



Hospital Acquired Infections (HAI)

Objectives:

- Know different types of HAI and how to prevent them
- Highlight the crucial importance of Hand Hygiene
- Understand different types of Isolation Precautions and how to comply with them

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Resources: 435 team + Davidson + Recall questions step up to medicine.

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Hospital Acquired Infections (HAI)

- Between 5% and 10% of patients admitted to hospitals acquire one or more HAI
- Causes more serious illness
- Prolonged hospital stay
- Long-term disability
- High personal burden on patients and their families
- High additional financial burden
- Deaths

★ Estimated rates of **HAI** worldwide:

- Developed world→ 5–10% of patients acquire one or more infections.
- Developing countries→ the risk of a HAI might exceed 25%.
- In intensive care units→ HAI affect about 30% of patients and the attributable mortality may reach 44%.

★ Sources of infection: HAIs are caused by infectious agents from:-

Endogenous sources (body sites)	Such as the skin, nose, mouth, GIT, or vagina that are normally inhabited by microorganisms (normal flora). 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".
Exogenous sources (external to the patient)	Health care workers (HCW) 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).

★ **Types of HAI:** Four categories of infections account for approximately 75% of HAIs in the acute care:

1. Catheter-Associated Urinary Tract Infections (CAUTI) **Most common type**
2. Central line-associated bloodstream infections (CLABSI)
3. Surgical site infections (SSI)
4. Ventilator-associated pneumonia (VAP)

Catheter-Associated Urinary Tract Infections (CAUTI)

★ **Invasive urinary procedures**

- Such as procedures done by urologists: cystoscopy or ureteroscopy. These devices may introduce organisms from the outside into the body.

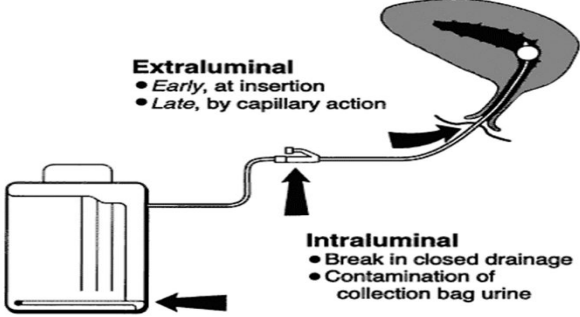
★ **Indwelling urinary catheter and foley's catheter**

CAUTI

- **Most common type of HAI: > 30%**
- Estimated > 500,000 of hospital UTIs annually.
- **Increased morbidity & mortality**
- Estimated 13,000 attributable deaths annually.
- Leading cause of secondary bloodstream infection with ~10% mortality.
- **Excess length of stay: 2-4 days**
- **Indwelling Urinary Catheters**
- 15-25% of hospitalized patients receive urinary catheters during their hospital stay.
- Often placed for inappropriate indications **where patients don't need catheters**
- **Physicians frequently unaware:**
- > 50% did not monitor which patients catheterized
- 75% did not monitor duration and/or discontinuation

-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.

