

Healthcare Associated Infections

435 medicine teamwork

[**Important** | **Notes** | Extra Explanation | Editing file]

lecture objectives:

⇒ Not given

this is more of infection control , clinical guidelines and general information lecture just go through it and understand it don't spend much time , there will be only one or two questions in the exam and there will be very simple don't worry (doctor fahad said that)

Lecture Summary

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References: Doctor slides and notes

Healthcare Associated Infections(HCAIs)

Introduction:

Health Care-associated Infection (HCAI):

- HCAI is 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.
- This includes infections acquired in the health-care facility but appearing after discharge.
- Hospital acquired infections include infections in both patients and hospital staff (doctors , nurses, technicians,...anyone acquiring an infection from a medical institute) It can happen between patients and doctors, patients and techniciansetc
- Note that HCAI can also occur at home (if the patient is receiving health care there), or in clinics ,so not only in hospitals!
- Examples of HCAI:
 - scenario 1: Patient was admitted for management due to dyspnea associated with heart failure, the patient was afebrile upon admission but acquired the infection through management with IV for example
 - Scenario 2: FEBRILE Patient was admitted due to suspected meningitis ,upon examination, the patient coughed in the doctor's face The doctor got infected by meningococcal organism (from patient to doctor)
 - Note! Even if the patient got the fever AFTER discharge (due to incubation period), we STILL call it HCAI (if organism acquired from the setting of a medical institute)
- is a condition in which patients develops fever during active medical treatment for some other illness, such as:
 - **Surgical procedures** (The most common is wound infections Less common :infection due to instrumentation),
 - **Urinary and respiratory tract instrumentation,**
 - **Intravascular devices** → **septic thrombophlebitis,**
 - **Drug therapy,**
 - **Immobilization** → **recurrent pulmonary emboli** (This is obviously not an infection , but the doctor mentioned it here because PE can cause fever which can be mistaken for an infection),
 - **Clostridium difficile colitis** (secondary to antibiotic therapy)
- Can be either Localized or Systemic
- In the past it was referred to as “nosocomial” or “hospital infection”. But it has been changed to HCAI because patients aren’t all hospitalized (i.e. dressing changes, dialysis)

Infection vs. colonization:

- **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.
- You MUST Differentiate between colonization and health care associated infection
- If a throat culture is taken from a normal person (one of the students for example), we will get an organism that is present in the community BUT say if the student was admitted to the hospital and stayed for a few days, and then we culture their throat, we will find a nasty organism that is found in the hospital -this organism is not causing a problem thus we call this colonization! Thus culturing a nasty organism (that is hospital related) that does not cause a pathology does NOT mean that there is an actual nosocomial infection
- -if you swab a wound that does not appear to be infected (not swollen nor red ..) and find an organism, this is only colonization

