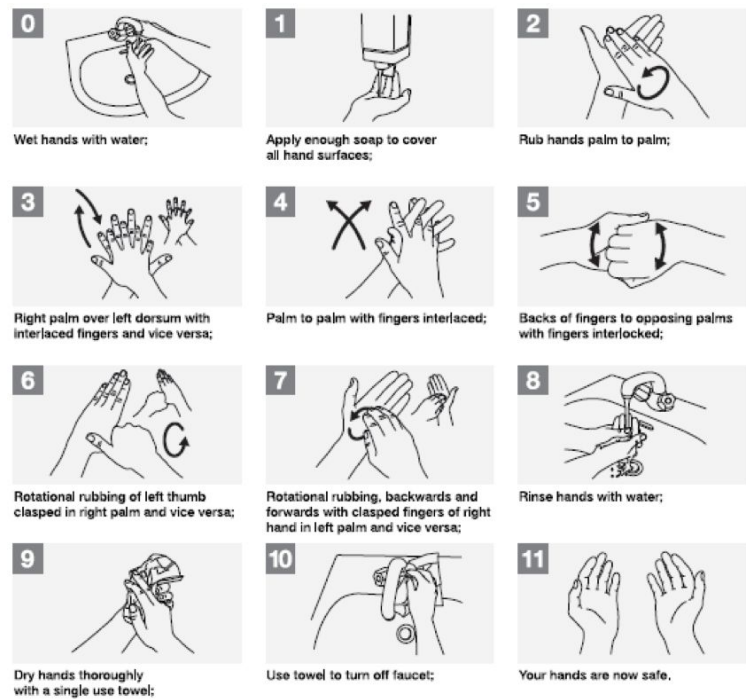
-Hands are the most common vehicle to transmit health care-associated pathogens

-Hand Hygiene is important to protect the patient and the health-care worker

-How to clean?

Hand Rubbing with alcohol-based handrub is the preferred routine method of hand hygiene if hands are **not visibly soiled**

Handwashing with soap and water essential when hands are exposed to **C. difficile**¹, **visibly dirty** or **visibly soiled** (following visible exposure to body fluids). Must last for 40-60 sec.



An effective prevention program requires several key factors:

- aggressive goals
- participation by everyone,
- strong partnership between infection prevention experts and clinicians, and especially leadership support.

1. Spores of c.difficile can't be removed by Sanitizer.

Thank you

If you have any question please contact with us at:
Internalmedicineteam434@gmail.com