<p>Pathogenesis</p>	<p>Source of microorganisms:</p> <ol style="list-style-type: none"> 1. <u>Extraluminal contamination of the catheter</u>: Exogenous, usually via contaminated hands of HCW during catheter insertion or manipulation of the collecting system. 2. <u>Intraluminal contamination of the catheter</u>: Endogenous (meatal, rectal, or vaginal) organisms enter drainage system. improper aseptic technique. It has to be a closed system and the bag shouldn't be filled up to the limit and should always be emptied .  <ul style="list-style-type: none"> • Formation of biofilms¹ by urinary pathogens is common on the surfaces of catheters and collecting systems. Biofilms prevent the immune cells or antibiotic from reaching the target organism • Bacteria within biofilms are resistant to antimicrobials and host defenses. • Must remove catheter for cure. Antibiotics alone will not do the job
<p>Risk Factors</p>	<ul style="list-style-type: none"> • Advanced age, • Severe underlying disease • Urolithiasis kidney or bladder stones • Pregnancy • DM <p>-The most important risk factor for developing a catheter-associated UTI (CAUTI) is prolonged use of the urinary catheter.</p>
<p>Diagnosis</p>	<ul style="list-style-type: none"> • Symptomatic urinary tract infection: must meet <u>at least 1</u> of the following criteria:- <p>-Fever (38.8C) -urgency -Frequency -dysuria or suprapubic tenderness. Or flank tenderness -Positive urine culture (> 10⁵ microorganism/cc of urine) with no more than 2 species of organisms. <u>Why? when it exceeds 1 or 2 types of species that means it is contaminated "false +ve"</u>.</p> <ul style="list-style-type: none"> • A positive culture of a urinary catheter tip is not an acceptable laboratory test to diagnose a urinary tract Infection. So don't give antibiotics . <p>-Indications of antibiotics in asymptomatic include: pregnancy, kidney transplant or before urological procedures, other than that Do NOT use antibiotics in Asymptomatic bacteriuria.</p> <p>-What are the most common organisms (UTI?) 1-E-coli 2-klebsiella pneumoniae 3-Enterococcus</p>

<p style="text-align: center;">prevention “CAUTI BUNDLE”</p>	<ul style="list-style-type: none"> ● Insert catheters for appropriate indications only as necessary and for the shortest time. ● 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. An open system will help in developing CAUTI ● 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). ● Daily revision of need of catheterization. ● Hand hygiene before and after insertion or manipulation of the catheter. ● Minimize use in all patients, particularly those at higher risk of CAUTI and mortality : Women, elderly, impaired immunity ● Avoid its use for management of incontinence it won't fix the problem , it will just treat the symptom! ● Use catheters in operative patients only as necessary ● Remove catheters ASAP postoperatively, preferably within 24 hours, unless there is an appropriate indication for continued use. <p>-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.</p>
<p style="text-align: center;">Treatment</p>	<p>-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.</p>

Surgical Site Infection (SSI) 2nd most common infection

SSI	<p>A surgical site infection is an infection that occurs after surgery in the part of the body where the surgery took place.</p> <ul style="list-style-type: none"> ● Burden <ul style="list-style-type: none"> - Accounts for 17% of all HAIs in hospitalized patients; second to UTI. - Occurs in 2%–5% of patients undergoing inpatient surgery. ● Mortality <ul style="list-style-type: none"> - 3 % mortality - Patients have a 2–11-times higher risk of death compared with operative patients without an SSI. - 75% of deaths among patients with SSI are directly attributable to SSI. ● Morbidity <ul style="list-style-type: none"> - Long-term disabilities.
Causes	<ul style="list-style-type: none"> ● Inadequate antibiotic prophylaxis: (Important <u>Modifiable Risk Factors</u>) <ul style="list-style-type: none"> - 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 (Procedures > 3 h.). ● Incorrect/ineffective surgical site or skin preparation. In OR ● Inappropriate wound care (Inadequate wound dressing protocol). ● Colorectal procedures <ul style="list-style-type: none"> - Inadequate bowel prep/antibiotics ● Colonization with preexisting microorganisms ● improper glucose control in OR
Risk factors	<ul style="list-style-type: none"> ● Surgical intervention duration the longer the surgery duration the more chances of developing SSI ● Type of wound ● Type of surgery: clean, clean-contaminated, contaminated, dirty ● Poor glucose control (diabetes) ● Immunodeficiency, Malnutrition, Hypothermia is common with anesthesia , you have to maintain the temp during the surgery ● Improper surgical aseptic preparation ● Lack of training and supervision
Surgical wound classification	<ul style="list-style-type: none"> ● Clean: <ul style="list-style-type: none"> - Uninfected, no inflammation - Resp, GI, GU tracts not entered - Closed primarily <p><i>E.g. Ex lap, mastectomy, neck dissection, thyroid, vascular, hernia, splenectomy.</i></p> ● Clean-contaminated: minor spillage <ul style="list-style-type: none"> - Resp, GI, GU tracts entered, controlled - No unusual contamination <p><i>E.g. Chole, Small bowel resection, Whipple procedure, liver transplant, gastric surgery, bronchoscopy, colon surgery.</i></p>