Healthcare workers

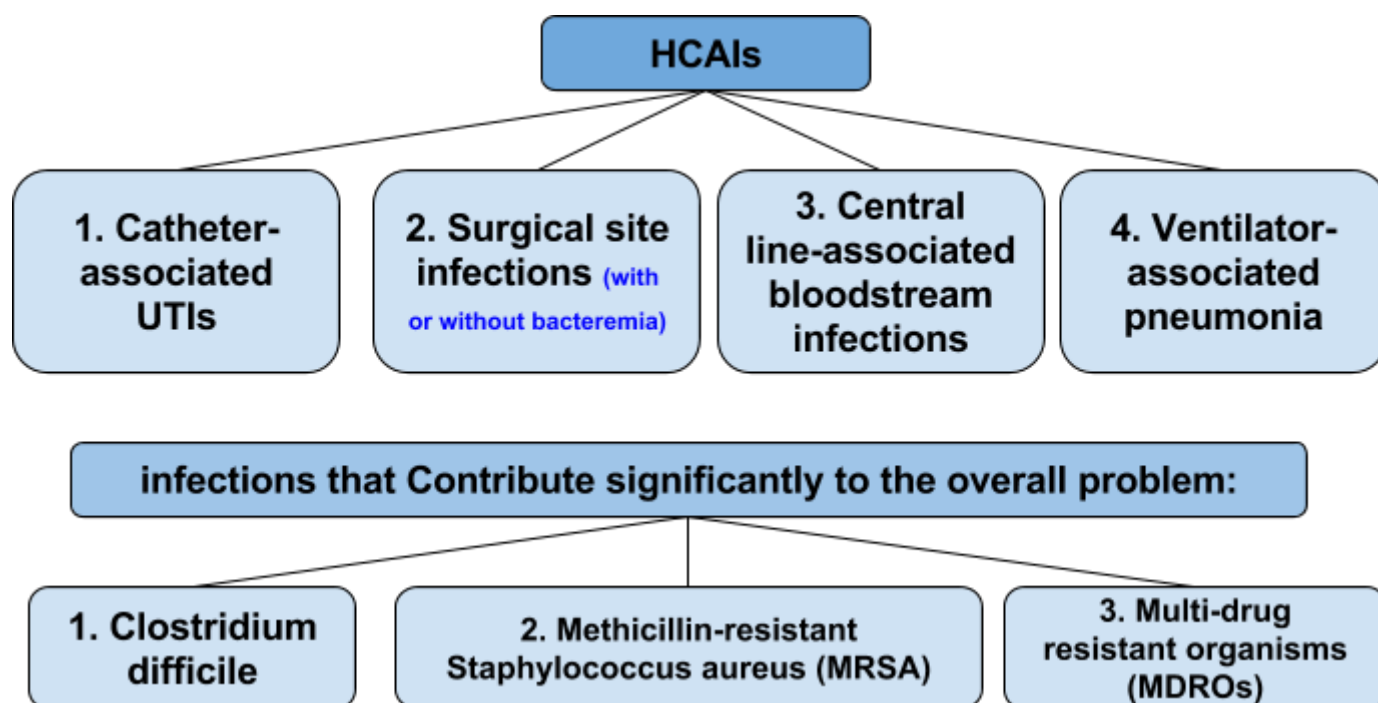
- Workers in the health care are at risk of occupational exposure via:
 - 1) **Needle stick injury**, exposure to mucous membranes, or non-intact skin:
 - HIV/AIDS , Hepatitis B and Hepatitis C ..
 - 2) **Person’s respiratory secretions**, such as through coughing
 - Tuberculosis , MERS-COV, H1N1..
- the most common in KSA is TB

Estimated rates of HCAI worldwide: In modern health-care facilities in the:

- **Developed world (north america , Japan ,Europe...etc):** 5–10% of patients acquire one or more infections
- **Developing countries:** the risk of a HCAI might exceed 25%.
- **In intensive care units:** HCAs affect about 30% of patients and the attributable mortality may reach 45%
- Why is the percentage higher in the ICU? because more devices are used: the urinary catheter , the central line , the intubation devices, peripheral line
- the longer the devices stay attached to the patient, the higher the risk of infection, so remove the device as soon as possible

Sources of infection:	
Endogenous sources (body sites)	Exogenous sources (external to the patient)
<p>skin, nose, mouth, GIT, or vagina that are normally inhabited by microorganisms.</p> <p>Examples of endogenous infections:</p> <ul style="list-style-type: none"> • Nasal staph culture is necessary before CABG to make sure that the patient is not a STAPH CARRIER (to prevent staph sternal osteomyelitis) • The GIT has gram negative bacteria as normal flora, which give balance and help prevent infection ~ antibiotics cause an imbalance which leads to infection by killing the protective normal flora • Note that females are more susceptible to infections that are transmitted from the GI to the genitourinary tract due to their short urethras • If the doctor introduces a catheter in a female and forgets about it, she can develop " fecal catheter associated infection" 	<ul style="list-style-type: none"> - patient care personnel Ex: Doctor examines a patient with infected hands transmitting organisms by physical contact, - visitors - patient care equipment - medical devices Ex: Introducing a non sterile catheter into the patient - the healthcare environment (A TB patient that is not put into isolation upon admission, thus infecting the patients around him in the same room by coughing mycobacterium bacilli into the environment)

Four categories of infections account for approximately 75% of HAIs in the acute care:



Types of Healthcare Associated Infections

1. URINARY TRACT INFECTIONS (UTIs) (30%) :

Nosocomial UTIs are CAUSED BY:

1- Invasive urinary procedures.

- Such as procedures done by urologists : cystoscopy or ureteroscopy. These devices may introduce organisms from the outside into the body
- **Risk factors:** Advanced age, Severe underlying disease, Urolithiasis, Pregnancy, and Diabetes

2- Urinary catheter (Catheter associated UTIs):

- **Most common type of HCAIs** (About a quarter of in-patients are catheterized)
- Thus if you want to decrease incidence of HCAI , you must decrease incidence of UTIs (do not catheterize unless necessary) -catheter introduces the infection into the bladder which may ascend to the kidneys
- Hospital staff are advised to use diapers in elderly patients who do not have a crucial need for a catheter to minimize the incidence of UTIs
- The vast majority of nosocomial UTIs occur in patients whose urinary tracts are currently or recently catheterized (35-45%)
- Catheter-associated bacteriuria in about 5% catheter per day; >90% is CA-ASB¹ that is usually persistent. Most do not progress to CA-UTI. 3% of bacteriuric patients develop bacteremia.
- Important source of multi-drug resistant bacteria.
- 15-25% of hospitalized patients receive urinary catheters during their hospital stay ..
- Male and female, female predominance
- Pathogen is less virulent than in uncomplicated UTI² and may be:
 - Single (short-term catheter)
 - Multiple (long-term catheter): gram-negatives, gram-positives, Candida sp.
- CA-UTI: fever, altered mental status, usually no lower tract symptoms because they're on catheter so you won't see the voiding and storage/obstructive symptoms
- CA-UTI: $\geq 10^3$ CFU/mL³

Just know the following : Catheter associated UTIs occur in both males and females with a slight female predominance . The organisms may be intraluminal or extraluminal • if the catheter stays for a short amount of time , then there is usually only ONE organism causing the infection • If the catheter stays for a long time , usually more than two organisms cause the UTI • The rule is : the longer the catheter stays , the more organisms will contribute to the infections ! • How to diagnose it ? if you find more than a 100000 bacteria

Impact of CAUTI:

- Increased morbidity, mortality, Hospital cost, and length of stay.
- Hospital costs are increased. This is attributed to the increased length of stay and to the cost of antibiotics
- Bacteriuria can lead to unnecessary antimicrobial use [which can increase resistance](#)
- Urinary drainage systems are often reservoirs for multidrug-resistant bacteria and a source of transmission to other patients.

PATHOGENESIS:

1. **Extraluminal contamination of the catheter:** fecal organisms spread up the periurethral space from the patient's perineum or GI-Tract (**endogenous**) and ascend catheter/urethra (**exogenous**)
2. **Intraluminal contamination of the catheter:** fecal or exogenous (cross-infection) organisms enter drainage system. occurs by reflux of microorganisms gaining access : to the catheter lumen from failure of closed drainage or contamination of urine in the collection bag.