	<ul style="list-style-type: none"> ● Contaminated: major spillage - Open, fresh, accidental wounds - Major break in sterile technique - Gross Spillage from GI tract - Acute nonpurulent inflammation <p><i>E.g.</i> Inflamed appendix, bile spillage in chole, diverticulitis, Rectal surgery, penetrating wounds</p> <ul style="list-style-type: none"> ● Dirty: (there is infection prior to surgery) - Old traumatic wounds, devitalized tissue necrotic tissue - Existing infection or perforation - Organisms present BEFORE procedure <p><i>E.g.</i> Abscess I&D (incision and drainage), perforated bowel, peritonitis, wound debridement, positive cultures pre-op.</p>
<p>Types of (SSI)</p>	<ul style="list-style-type: none"> ● Superficial incisional SSI: - Infection occurs within 30 days after the operative procedure, and Involves only skin and subcutaneous tissue of the incision. - Purulent drainage from the superficial incision - Organisms isolated from an aseptically obtained culture of fluid or tissue from the superficial incision - Often Clinical diagnosis: pain or tenderness, localized swelling, redness, or heat, lack of systemic symptoms (e.g. fever) - <u>A negative culture does not rule it out</u> ● Deep incisional SSI (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. - Bone surgeries that would result in osteomyelitis - Bowel surgeries that would result in intrabdominal abscesses - Involves deep soft tissues (e.g., fascial and muscle layers) of the incision. - Clinically may have abscess (a CT with contrast must be done to rule it out, ultra sound is not good for abscess as about 40% can be missed), fever (a good suggestion of deep SSI).
<p>Pathogenesis</p>	<p>Pathogen Sources:</p> <ul style="list-style-type: none"> ● Endogenous: - Patient flora: skin, mucous membranes, GI tract. - Seeding from a distant focus of infection. ● Exogenous - Surgical Personnel (surgeon and team): Soiled attire dirty clothes , Breaks in aseptic technique, Inadequate hand hygiene. - O.R. physical environment and ventilation - Tools, equipment, materials brought to the operative field.
<p>Organisms causing SSI</p>	<ul style="list-style-type: none"> ● Staphylococcus aureus 30.0% ● Coagulase-negative staphylococci 13.7% ● Enterococcus spp. 11.2% -Gram positives are more common in implants with artificial limbs ● Escherichia coli 9.6% ● Pseudomonas aeruginosa 5.6%

	<ul style="list-style-type: none"> ● Enterobacter spp 4.2% ● Klebsiella pneumoniae 3.0% ● Candida spp. 2.0% ● Klebsiella oxytoca 0.7% ● Acinetobacter baumannii 0.6% <p>-Gram negatives are more common in surgeries like laparotomy, hysterectomy or C-Section</p>
<p style="text-align: center;">Prevention</p>	<p>preoperative prevention guidelines:</p> <ul style="list-style-type: none"> ● Administer antimicrobial prophylaxis in accordance with evidence based standards and guidelines: usually not done to clean surgery - Administer within 30-45 minutes prior to incision; (not when the patient gets called to the OR) 1-2hr for <i>vancomycin</i> and <i>fluoroquinolones</i> ● Select appropriate agents on basis of: <ul style="list-style-type: none"> - Surgical procedure - Most common SSI pathogens for the procedure - Published recommendations ● Nasal screen and decolonize only Staphylococcus aureus carriers undergoing <ul style="list-style-type: none"> -Elective cardiac. (because they are at risk of developing infective endocarditis) -Orthopedic surgery -Neurosurgery procedures with implants. <p>If positive decolonize USING: Preoperative <u>Mupirocin Ointment</u> therapy Over the nose 10-14 days.</p> ● Shower night before surgery ● Antimicrobial prophylaxis should be administered only when indicated: <ul style="list-style-type: none"> - Certain surgeries only (not indicated in clean surgeries) - Single pre-operative dose 30-45 min before incision (common mistake is that the surgeons continue the antibiotic for days after the surgery and that kills the normal flora and could cause SSI) - Topical antibiotics should not be applied to the surgical site - In clean and clean-contaminated surgery: No additional prophylactic antimicrobial doses should be given even in the presence of a drain. ● Skin preparation in the O.R. by alcohol-based agent ● Good glyceimic control during surgery ● Normothermia should be maintained throughout surgery ● Administration of FIO2 oxygen during surgery and after extubation. <p>In dirty SSI or complicated contaminated SSI you should consider antibiotics postoperative</p>