¹ catheter-associated asymptomatic bacteriuria

² E. coli strains isolated from **complicated** UTI (such as CA-UTI) cases are, as a group, less virulent than those isolated from uncomplicated infections. [Read](#)

³ the threshold of bacteriuria proposed at IDSA to diagnose CAUTI in a symptomatic patient was $\geq 10^3$ count-forming units (CFU)/ml. if the level of bacteriuria is between $\geq 10^3$ and $\leq 10^5$ CFU/ml, a positive urinalysis is required to satisfy the diagnosis of CAUTI. [Read](#)

DIAGNOSIS OF UTI:

The doctor stressed that the majority of patients with catheter associated UTIs are asymptomatic (why?) because the presence of the catheter does NOT allow them to feel dysuria upon micturition nor frequency BUT IF THE INFECTION ASCENDS FROM THE BLADDER TO THE KIDNEY ---> PATIENT WILL BE SYMPTOMATIC

- an asymptomatic patient with a lower UTI will become symptomatic upon catheter REMOVAL

1. Symptomatic urinary tract infection:

- Fever (38.8C), urgency, frequency, dysuria or suprapubic tenderness
- Positive urine culture ($> 10^5$ 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”

2. Asymptomatic bacteriuria:

- An indwelling urinary catheter within 7 days
- A positive urine culture, with no more than 2 species of microorganisms
- **NO** fever, urgency, frequency, dysuria, or suprapubic tenderness.
 - A positive culture of a urinary catheter tip is not an acceptable laboratory test to diagnose a urinary tract Infection. This is no longer practiced, because it has been proven that the catheter tip will become contaminated upon removal and touch thus giving false results

PREVENTION:

- Reduce urinary catheterization; use condom, intermittent or suprapubic catheter vs. indwelling urethral catheter; strict closed system with indwelling urethral catheter
- **Insert catheters for appropriate indications only as necessary and for the shortest time.**
 - Avoid use for management of incontinence
 - Remove catheters ASAP postoperatively, preferably within 24 hours, unless there is an appropriate indication for continued use.
 - **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.
- 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. **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).
So we keep the bag lower than the bladder ,Why? Because gravity will help in urine emptying if the bag is at a low level , thus preventing stagnation and decreasing risk of infections.
- Hand hygiene before and after insertion or manipulation of the catheter. If you want to take anything from this lecture , JUST REMEMBER HAND HYGIENE---> you prevent many infections this way

Treatment:

- Multidrug resistance is common
- 5-14 day regimen, depending on severity
- Because of increasing antimicrobial resistance, it is important **not** to treat patients with asymptomatic bacteriuria unless there is evidence of potential benefit.

2. SURGICAL SITE INFECTIONS (17%):

A surgical site infection is an infection that occurs after surgery in the part of the body where the surgery took place. If a surgical site infection occurs, this suggests that there is a problem with the aseptic technique of either the doctor or the nurses or the intern.... it can be anyone in the surgical environment

- Occurs in 2%–5% of patients undergoing inpatient surgery.
- Accounts for 17-20% of all HAIs in hospitalized patients
- Each SSI is associated with approximately 7–11 additional postoperative hospital-days
- Patients have a 2–11-times higher risk of death compared with operative patients without an SSI.

Causes:

- **Inadequate antibiotic prophylaxis.** One dose before anesthesia and one dose after should be given
 - Inappropriate choice
 - Improper timing (pre-incision dose). Prophylactic antibiotics are given IV within 1 hour prior to surgery. (2hr for vancomycin and fluoroquinolones). So, it reaches its peak during the procedure!
 - Inadequate dose based on BMI.
- **Incorrect/ineffective surgical skin preparation.**
- **Inappropriate wound care** Post-op care is faulty

Risk factors:

- Immunodeficiency
- Improper glucose control (diabetes)
- Surgical intervention duration (Procedures > 3 h.)
- Others: Type of wound, Poor surgical asepsis, Nutritional state, Lack of training and supervision, Colorectal procedures, Colonization with preexisting microorganisms

TYPES OF SURGICAL SITE INFECTIONS (SSI) :	
Superficial incisional SSI (SIP or SIS):	Deep incisional SSI (more serious):
Infection occurs <u>within 30 days</u> after the operative procedure, and	Infection occurs <u>within 30 days</u> after the operative procedure if no implant is left in place, or <u>within 1 year</u> if implant is in place and the infection appears to be related to the operative procedure
Involves only skin and subcutaneous tissue of the incision.	Involves deep soft tissues (e.g., fascial and muscle layers) of the incision.

Diagnosis:

1. Purulent drainage from the superficial incision. A Deep incision spontaneously dehisces or is deliberately opened by a surgeon and is culture-positive or can not be cultured.
2. Organisms isolated from an aseptically obtained culture of fluid or tissue from the superficial incision
 - **A culture-negative finding does not meet this criterion.**
3. At least 1 symptom or sign of infection: Fever (38.8), localised pain or tenderness, localised swelling, redness, or heat.

PATHOGENS CAUSE SSI: (IMPORTANT)

- Coagulase negative staphylococci (31%) - the most common
- Staphylococcus aureus (20%)-which is coagulase positive
- Others: Enterococci, Candida species, Escherichia coli, Klebsiella species, Pseudomonas species, Enterobacter species, Serratia species, Acinetobacter baumannii.

Prevention strategies:

CDC infection prevention guidelines:

- Clean hands and arms up to the elbows with an antiseptic agent just before the surgery.
- Clean hands with soap and water or an alcohol-based hand rub before and after caring for each patient.
- Wear special hair covers, masks, gowns, and gloves during surgery to keep the surgery area clean.
- Use prophylactic antibiotics if indicated:
 - Administer within 1 hour prior to incision and discontinue within 24 hours.
 - Select appropriate agents on basis of:
 - Surgical procedure
 - Most common SSI pathogens for the procedure
 - Published recommendations
 - Redose prophylactic antimicrobial agents for long procedures
 - Nasal screen and decolonize only Staphylococcus aureus carriers undergoing:
1) Elective cardiac. 2) Orthopedic. 3) Neurosurgery procedures with implants.
USING: Preoperative Mupirocin therapy
- Clean the skin at the site of your surgery .

3. CENTRAL LINE-ASSOCIATED BLOODSTREAM INFECTION (CLABSI) (14%):

- An important **cause of morbidity and mortality**
- Most are associated with intravascular catheters, and central venous catheters in particular (90%).

Pathophysiology:

1) migration of skin organisms at the insertion site into the cutaneous catheter tract and along the surface of the catheter with colonization of the catheter tip usually during the 1st week after insertion.

→ This is the most common route of infection for short-term catheters

2) direct contamination of the catheter or catheter hub by contact with hands or contaminated fluids or devices. Extrinsic contamination cause up to 50% of bacteremia with arterial line insertion for hemodynamic monitoring.

3) less commonly, catheters might become hematogenously seeded from another focus of infection

4) rarely, infusate contamination might lead to Catheter-related bloodstream infection (CRBSI)

Diagnosis: Laboratory-confirmed bloodstream infection.

[Read more](#)

Criterion 1 (recognized pathogens):

Isolation of one or more recognized bacterial or fungal pathogens from one or more blood cultures

- Staphylococcus aureus,
- Gram negative bacilli accounted for 19% and 21% of CLABSIs reported to CDC
- Candida albicans.

+ organism cultured from blood is not related to an infection at another site.

Criterion 2:

The patient has at least one of the following signs and symptoms within 24 hours of a positive blood culture being collected:

- Fever (>38°C);
- Chills or rigors;
- or Hypotension

AND AT LEAST : isolation of the same potential contaminant from two (2) or more blood cultures drawn on separate occasions within a 48 hour period.