Central Line-Associated BloodStream Infection (CLABSI)

Definition	<ul style="list-style-type: none"> ● Laboratory-confirmed bloodstream infection by a positive blood culture. ● Not related to an infection at another site. ● Develops at least after 48 hours of a central line placement. ● Most common site: femoral central lines. Internal Jugular is less common, subclavian. <p>-Most are associated with intravascular catheters, and central venous catheters in particular (90%).</p> <p>-other types of central line that stay for longer periods to perform dialysis or chemotherapy are called tunneled central line:</p> <p>1-hickman catheter</p> <p>2-PICC (peripherally inserted central catheter)</p> <p>-risk of developing CLABSI is more in short term central lines</p>
Organisms	<ul style="list-style-type: none"> ● GPC:Gram +ve cocci <ul style="list-style-type: none"> - CoNS 35% coagulase negative staph. - Enterococci spp 15% - Staphylococcus aureus 10% ● GNB: <ul style="list-style-type: none"> - Klebsiella pneumoniae 6% - E.coli 3% - Enterobacter spp. 3% - Pseudomonas aeruginosa 3% - Acinetobacter baumannii 2% ● Candida spp. 12% in ICU patients with multiple comorbidities ● Other 10%
Pathophysiology	<p>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.</p> <p>→This is the most common route of infection for short-term catheters.</p> <p>2) Direct contamination of the catheter or catheter hub by contact with hands or contaminated fluids or devices.</p>
Prevention Bundle	<p>Prevention Guidelines During Insertion:</p> <ul style="list-style-type: none"> ● Hand hygiene before wearing gloves. ● Strict aseptic technique by maximal sterile barrier precautions including a full- body drape ● Use of 2% chlorhexidine skin preparations for disinfecting/ cleaning skin before insertion ● Ultrasound guidance by an experienced personnel and reduce the number of attempts. ● Avoid the femoral vein, prefer the subclavian vein ● Promptly remove any central line that is no longer required ● Replace central lines placed during an emergency (asepsis not assured) as soon as possible or at least within 48 hours ● Use a checklist

	<p>Prevention Guidelines During Maintenance:</p> <ul style="list-style-type: none"> ● Disinfect catheter hubs, injection ports, and connections before accessing line. ● Replace administration sets other than sets used for lipids or blood products every 96 hours. ● Assess the need for the central line daily.
Treatment	<ul style="list-style-type: none"> ● Removal of central line. Place it on another site ● Antimicrobial therapy bacteremia - Type and duration depends on culture results, type of organism, complicated disease <p>E.g. of Antibiotics used: Vancomycin, cloxacillin, cefazolin, piperacillin/tazobactam, cefepime, ceftazidime, carbapenems, Aminoglycosides, colistin, daptomycin, echinocandins. We give empiric treatment in the beginning</p>

Ventilator-Associated Pneumonia (VAP)

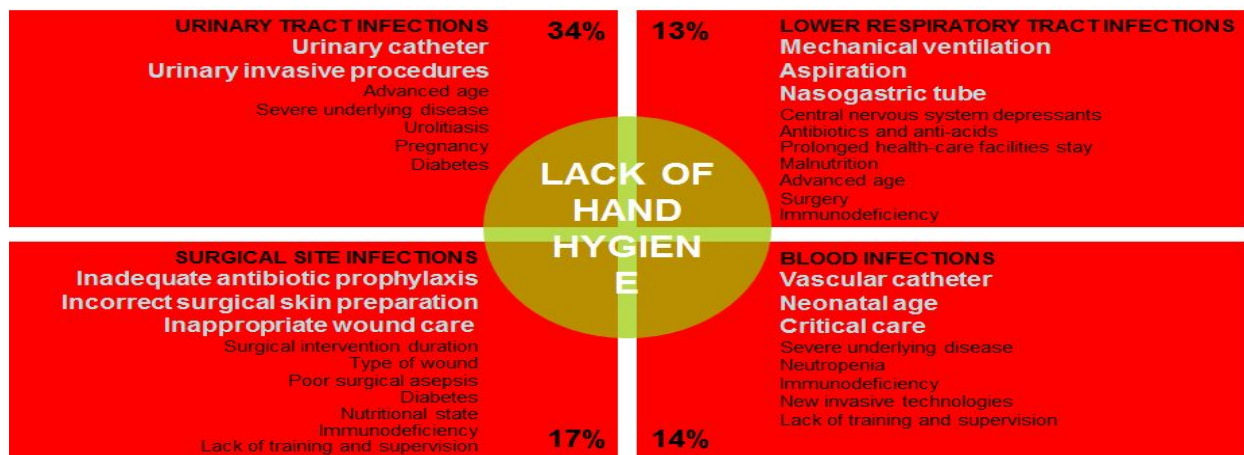
★ Lower Respiratory Tract infections:

1. Mechanical ventilation. (Most common type)
 2. Aspiration.
 3. Nasogastric tube
- 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.

Definition	<ul style="list-style-type: none"> ● VAP is one of the <u>most common infections</u> acquired by adults and children in <u>intensive care units</u>. <p>-It is a type of HAP that develops more than 48 to 72 hours after endotracheal intubation.</p> <ul style="list-style-type: none"> ● Affects critically ill patients. ● VAP is a cause of significant morbidity and mortality, increased utilization of healthcare resources. ● The mortality attributable to VAP exceed 15%.
Pathogenesis and Risk factors for VAP	<p>The three common mechanisms:</p> <ul style="list-style-type: none"> ● Aspiration of secretions. ● Colonization of the aerodigestive tract ● Use of contaminated equipment
Prevention	<ul style="list-style-type: none"> ● Prevent Aspiration of secretions:

	<ul style="list-style-type: none"> -Maintain elevation of head of bed (HOB) 30-45 degrees -Avoid gastric over-distention -Avoid unplanned extubation and re-intubation -Use cuffed endotracheal tube with in-line or subglottic suctioning -Encourage early mobilization of patients with physical/occupational therapy <ul style="list-style-type: none"> ● Reduce duration of ventilation: -Conduct “sedation vacations” stop sedation so that diaphragm can move -Assess readiness to wean from vent daily -Conduct spontaneous breathing trials <ul style="list-style-type: none"> ● Reduce colonization of airway and digestive tract: -Use cuffed Endotracheal Tube with inline or subglottic suctioning → Minimizes secretions above cuff; prevents contamination of lower airway -Avoid acid suppressive therapy for patients not at high risk for stress ulcer or stress gastritis → Increases colonization of the digestive tract -Prevent exposure to contaminated equipment
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★ Most frequent sites of infection and their risk factors



Prevention of HCAI

- Validated and standardized prevention strategies have been shown to reduce HAI.
- At least 50% HAI could be prevented.
- Most solutions are simple and not resource-demanding and can be implemented with ease by all HCW:

- Hand hygiene
- Bundles
- Compliance with isolation precautions
- Annual influenza vaccination
- Annual TB screening: TST, IGRA
- UpToDate with vaccinations: HBV Ab titre above 10, MMRV, Td