Vascular catheter infections - Risk factors

- Neonatal age
- Severe underlying disease
- Neutropenia
- Immunodeficiency
- New invasive technologies
- Lack of training and supervision

Catheter factors:

- Location of the catheter.
- Duration of catheterization
- Type of catheter material
- Conditions of insertion
- Catheter-site care
- Skill of the catheter inserter

How to avoid? *Advices*

1. For Clinicians

- **Promptly remove unnecessary central lines:**

- **Remove peripheral venous catheters if the patients develops signs of:**
 - phlebitis (warmth, tenderness, erythema or palpable venous cord),
 - infection, or
 - a malfunctioning catheter
- Perform daily audits to assess whether each central line is still needed (no maximum # of days)
- Use for hyperalimentation or hemodialysis compared with other indications

- **Follow proper insertion practices**

- Hand hygiene before insertion
 - Adhere to aseptic technique (education)
 - Use maximal sterile barrier precautions (i.e., mask, cap, gown, sterile gloves, and sterile full-body drape). Submaximal compared with maximal (mask, cap, sterile gloves, gown) barrier precautions during insertion .
 - Perform skin antisepsis with >0.5% chlorhexidine with alcohol
 - Choose best site to minimize infections and mechanical complications
 - Avoid femoral site in adult patients: Femoral IV line = DIRTIEST (due to increased colonization by normal flora in the inguinal area), Subclavian IV line = CLEANEST
 - Femoral or internal jugular placement compared with subclavian
- What are the three areas of humidity in the human body ?
- 1-Axilla
 - 2-inguinal area
 - 3-area under the breasts This is why the subclavian is favored over the femoral when putting a central line
- Cover the site with sterile gauze or sterile, transparent, semipermeable dressings

2. For Facilities

- Empower staff to stop non-emergent insertion if proper procedures are not followed.
- "Bundle" supplies (e.g. in a kit)
- Provide the checklist to clinicians
- 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 (13%):

-A patient comes with PULMONARY edema -severe dyspnea- thus he is put on a ventilator
-The ventilator predisposes to infection because patient's cilia and cough impulse can no longer ward off infection and the lungs are vulnerable to infectious organisms

1- Mechanical ventilation. (most common type)

2) Aspiration.

3) Nasogastric tube.

Pathogenesis/ etiology:

- Aspiration of endogenous or hospital acquired oropharyngeal flora.
- Aspiration of secretions
- Colonization of the aerodigestive tract
- Use of contaminated equipment

Risk Factors:

- Central nervous system depressants
- Antibiotics and anti-acids
- Prolonged health-care facilities stay
- Malnutrition
- Advanced age
- Surgery
- Immunodeficiency

Health care associated pneumonia

Note that there are three mechanisms to acquire pneumonia : 1-inhaled the organism (usually occurs in CAP) 2-aspiration: for example : an elderly patient seizing ---> lost consciousness ---> aspirated the organism to the lungs 3-hematogenous

- Pneumonia that occurs 48 hours or more after admission and did not appear to be incubating at the time of admission.
- Ventilator-associated pneumonia (VAP) is a type of HAP that develops more than 48 to 72 hours after endotracheal intubation
- Pneumonia has accounted for approximately 15% of all hospital-associated infections.
 - and 27% of all infections acquired in the medical intensive-care unit (ICU) and
 - and 24% coronary care unit.
 - but IT cause 40% extra cost in hospital.
- The second most common hospital-associated infection after that of the urinary tract
- A leader cause of mortality among HCAI.
 - **The most common and lethal is: Ventilator-associated pneumonia: 5-15% death.(important)**

Risk factors: (Events) just go through it

A} Factors that increase colonization by potential pathogens:

- 1) prior antimicrobial therapy.
- 2) contamination of ventilator circuits.
- 3) Decreased gastric acidity

Gastric acid (low ph) kills infectious organisms When we take PPIs , we decrease the potent acidity of the stomach , thus predisposing us to GI infections and UTIs

Side note : pantoprazole may cause osteoporosis thus ranitidine may be used instead

B} factors facilitate aspiration of oropharyngeal contents:

- 1) Intubation
- 2) Decreased level of consciousness.
- 3) Presence of nasogastric tube.