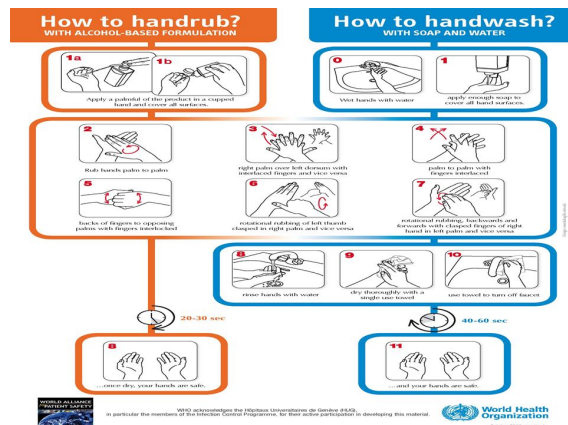
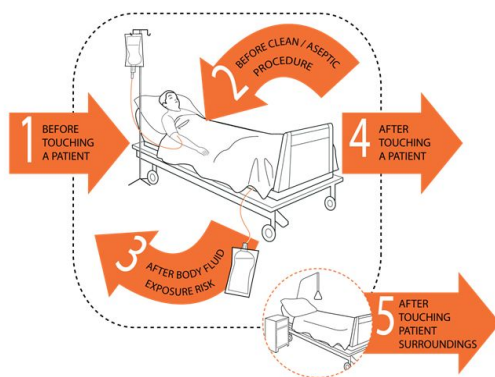
★ Hand transmission:

- Hands are the most common vehicle to transmit healthcare associated pathogens.
- Transmission of microbiological organisms from one patient to another via HCW hands.
- In USA 20,000 cases of HAIs are directly related to poor hand hygiene annually.

★ Why should you clean your hands?

- Any HCW involved in health care needs to be concerned about hand hygiene
- Other HC workers (e.g. your colleagues and seniors) hand hygiene concerns you as well
- You must perform hand hygiene to: Protect the patient against harmful microbes in your hands or present on your skin and Protect yourself and the healthcare environment from harmful microbes.

★ Five moments of hand hygiene:



★ How to clean your hands?

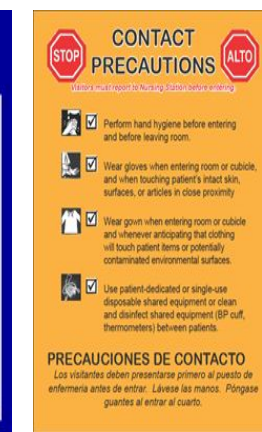
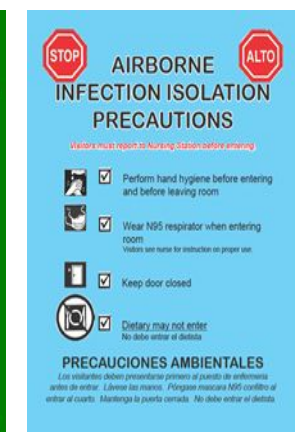
- I. **Handrubbing** with alcohol-based handrub is the preferred routine method of hand hygiene if hands are not visibly soiled.
- II. **Handwashing** with soap and water, essential when hands are visibly dirty or visibly soiled (following exposure to body fluids).

★ Hand hygiene and glove use:

- The use of gloves does not replace the need to clean the hands.
- Remove gloves to perform Hand hygiene, when an indication occurs while wearing gloves.
- Wear gloves **only when indicated**, otherwise they become a major risk for germ transmission.