C} factors that reduce the host defense:

- 1) Chronic lung disease
- 2) Old age
- 3) Upper abdominal surgery.

Diagnosis:

1. Fever, cough, and development of purulent sputum.
2. Radiologic evidence of a new or progressive pulmonary infiltrate
3. Leukocytosis.

Prevention of HCAI:

- Validated and standardized prevention strategies have been shown to reduce HCAI.
- 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

Hand Transmission:

- Hands are the **most common vehicle** to transmit health care-associated pathogens
- Transmission of healthcare-associated pathogens from one patient to another via health-care workers' hands requires strict hand hygiene
- 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. To effectively reduce the growth of germs on hands, handrubbing must be performed by following all of the illustrated steps ([picture](#)). This takes only 20–30 seconds!
- **Handwashing with soap and water** is essential when hands are visibly dirty or visibly soiled (following visible exposure to body fluids)⁴. To effectively reduce the growth of germs on hands, handwashing must last 40–60 secs and should be performed by following all of the illustrated steps ([picture](#))

Isolation

Standard precautions: Gloving and hand cleansing for potential contact with :

- 1) blood
- 2) all other body fluid ,secretion or excretion
- 3)non-intact skin
- 4) mucus membrane

Isolation indicated for Patients with potentially contagious clinical syndrome:

Diagnosed to be colonized or infected with transmissible organism through airborne, droplet, and contact:
such as pulmonary tuberculosis, meningitis...etc

⁴ & if exposed to C. difficile, as Spores of c.difficile can't be removed by Sanitizer.

Transmission of multidrug-resistant/marker organisms:

<p>MRSA (Methicillin-resistant Staphylococcus aureus)</p>	<p>MRSA is a predominant cause of S. aureus infection in both healthcare (49-65%) and community settings</p> <ul style="list-style-type: none"> ● Second most common overall cause of HCAI (14%). (1st most common is Coagulase-negative staphylococci (15%)) ● Most common cause of: surgical site infections (30%) and VAP (24%) <p>It is Resistant to a number of widely used antibiotics- WORSE than Acinetobacter</p>
<p>VRE</p>	<p>Vancomycin-resistant Enterococci are specific types of antimicrobial-resistant bacteria that are resistant to vancomycin, the drug often used to treat infections caused by enterococci.</p>
<p>Carbapenem-resistant Acinetobacter</p>	<ul style="list-style-type: none"> ● Acinetobacter is commonly found in soil and water ● Outbreaks typically occur in ICU and healthcare settings housing in very ill patients. ● While there are many types or “species” of Acinetobacter and all can cause human disease, Acinetobacter baumannii accounts for about 80% of reported infections. ● rarely occur outside of healthcare settings
<p>Multi-drug resistant (MDR) Enterobacteriaceae e.g. ESBL-producing organisms</p>	<p>Extended Spectrum Beta-Lactamase (ESBL) Producing Bacteria are Gram-negative bacteria that produce an enzyme; beta-lactamase that has the ability to break down commonly used antibiotics, such as penicillins and cephalosporins. The most common ESBL-producing bacteria are some strains of Escherichia coli and Klebsiella pneumoniae.</p>
<p>Clostridium difficile</p>	<ul style="list-style-type: none"> ● C.difficile is a bacterium that causes colitis. Diarrhea and fever are the most common symptoms of Clostridium difficile infection. ● Overuse of antibiotics is the most important risk for getting C. difficile infection.
<p>Aspergillus</p>	<p>in burn and in immunocompromised patient .</p>
<p>Tuberculosis (MDR) -TB patients MUST BE ISOLATED IN NEGATIVE PRESSURE CHAMBERS - What do you do to a person who has a multi resistant organism ? You MUST ISOLATE but not necessarily negative pressure</p>	<p>Tuberculosis (TB) is an airborne disease</p> <ul style="list-style-type: none"> → Prompt recognition..Atypical presentation. → Isolation → Treatment <p>The room:</p> <ul style="list-style-type: none"> ● Negative pressure ● 100% exhaust ● Private isolation with closed door. ● Use of N95 respirators. ● Follow the contact and test for infection.
<p>Others</p>	<p>HIV, Influenza, meningitis.</p>

MCQs

A 74-year-old woman patient, who is being treated for chest infection following an elective gastrectomy, develops profuse diarrhoea. A stool sample is collected and microscopy, culture and sensitivity reveal Clostridium difficile toxin. What is the most appropriate treatment?

- A. Intravenous co-amoxiclav
- B. Oral metronidazole
- C. Isolate the patient and treat conservatively with intravenous fluids
- D. Isolate the patient and treat conservatively with oral rehydration solution
- E. Prednisolone

Answer: B

Clostridium difficile colitis is caused by the use of broad-spectrum antibiotics which eradicate the normal gut flora and result in colonization of the gut by Clostridium difficile. This extensive infection results in pseudomembranous colitis and patients will usually present with profuse watery diarrhoea. The treatment of this is with oral metronidazole (B). Intravenous co-amoxiclav (A) may cause pseudomembranous colitis due to Clostridium difficile infection and must be stopped if possible. The patient must be isolated and treated with oral rehydration solution (D) or intravenous fluids (C) but conservative measures alone are not sufficient. Prednisolone (E) is not used in the treatment of pseudomembranous colitis.

A 39-year-old Indian man presents to his GP with a 5-week history of haemoptysis, night sweats and weight loss. Which of the following investigations can be used to confirm the diagnosis of tuberculosis?

- A. Tuberculin skin testing
- B. Blood cultures
- C. Chest x-ray
- D. Ziehl–Nielsen sputum staining
- E. Computed tomography pulmonary angiogram (CTPA)

Answer: D

This is a straightforward question. The diagnosis of tuberculosis is confirmed on staining of sputum with Ziehl–Nielsen staining (D) for acidfast bacilli. Tuberculin skin testing (A) is when the tuberculosis antigen is injected intradermally and the size of the reaction is measured 48–72 hours later. While this test indicates immunity to tuberculosis, it does not help confirm a diagnosis of the disease. Blood cultures (B) are not useful in the diagnosis of tuberculosis. Sputum cultures however, which are grown on Lowenstein–Jensen medium for up to 12 weeks, can confirm the diagnosis. This test has the added advantage that antibiotic sensitivity can also be determined. Chest x-ray (C) is highly useful and may demonstrate a cavitating lesion of pulmonary tuberculosis. However, a diagnosis on microscopy or culture is needed to confirm the x-ray findings. CTPA (E) is the investigation of choice in the diagnosis of pulmonary embolism.

Following a colonic resection, a 72-year-old woman becomes unwell with acute confusion, pyrexia, tachycardia and hypotension. The patient has had a difficult postoperative period, which has included an admission to ITU for the management of a chest infection. Blood cultures are sent and grow methicillin-resistant Staphylococcus aureus (MRSA). The patient is placed in isolation and barrier nursing is implemented. What is the most appropriate management of this patient?

- A. Manage conservatively
- B. Start intravenous vancomycin
- C. Start intravenous co-amoxiclav
- D. Start intravenous co-amoxiclav and gentamicin
- E. Start oral metronidazole

Answer: B

MRSA is a hospital-acquired infection which may colonize the skin, cause wound infections, pneumonias or septicaemia. The case in this question is describing sepsis as a result of MRSA. The most appropriate management of this patient is with isolation, barrier nursing and intravenous vancomycin (B). The patient is septic and thus conservative management (A) is inappropriate. Co-amoxiclav (C), gentamicin (D) and metronidazole (E) are not used in the treatment of MRSA. Isolation, barrier nursing, hand washing and removal of lines when possible are needed to prevent the spread of MRSA.