★ Types of Isolation Precautions:

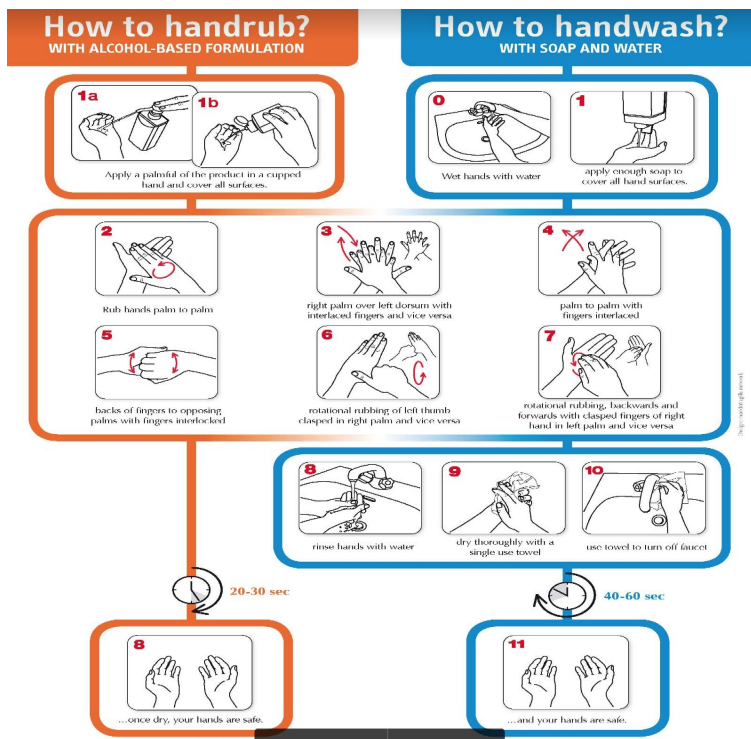
- I. Standard precautions
- II. Transmission-based precautions: types below
 - **Contact precautions**
 - Infections spread by direct or indirect contact with patients or patient-care environment; C. difficile, MRSA, VRE vancomycin resistant enterococci, ESBL extended spectrum b-lactmase producing bacteria, CRE carbapenem-producing enterobacteriaceae and MDR GNR multi-drug resistant gram -ve bacteria.
 - Limit patient movement
 - Private/SINGLE room or cohort with patients with same infection
 - Wear disposable gown and gloves when entering the patient room
 - Remove and discard used gown and gloves inside the patient room
 - Wash hands immediately after leaving the patient room
 - Use dedicated equipment if possible (e.g., stethoscope)
 - **Airborne precautions DONT SKIP THE PICTURES !**
 - Tuberculosis, measles, varicella, MERS-CoV (severe) , Ebola
 - Place the patient in an airborne infection isolation room (AIIR)
 - Negative Pressure should be monitored with visible indicator
 - Use of respiratory protection (e.g., fit tested N95 respirator) or powered air-purifying respirator (PAPR) when entering the room
 - Limit movement and transport of the patient. Use a mask on the patient if they need to be moved
 - Keep patient room door closed, do not open anteroom door till other door closed.



- **Droplet precautions**

- Reduce the risk of transmission by large particle droplets (larger than 5 m in size).
- Requires close contact between the source person and the recipient
Droplets usually travel 3 feet or less
- E.g., influenza, MERS-CoV, other respiratory viruses, rubella, parvovirus B19, mumps, H. influenzae, and N. meningitidis
- A private/single room or Cohort with patient with active infection with same microorganism
- Use a mask when entering the room especially within 3 feet of patient
- Limit movement and transport of the patient. Use a mask on the patient if they need to be moved and follow respiratory hygiene/cough etiquette.

- ❖ Pictures from the doctor's slides:



-Bacteria is isolated everywhere, eg: Vancomycin resistant Enterococcus

Summary

Hospital Acquired Infections (HAI): Are caused by infectious agents from endogenous sources such as skin, nose, mouth, GIT , and vagina or exogenous sources like HCW, visitors, medical devices and healthcare environment .		
Four types	Catheter-Associated Urinary Tract Infections (CAUTI)	<p>Most common type of HAI: > 30%</p> <hr/> <p>Pathogenesis: Caused by Indwelling urinary catheters and often inappropriately indicated. Microorganisms are either Exogenous via contaminated HCW hands during insertion, Or Endogenous from meatal, rectal, or vaginal organisms. These organisms are protected by biofilms and we must remove the catheter to cure.</p> <hr/> <p>Diagnosis: Must meet 1 of the following: Fever, urgency, frequency, dysuria or suprapubic tenderness. With a positive urine culture. Positive culture of a urinary catheter tip is not diagnostic.</p> <hr/> <p>Prevention: Insert catheters for appropriate indications only as necessary and for the shortest time. Aseptic technique for catheterization. Closed drainage system. Hand hygiene. Avoid using catheters for management of incontinence. Minimize use for those with high risk(women, elderly, immunocompromised).</p>
	Surgical Site Infections (SSI)	<p>Second to CAUTI and causes 17-20% of all HAI.</p> <hr/> <p>Causes: Inadequate antibiotic prophylaxis(Choice, time, or dose) Incorrect/ineffective surgical site or skin preparation. Inappropriate wound care(dressing).</p> <hr/> <p>Risk Factors: Duration, type of wound, type of surgery, poor glucose control, hypothermia... etc.</p> <hr/> <p>Surgical wound classification: I- Clean. II- Clean-contaminated III- Contaminated IV- Dirty</p> <hr/> <p>Types of SSI: <u>Superficial incisional SSI</u> occurs within 30 days and involves</p>

		<p>skin and subcutaneous tissue with lack of systemic symptoms. It is diagnosed clinically and a negative culture does not rule it out.</p> <p>Deep incisional SSI occurs with 30 days or 1 year if there is an implant. Has systemic manifestations and involves the deep tissues.</p> <hr/> <p>Organisms: -Staph. aureus 30.0% -Coagulase-negative staphylococci 13.7% -Enterococcus spp. 11.2% -Escherichia coli 9.6%</p> <hr/> <p>Prevention: Appropriate prophylactic Antibiotics 30-45mins before incision. Nasal screening and decolonization. Good glycemic control Normothermia</p>
	<p>Central line-Associated BloodStream Infection (CLABSI)</p>	<p>Laboratory-confirmed bloodstream infection by a positive blood culture that is not related to another site and develops 48h after central line placement.</p> <p>Most commonly from femoral central line</p> <hr/> <p>Organisms: - Gram positive cocci 60% - Gram negative bacilli 16% - Candida spp. 12% - Other 10%</p> <hr/> <p>Prevention: Hand Hygiene before wearing gloves. Strict aseptic technique including a full-body drape. Ultrasound guidance. Avoid femoral vein, prefer the subclavian. Use a checklist. Disinfect before accessing line. Replace administration sets every 96h except for lipid and blood sets.</p> <hr/> <p>Treatment: Central line removal Antimicrobial therapy e.g. vancomycin, cefazolin, tazobactam...</p>
	<p>Ventilator-Associated Pneumonia (VAP)</p>	<p>One of the most common infections in intensive care units.</p> <p>Pathogenesis: Aspiration of secretions. Colonization of the aerodigestive tract. Use of contaminated equipment.</p> <hr/> <p>Prevention: 1- Prevent aspiration of secretions 2- Reduce duration of ventilation 3- Reduce colonization of airway and digestive tract 4- Prevent exposure to contaminated equipment</p>

Questions

Q1: 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.

Q2: You are called to see a 69-year-old male with acute SOB. Vital signs are: Temperature = 100.1, BP = 166/88, pulse = 130, RR = 33. You rush to see the patient and on your arrival, oxygen saturation is 79% on a 100% oxygen nonrebreather face mask. The nurse informs you that his oxygen saturation was 68% on room air. He currently has heavily labored breathing and appears cyanotic. The nurse informs you that the patient was admitted 2 days ago for a severe COPD exacerbation. You decide to emergently intubate the patient. Which of the following will reduce the risk of developing pneumonia in this patient?

- A. Place the patient in a supine position
- B. Avoid daily attempts to wean the patient from the ventilator
- C. Administer oral chlorhexidine solution twice daily
- D. Administer daily omeprazole
- E. Avoid any instrumentation of the airway, including endotracheal suctioning

Answers : C , C